# REGION ONE PROTOCOL EFFORT

# REGION

## THE STANDARD OF CARE FOR EMS PROVIDERS IN THE GREATER NEW ORLEANS AREA

**REVISED MARCH 2021**

# Region One Protocol Effort

Region One includes four parishes in the southeast part of Louisiana: Orleans, Saint Bernard, Plaquemines, and Jefferson parishes. The primary 911 providers of each parish within Region One are:

| | |
|---|---|
| Orleans: | New Orleans EMS |
| Saint Bernard: | Acadian Ambulance Services of New Orleans |
| Plaquemines: | Plaquemines Parish EMS |
| Jefferson: | East Jefferson EMS and West Jefferson EMS, respectively<br>Westwego EMS and Gretna EMS, within their incorporated boundaries |

Clinicians within the region collaborated to provide the following standing orders[1] and offline medical direction. In addition to EM and EMS expertise, primary references include NASEMSO National Model EMS Clinical Guidelines, peer-reviewed journals, local specialist physicians, and extensive review of outside EMS agencies (special thanks to Denver Metro EMS, East Baton Rouge EMS, and Austin Travis County EMS!) These orders reflect up to date, evidence based, standard of care for prehospital medicine and have been approved by local EMS medical directors within the Region One Metropolitan Ambulance Council (MAC) Clinical Committee.

Members of the Region One MAC Clinical Committee include:

| | |
|---|---|
| Sarah Bass, NRP | Meg Marino, MD |
| Chuck Benedict, NRP | Dre Mouledoux, MD |
| Jovan Bernard, MPH, BSN, RN | Emily Nichols, MD |
| Andre' Brooks, NRP | Bill Niemeck, NRP, BGS |
| Chuck Burnell, MD | Lynn Ramagos, NRP |
| Tom Dransfield, NRP | David Rayburn, MD |
| Jeffrey Elder, MD | Julia Schweizer, MD |
| Toni Gross, MD | Nicolas Sokolik, NRP |
| Elizabeth Lacy, BIS, NRP | Bill Rogers, MD |

Any EMT or paramedic certified to provide prehospital care within the parishes of Region One must adhere to these orders. In accordance with Louisiana Administrative Code, Title 48, these revised guidelines shall supersede all guidelines currently in use within any EMS system – public or private – licensed to operate in Region One. The use of any other protocols/orders/guidelines specifically developed for an individual EMS system is strictly prohibited. It is recommended that EMS agencies routinely conduct quality assurance and that the MAC Clinical Committee meet regularly to evaluate the effectiveness of these guidelines to ensure providers maintain the highest quality prehospital patient care.

ROPE guidelines should never overshadow sound clinical judgment of prehospital providers.

[1] Defined as "protocols" by the Louisiana Administrative Code

THIS PAGE INTENTIONALLY LEFT BLANK

# Table of Contents

## Cardiac Guidelines



## Trauma Guidelines

## Pediatric Guidelines

## Hazardous Materials (HAZMAT) Guidelines



## Advanced Practice Guidelines

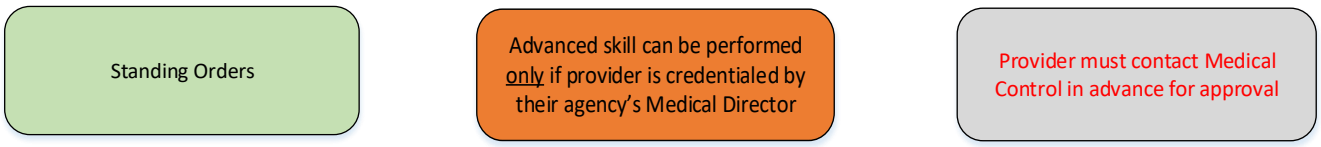
# ROPE Introduction

All licensed EMS practitioners are expected to provide prehospital care under the direction of the highest skilled level EMS practitioner and Medical Control. This may be accomplished by voice communication established with a physician and under the physician's order or through utilization of standing order outlined in an approved protocol.

**Standing Orders**

Standing orders are designed for EMS providers to initiate care without having to contact Medical Control. Additionally, certain treatments and procedures must be credentialed by the agency's Medical Director before they can be performed within Region One. Education, training, and medical oversight for these advanced skills is the responsibility of the agency's Medical Director.

The following colors are utilized within the ROPE guidelines to clarify provider orders:




Additional colors utilized within the ROPE guidelines include:


**Medical Control**

Online medical control – via radio or telephone – can be used whenever desired by the EMT or paramedic. When contacting Medical Control, providers should begin their report stating the reason or request for which they are calling. The provider report should then follow the format outlined in the appendix.

Listed below are reasons for which Medical Control **MUST** be contacted:

- as clinically indicated and in accordance with the operating procedures of your employer
- as indicated in the On-Scene Physician policy
- at any point as directed within the following ROPE guidelines
- prior to administration of medications that are not standing orders
- if a line of treatment is in question or patient care becomes unclear
- prior to performance of an advanced skill(s) as specifically stated in the appropriate guideline
- to request/receive orders to terminate, or not attempt, resuscitation

In the event that primary Medical Control cannot be reached, the responsibility of Medical Control will belong to either the receiving facility or the agency's EMS Medical Director. Physicians serving as Medical Control are expected to be familiar with ROPE guideline and to use them as a guide for providing prehospital orders and/or consultation.

A Medical Control physician should notify an agency's EMS director in writing or by email whenever prehospital care has been rendered that they believe does not comply with the guidelines as outlined by ROPE. They may also notify the Region One MAC if there are guidelines that a Medical Control physician needs to be revised in order to maintain quality prehospital patient care.

**On-Scene Physician**

If a licensed physician other than an agency's EMS medical director is first to arrive on-scene of an emergency, protection from liability applies as outlined in the Good Samaritan Statute[1]. Upon arrival of the EMS practitioner, the physician has three options:

a) *Allow the EMS practitioner to assume full authority for directing the care of the patient.* In this instance, the physician will not have any risks of liability for patient abandonment.

b) *Assist the EMS practitioner in the care of the patient without assuming authority over patient care.* In this instance the EMS practitioner must articulate that state law requires EMS personnel to comply with standing orders and/or verbal orders from a pre-established Medical Control.

c) *Assume full authority for directing patient care*. The primary purpose of this option is to support a previously well-established physician-patient relationship; however, it may be utilized under other less anticipated circumstances. In this instance, the physician must state their intent to assume responsibility for any patient care given and must accompany the patient to the hospital. EMS providers should manage this situation based on the following process.

Process for On-Scene Physician Assuming Patient Care

1. The EMS practitioner should ask the physician to show his/her Louisiana State Board of Medical Examiners license as verification of his/her identity as a physician.
2. The EMS practitioner should confirm (and reaffirm) that the on-scene physician is agreeing to
    a. Full medicolegal responsibility of patient care
    b. Remain physically present during the duration of prehospital care, including riding in the back of the ambulance with patient and performing handoff to a clinician at the receiving facility
    c. Sign the EMS patient care report (i.e. prehospital medical record) indicating that they have accepted full responsibility for medical care and all medical orders given
3. The EMS practitioner should establish contact with the base hospital physician serving as Medical Control. After advising the Medical Control Physician (MCP) of useful patient information, the EMS practitioner should inform them that a physician is present and wishing to assume patient care responsibility. The on-scene and Medical Control physician should discuss the appropriate patient treatment and determine who will have authority over patient care.
4. EMS personnel will accept orders from the on-scene physician only after the base hospital physician serving as Medical Control has stated that care is being transferred to the on-scene physician. EMS practitioners may only execute orders and perform duties that are within their scope of practice.
5. If at any time the on-scene physician's orders become questionable, are contrary to established Region One protocols, or appear to interfere with quality patient care, the EMS practitioner should

[1] Louisiana State Legislature RS 37:1731. http://legis.la.gov/legis/Law.aspx?d=93432

immediately re-establish contact with the base hospital physician for guidance before executing the orders. In any case of conflict, the orders of the online Medical Control physician take priority.

EMS practitioners shall treat all on-scene physicians with respect and shall endeavor to work in cooperation with an on-scene physician for the patient's best interest. The EMS practitioners should make their services, equipment, supplies and ambulance available to the on-scene physician as much as feasible.

Patient Refusal of On-Scene Physician Care

In the event that a patient refused the care of the on-scene physician but accepts the care of the EMS practitioner, the online Medical Control physician will be responsible for directing the EMS practitioner, regardless of whom the two physicians originally decided would have patient care authority

A patient (or a patient/guardian, in the case of a minor) who is lucid and understands the medical risks and consequences of their decisions has the legal right to refuse care by the EMS practitioner, on-scene physician, and Medical Control physician after such risks and consequences have been explained to him/her.

In the event that a patient wishes for the on-scene physician to have authority over care, but the online Medical Control physician does not feel that this is in the patient's best interest, the EMS team on-scene should attempt to have the patient sign a refusal of service form before leaving the scene (as is standard practice). The on-scene physician is then responsible for further patient care and for arranging transport of the patient to an appropriate hospital or facility.

## Provider Responsibilities

EMS practitioners are authorized to perform services, treatments, and procedures authorized by ROPE and within the provider's Louisiana Bureau of EMS scope of practice matrix guidelines to the extent that he/she has been trained to perform such services. EMS agencies are responsible for module education and documentation of skill proficiency and education. All skills, procedures, interventions, and medications must be included in agency protocols as approved by the agency's medical director. Ambulance services are responsible for ensuring compliance with applicable protocols by their personnel.

In the event of a basic level ambulance response to an emergency within Region One (prohibited in Orleans parish unless an MCI or disaster is declared) EMRs, EMTs and Advanced EMTs are permitted to administer the medications as specified within this document that are also in accordance with the Louisiana Bureau of EMS approved scope of practice matrix for licensed EMS practitioners.

The scope of practice for each EMS practitioner level is determined by the LA EMS Certification Commission. The most up to date matrix is available at https://ldh.la.gov/index.cfm/page/1754.

## Ambulance Requirements

Patients in the need of transport to a hospital will be transported in an ambulance or an approved vehicle that meets the requirements of the regulatory agencies of Region One and the state of Louisiana.

In addition to state requirements, Region One mandates all EMS services and systems licensed to operate in the region carry the following equipment:

- 12-lead EKG
- AED (Automatic External Defibrillator); biphasic (for BLS units)

- All medications listed within these guidelines, unless stated "if available"
- Biphasic defibrillation
- Quantitative end tidal $CO_2$ ($EtCO_2$) capnography
- Glucometer
- Intraosseous vascular access (adult and pediatric)
- SpO2
- Transcutaneous pacing
- Continuous Positive Airway Pressure (CPAP)

Operating without the above equipment violates certain parish ordinances and could jeopardize licensure.

**Hospital Selection**

1. The choice of hospital destination should preferentially be based on the patient's medical need. If, in the opinion of the highest skilled level EMS practitioner or Medical Control, the patient's condition is unstable the patient will be transported to the closest appropriate hospital emergency department.

2. In patients who are stable, hospital diversion should next be considered by EMS practitioners when choosing hospital destination. Providers should maintain awareness of local hospital status and encourage local ED staff to regularly update hospital status within the LERN ESF-8 Portal. Providers may be required to override hospital diversion to transport patient to facilities with specialized patient care capabilities (e.g. trauma, stroke, STEMI).

3. In stable patients where hospital diversion is not a factor, patients (or an authorized guardian) will be allowed to select the hospital destination of choice within the EMS service area. EMS providers should consider factors such as travel time and weather when determining hospital destination and make selections in the patient's best interest. If a patient's hospital choice cannot be honored, providers should make every effort to transport the patient to a hospital within their preferred healthcare system. Hospital destination should not be determined by a provider's unsubstantiated perception of hospital capability.

4. Patients who have sustained rabid animal bites, venomous snake bites, or any other poisonous bites or stings should be transported to an ED that has antivenin and rabies treatment. Providers should contact Medical Control for assistance identifying the appropriate receiving ED.

**Hospital Diversion**

Region One providers will make every attempt to honor hospital diversion and acknowledge patient off-load times of receiving facilities. A diversion request usually means the hospital's current patient load exceeds the ED's ability to treat additional patients promptly. If one ED is overcrowded and another is available, diversion helps ensure that a patient is treated in a timely manner.

Diversion status indicates an area of the hospital (e.g. ICU, psychiatric) is without further available resources. This may include "ED Saturation." EMS providers should make every effort possible to avoid transporting patients to hospitals on ED saturation. Limited Diversion Status does not apply to patients who are critically ill requiring immediate stabilization.

The dispatch centers of all Region One EMS providers will monitor the LERN ESF-8 portal and update on-duty crews of hospital diversion status, color (as outlined below), and off-load times. If approved by the individual agency, EMS providers may also access the portal and review off-load times themselves. Posting current and updated information is the hospital's responsibility.

Hospital's approximate off-load times correspond to the following colors listed on the LERN portal:

| | | |
|---|---|---|
| **Green** | → | **off-load times less than 15 minutes** |
| **Yellow** | → | **off-load times of 15 – 30 minutes** |
| **Red** | → | **off-load times of 30 – 60 minutes** |
| **Black** | → | **off-load times of greater than 60 minutes** |
| **Purple** | → | **off load times greater than 120 minutes** |

**Patient/Call Disposition**

All 911 calls received by EMS will be given one of the following dispositions:

1. Cancelled prior to arrival on scene
   - This disposition is provided by the Communications Center (i.e. dispatch).
   - Dispatcher must obtain a name of the canceling party, documenting it on a recorded line as they relay the name to the EMS crew for agency-specific documentation.
2. Unfounded
   - This is reserved for instances when an EMS crew (or first responding agency) arrives at a location and is unable to locate a patient. Every attempt will be made by the responding crew to locate the patient.
3. Patient "Gone on Arrival" (GOA)
   - This is reserved for instances when an EMS crew (or first responding agency) arrives on a scene and a bystander reports that the patient has left the scene.
   - Every effort should be made to obtain information regarding how and when the patient left and the party relaying that the patient is gone should be documented over the radio.
4. Cancelled on Scene
   - This is reserved for when an EMS unit arrives on the scene of a 911 call and finds **an individual with no injuries, no complaints, and no request(s) for medical assistance.**
   - Should the medic render ANY type of assessment or treatment, this disposition should not be utilized. This disposition generally does not apply if a unit is on scene for an extended period of time.
   - EMS providers must obtain the name of the canceling party (whether it is law enforcement, fire department or the people involved in the incident).
5. Patient Refusal
   - This is reserved for a low acuity call in which neither the patient/guardian nor the provider feels that the patient's condition warrants transport via an ambulance.
   - It is recommended that providers obtain a patient refusal – not "cancelled on scene" disposition – when choosing not to care for individuals involved in trauma with a concerning mechanism of injury.

- A patient refusal on a patient care report will be signed by the patient/guardian and witnessed by another party on the scene. Providers should seek to obtain witness signature from an individual accompanying the patient or a first responder from an outside agency (e.g. police, fire).
- Providers may obtain the signature of their EMS partner as a last resort if no third party is present.

6. Patient AMA
   - This is reserved for a more acute call in which the provider believes – based on their clinical assessment – that the patient needs EMS treatment and transport yet the patient/guardian is declining
   - AMA requires consultation with online Medical Control or the Medical Director of the responding agency.
   - AMA requires refusal on a patient care report and signature by patient and witness as described above.
   - Providers may offer and provide stabilizing care to the patient on-scene prior to completing the call.
7. Patient Deceased on Scene
   - Death may be medical or traumatic in etiology; providers should follow the appropriate clinical guideline.
   - Providers must contact Medical Control to obtain orders to withhold or terminate resuscitation.
   - Providers must report the Time of Termination (TOT) in the patient care report.
   - Local law enforcement and/or the parish Coroner's Office must be contacted.
8. EMNAT "Emergency Medical Necessary Action Taken"
   - This is reserved for when an EMS crew evaluates and/or treats a patient according to a special event protocol (e.g. road race, concert venue) or during a mobile integrated healthcare encounter.
   - The patient is evaluated, treated, and released with appropriate follow up instructions.
   - Providers must document the patient encounter based on the policies of their local agency.
9. Patient Transported to an appropriate ED or pre-established alternate destination of care.

**Regional Mass Casualty Response**

For any mass casualty incident (MCI) within Region One, the primary 911 provider for the parish in which the incident occurred is expected to serve as lead EMS agency and assume control of the incident upon their arrival. The National Incident Management System (NIMS) will be utilized to manage all MCI events.

Any non-lead EMS agency present on-scene will defer to the leadership of the primary 911 provider – this includes relinquishing command/control of the incident to a representative of equal or higher skill level within the lead EMS agency.

It is the responsibility of the highest skilled provider within the lead agency to serve as Incident Commander (or designate another incident commander) and to request additional resources as needed. Additional EMS agencies may provide mutual aid as designated/requested by the Incident Commander.

# Region One Protocol Effort

## Medical Guidelines

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Medical Preambles

The following general principles should be practiced while operating within Region One. These principles serve as a reference to be used in conjunction with each disease-specific guideline. When a clinical situation is not specifically addressed in a guideline, providers should refer to the basics of prehospital medicine, utilizing the skills of assessment and treatment appropriate for their level of training. Medical Control should be considered a resource for consultation when mandated and as needed.

- As scene safety and scene conditions allow, a *primary* survey, routine medical care, and initial treatment should be completed **prior to moving the patient to the ambulance.** The performance of the *secondary* survey should not delay transport in critical patients.

- High-visibility, retro-reflective apparel should be worn when deemed appropriate (e.g. operations at night, in darkness, in large crowds, on or near roadways)

- Appropriate personal protective equipment (PPE) should be worn by EMS providers at all times during patient care.

**I. UNIVERSAL CARE**

- All patients should have vital signs assessed upon patient contact or as soon as reasonably possible. Region One recognizes vital signs as:
    - blood pressure (+ capillary refill in children)
    - heart rate
    - respiratory rate
    - $SpO_2$
    - GCS or AVPU (**Al**ert, **V**erbal, **P**ainful, **U**nresponsive)
    - pain scale
    - temperature (where indicated)

- At least two full sets of vital signs should be documented for every patient. Ideally, one set should be taken shortly before arrival at the receiving facility. Critical patients should have pertinent vital signs monitored more frequently.
- Abnormal vital signs should be addressed and reassessed.
- Response to therapy provided should be documented, including pain scale reassessment if appropriate.
- Upon administration of any medication, patients should ideally have IV access, cardiac monitoring, and pulse oximetry measurement with $O_2$ as indicated.
- Following administration of medications via IV/IO access, providers should flush the line with saline fluid bolus. Give 20ml of NS following medication given during cardiac arrest; give a 10ml NS flush following IV/IO medication administered at all other times.
- When medication, including a fluid bolus, are not required or anticipated saline locks may be used at the paramedic's discretion.
- Medication administration via the endotracheal tube is strongly discouraged.

## Medical Care During Pandemics

During periods of pandemic (e.g. SARS-COV-2, COVID-19) the following guidelines should be followed as endorsed by the Centers for Disease Control and Prevention[1]

- **EMS personnel working in areas with moderate to substantial community transmission** are more likely to encounter asymptomatic or pre-symptomatic patients with SARS-CoV-2 infection. If SARS-CoV-2 infection is not suspected in a patient (based on symptom and exposure history), EMS personnel should follow Standard Precautions (and Transmission-Based Precautions if required based on the suspected diagnosis). They should also:
  - Wear eye protection in addition to their facemask to ensure the eyes, nose, and mouth are all protected from splashes and sprays of infectious material from others.
  - Wear an N95 or equivalent or higher-level respirator, instead of a facemask, for aerosol generating procedures

- **For EMS personnel working in areas with minimal to no community transmission,** the universal eye protection and respirator recommendations described for areas with moderate to substantial community transmission are optional. However, EMS personnel should continue to adhere to Standard and Transmission-Based Precautions, including use of eye protection and/or an N95 or equivalent or higher-level respirator based on anticipated exposures and suspected or confirmed diagnoses.

- Universal use of a facemask for source control is recommended for EMS personnel. EMS personnel should wear a facemask at all times while they are in service, <u>including in breakrooms or other spaces where they might encounter co-workers.</u>

  - When available, facemasks are preferred over cloth face coverings for EMS personnel as facemasks offer both source control and protection for the wearer against exposure to splashes and sprays of infectious material from others.
  - Cloth face coverings should NOT be worn instead of a respirator or facemask if more than source control is needed.

- To reduce the number of times EMS personnel must touch their face and potential risk for self-contamination, EMS personnel should consider continuing to wear the same respirator or facemask (extended use) throughout their entire work shift, instead of intermittently switching back to their cloth face covering.

- Respirators with an exhalation valve are not recommended for source control, as they allow unfiltered exhaled breath to escape.
- EMS personnel should remove their respirator or facemask, perform hand hygiene, and put on their cloth face covering when leaving at the end of their shift.

[1] https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html

Aerosol-Generating Procedures

EMS personnel should exercise caution if an aerosol-generating procedure (AGP) is necessary. When possible, EMS personnel should consult with **Medical Control** before performing aerosol-generating procedures for specific guidance.

- An N95 or equivalent or higher-level respirator such as disposable filtering facepiece respirators, PAPR, or elastomeric respirator instead of a facemask, should be used in addition to the other PPE by all personnel present while performing aerosol-generating procedures.
- Bag valve masks (BVMs), and other ventilatory equipment, should be equipped with HEPA filtration to filter expired air.
- If possible, the rear doors of the transport vehicle should be opened and the HVAC system should be activated during AGPs. This should be done away from pedestrian traffic.
- If possible, discontinue AGPs prior to entering the destination facility or communicate with receiving personnel that AGPs are being implemented.

- Providers should limit others riding in the ambulance while the patient is transported to the healthcare facility to only those essential for the patient's physical or emotional well-being or care (e.g. care partner, parent, etc).

- Patients and family members should wear their own cloth face covering (if tolerated) prior to the arrival of EMS personnel and throughout duration of the encounter, including during transport. If they do not have a face covering, they should be offered a facemask or cloth face covering, as supplies allow.

  - Facemasks and cloth face coverings should not be placed on young children under age 2, anyone who has trouble breathing, or anyone who is unconscious, incapacitated or otherwise unable to remove the mask without assistance.
  - If a nasal cannula is used, a facemask should (ideally) be worn over the cannula.

## Patient Assessment

PQRST History

- **O** Onset of symptoms
- **P** Provocation – location of symptom; any exacerbating or alleviating factors
- **Q** Quality of pain (sharp, dull, stabbing, pressure, etc)
- **R** Radiation of pain (is it localized in one area or does it spread)
- **S** Severity of symptoms (pain scale)
- **T** Time of onset of symptoms and circumstances around onset

SAMPLE History

- **S** Signs and symptoms including pain
- **A** Allergies
- **M** Medications prescribed and medications taken prior to arrival
- **P** Past medical history
- **L** Last oral intake
- **E** Events leading to injury or illness {Mechanism of Injury, (MOI)}

Signs and Symptoms should support the provider impressions, treatment guidelines and overall care given.

- A symptom is something the patient experiences and tells the provider; it is subjective.
- A sign is something the provider sees; it is objective.

Symptoms should not be confused with provider impressions. The provider impressions are the EMS working field diagnosis of the patient's actual medical condition. Provider impressions should be supported by symptoms but not be the symptoms except on rare occasions where they may be the same (e.g. weakness when no etiology for the weakness can be determined by the EMS provider).

Wong-Baker FACES Pain Rating Scale[2]


Providers should be sensitive to, and respectful of, how different cultures perceive and express pain.

**Documentation & Patient Care Reports**

Documentation should occur for all EMS events where a patient was encountered and one or more clinical guideline was used to determine patient treatment and/or disposition. The use of a narrative is essential to a complete patient care record and provides an efficient means to share patient information for continuity of care between prehospital and hospital staff.

A copy of the pre-hospital patient care report – paper or electronic – MUST be made available to the receiving emergency department.

Know your audience. Like every call, every report is unique. The disposition of the patient can help you convey why and how you provided care. Remembering the **BIG Five**[3] can help.

Patient Transports:

1) Write for Doctors, Nurses, and Allied Professionals
2) Organize as if the patient will become unconscious and unable to provide any information
3) Assume that the person reading your report knows nothing about anything that happened before the patient arrived in the ED
4) Make sure the reader knows WHEN you did what you did
5) Presume nothing and leave nothing [relevant] to the imagination

[2] Hockenberry MJ, Wilson D, Winkelstein ML. *Wong's Essentials of Pediatric Nursing*, (7th ed), St. Louis, 2005, p. 1259. Used with permission. Copyright, Mosby.

[3] https://www.ems1.com/ems-products/consulting-management-and-legal-services/articles/1056598-How-to-avoid-documentation-disasters/

Death in the Field:

1) Write for medical examiners, homicide detectives, and criminal justice attorneys
2) Organize as if you expect to see the report projected onto a giant screen in a courtroom
3) Assume that the person reading your report knows nothing about anything that happened while you were on the scene
4) Make sure the reader knows WHY you didn't treat or transport
5) Presume nothing and leave nothing [relevant] to the imagination

Patients not transported:

1) Write for the Attorney may sue you over this call
2) Organize as if you expect to see the report projected onto a giant screen in a courtroom — because it will be
3) Assume that the person reading your report (and the jury) knows nothing about anything that happened while you were on the scene
4) Make the reader understand WHY you didn't treat or transport
5) Presume nothing and leave nothing [relevant] to the imagination

Be complete. The old adage stands: If it is not documented, it did not happen. Every pertinent finding, every negative finding, every action taken, exists only if documented properly.

## II. FUNCTIONAL NEEDS OF PATIENTS

Medical care should not intentionally be reduced or abbreviated during the triage, treatment, and transport of patients with functional needs or communication barriers. The manner in which the care is provided may need to be modified to accommodate the specific needs of the patient.

### Communication Barriers

Providers should utilize tools to overcome language barriers when caring for patients with fluency in a different language than their own. Have telephone and/or video accessible service with live language interpreters is ideal. Other tools include electronic applications, written communication. Providers should also look for methods through which the patient augments his/her communication skills (e.g. eye blinking, nodding).

Providers should make every effort to obtain primary information about a patient's complaint and symptoms directly from the patients. However, provider may utilize family members of the patient to obtain secondary information or pertinent data. Transport of a family member who is fluent in the patient's language can also have a calming influence on some patients and is encouraged.

American Sign Language is a language and serves as the primary language of many persons within the United States who are deaf or hard of hearing.

### Physical Barriers

Providers should look for a patient's adjunct assistant devices and identify their physical needs by speaking with the patient, family, or bystanders. Providers should also look for medical alert bracelets or medical documents. Assistance adjuncts include but are not limited to,

(a) Extremity prostheses

(b) Hearing aids

(c) Magnifiers

(d) Tracheostomy speaking valves

(e) Wheelchair or scooters

Providers should document the patient's functional need and the avenue exercised to support the patient. Providers should make every effort to transport any adjunct devices that facilities the activities of daily living for the patient.

Bariatric patients should be asked if they need assistance with ambulation in the same manner as other persons with medical conditions limiting their mobility.

**Service Animals**

Service animals are not classified as a pet. Service animals are not required to wear a vest or a leash. EMS providers may ask the patient (1) if their service animal is required because of a disability and (2) what work or task the animal has been trained to perform. It is illegal to ask for special identification or documentation from the service animal's partner. Animals that solely provider emotional support, comfort, or companionship do not qualify as service animal.

By law service animals should always be permitted to accompany the patient with the following exception:
A public entity may ask an individual with a disability to remove a service animal from the premise if (a) the animal is not housebroken or (b) the animal is out of control and the animal's handler does not take effective action to control it.

Service animals must be allowed anywhere in a hospital that the public and patients may go. If a patient is unable to care for their service animal while in the hospital the patient can make arrangements for a family member or friend to come to the hospital to provide these services or to keep the dog during the hospitalization.

It is preferable that a service animal and its handler not be separated. If space in the ambulance is crowded and the animal's presence would interfere with the ability to treat the patients, providers should make other arrangements to have the service animal transported to the hospital.[4] If the patient is incapacitated and cannot personally care for the service animal, a decision can be made whether or not to transport the animal. EMS providers are not responsible for the care of the service animal.

## III. ABUSE AND MALTREATMENT

EMTs and paramedics are mandated reports of abuse. Abuse and maltreatment can happen to patients of all age. Human trafficking is also considered a form of abuse. Any provider who has cause to believe that an individual's physical or mental health or welfare is endangered as a result of abuse or neglect should report. Reporting serves as a request for investigation, not accusation. Mandated reporters are given immunity from legal liability for reports made in good faith.

[4] www.ada.gov/regs2010/service_animal_qa.html

Patients may be unwilling or unable to disclose abuse or maltreatment so the responsibility falls on EMS personnel to assess the situation, document appropriately, and take appropriate action to secure a safe place for the patient. EMS providers should not take it upon themselves to investigate, interview, or intervene – these actions should be left for the appropriate law enforcement personnel.

Each EMS agency should maintain a policy for how to report abuse or maltreatment. However, the following general principles apply when managing scenes and/or caring for a patient where abuse or neglect is suspected:

(1) Consider scene safety, as always. Survey the scene for factors that could adversely affect the patient's welfare. Providers should not confront suspected perpetrators as this may create an unsafe situation for EMS and for the patient. Providers should consider seeking assistance from law enforcement officers early.

(2) Address life-threatening issues and transport the patient even if no medical indication is present. EMS providers should not force child transport. If the suspected perpetrator is present and interferes with transportation of the patient or is influencing the patient's acceptance of medical care, law enforcement should be involved as soon as possible and Medical Control should be consulted as need for guidance.

(3) Thoroughly document the child's history and physical exam findings. Providers should document objective findings and use quotes to reference patient or family statements. Providers should not make accusations or opinions in their patient care reports.

(4) Upon arrival at the ED, notifying the receiving nurse or physician of the suspected maltreatment. This notification and handoff does not relieve a provider of their responsibility to report. Any mandated reporter who knowingly and willingly fails to report may be fined, imprisoned or both.

The Department of Child and Family Services performs investigates child abuse and neglect and provide services the children and families. Call **1-855-4LA-KIDS (1-855-452-5437)** 24/7/365 to report concerns for child abuse or neglect.

Adult Protective Services is responsible for investigating reports and arranging for services to protect vulnerable adults age 18-59 and emancipated minors who are at risk of abuse, neglect exploitation or extortion. Reports of adult abuse may be made to **1-800-898-4910**.

Elderly Protective Services protects people who are 60 or older from physical or emotional abuse as well as neglect by caregivers. The law also protects senior from self-neglects and from other people misusing or stealing their money. Reports of elder abuse may be made to **1-833-577-6532** or **225-342-0144.**

## IV. ADDITIONAL MEDICAL PEARLS

**Difficult Airway Management**[5,6]

A difficult airway is one in which the EMS provider identifies potential attributes of the patient that would make it difficult to utilize a bag-valve mask (BVM), insert a supraglottic airway (SGA), perform laryngoscopy, and/or perform a surgical airway. Doing so allows the provider to prepare for alternative airway management and minimize risks of further patient decompensation.

Numerous algorithms exist to support providers in difficult airway management. MOANS (Mask seal, Obesity/obstruction, Age 55, No teeth, Stiff lungs) and LEMON (Look externally, Evaluate the 3-3-2 rule, Mallampati, Obstruction, Neck mobility) are both commonly referenced. Quick assessment in the prehospital setting limits the utility of several mnemonics; however, the 4 D Concept is easy to remember:

The Four D's of Difficult Laryngoscopy (footnote):
Dentition – prominent upper incisors, receding chin
Distortion – edema, blood, vomit, tumor, infection
Disproportion – large tongue, small mouth, bull neck, short chin to larynx distance
Dysmobility – TMJ, cervical spine collar

All intubations should be considered to be potential difficult airways. Providers should routinely have alternative airway management tools prepared prior to attempting endotracheal intubation. All members of the team should be aware of the contingency plan(s). Tools/techniques for difficult airways management in the prehospital setting include

- Two-person bag mask ventilation
- Oropharyngeal and nasopharyngeal airways
- Alternative laryngoscope blade
- Video laryngoscopy
- Awake nasotracheal intubation
- ETT introducer (e.g. gum elastic bougie)
- Supraglottic airway device (e.g. LMA, iGel, Combitube, airQ)

Insertion of a Supraglottic Airway Device is a skill EMTs and Advanced EMTs can perform. All EMTs must be trained and prove competency on the insertion of supraglottic airway devices.

**Preoxygenation & Apneic Oxygenation**[7]

Preoxygenation should be attempted prior to initiating management of the difficult airway to delay the onset of desaturation while apneic. Supplemental oxygen may be delivered via nasal cannula, facemask, CPAP, or BVM (with PEEP valve). Preoxygenation via nasal cannula best serves as an adjunct in addition to using a facemask or BVM; the provider must ensure that the cannula does not interfere with maintaining an effective seal while using the other device.

[5] Walls RM. The emergency airway algorithms. In: Walls RM, Murphy MF, editors. Manual of Emergency Airway Management. 4th. Philadelphia: Lippincott Williams and Wilkins; 2012.
[6] https://litfl.com/difficult-airway-algorithms/
[7] www.https://litfl.com/preoxygenation/

It is sometimes difficult to achieve effective preoxygenation in the prehospital setting due to factors such as patient agitation or lack of manpower to maintain an effective mask seal; however, providers should make every effort to provide at least 30 seconds of preoxygenation. Use of sedatives (ex. ketamine, benzodiazepine) to assist the uncooperative patient in whom intubation is anticipated can facilitate preoxygenation.

The ideal length of time for preoxygenation is 3-4 minutes; however, allowing the patient to take eight maximal breaths over 60 seconds allows for more rapid preoxygenation when necessary. If inadequate respiratory drive is present, providers can assist patient breaths via BVM. Providers should remember that there is an inherent lag time with pulse oximetry ($SpO_2$). In critically ill patients this may be > 90 seconds. If there is no improvement in $SpO_2$ after 3-4 minutes, it is reasonable to proceed with intubation; there is no proven benefit to extending the preoxygenation period beyond 4 minutes.

Apneic oxygenation is generally considered an adjunct to be used during rapid sequence intubation (i.e. with a paralytic). Giving supplemental oxygen at 15 lpm via nasal cannula during ETT insertion helps to maintain an adequate $SpO_2$ while the tube is secured and connected to an oxygen source. Apneic oxygenation is likely to mostly benefit patients with difficult airways, but it should be considered for all intubations. Apneic oxygenation does not diminish the need for effective preoxygenation.

**Stroke**

Stroke symptoms may vary and include but are not limited to:

- Severe, unexplained headache
- Dizziness or vertigo
- Visual loss
- Communication deficit
- Facial or limb numbness or weakness
- Lack of coordination or disruption of gait

Treatment with mechanical thrombectomy is considered standard of care for patients with proximal large vessel occlusion (LVO). Early diagnosis and transport to an endovascular treatment facility is vital for better neurologic outcomes. The Cincinnati Prehospital Stroke Scale[8] (CPSS) is a quick tool that can be used for stroke recognition upon EMS arrival. If any of the following three signs is abnormal, the probability of a stroke is 72%.

**F**acial Droop – have patients show their teeth or smile

- *Normal*: both sides of face move equally
- *Abnormal*: one side of the face does not move at all

**A**rm Drift – have patients close their eyes and hold both arms out straight for 10 sec

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

**S**peech – have patients say "you can't teach an old dog new tricks"

- *Normal*: patient uses correct words with no slurring

[8] Kothari, R.; Hall, K.; Brott, T.; Broderick, J. (1997-10-01). "Early stroke recognition: developing an out-of-hospital NIH Stroke Scale". Academic Emergency Medicine. **4** (10): 986–990

- *Abnormal*: patient slurs words, uses the wrong words, or is unable to speak

**T**ime[9] – time last seen normal (LSN) within 24 hours. If the patient is unable to provide a history, LSN is the time last seen in a normal state as reported by a bystander. Patients with "wake up strokes" should be presumed to have a time of LSN < 24hours.

The CPSS is quick it but fails to measure cortical signs such as aphasia and neglect commonly seen with large vessel occlusions, thus it must be followed by utilization of the Vision, Aphasia, Neglect (VAN) scale whenever a stroke is suspected.

A patient is considered VAN positive when they display **weakness plus one** or more of the following:

**V**isual Field Disturbance – new onset blindness, double vision, field cut

**A**phasia – inability to speak, paraphrasic errors, inability to understand or follow commands (do not count slurring of words)

**N**eglect – forced gaze, inability to track to one side, ignoring one side, inability to identify their own arm, inability to field both sides at the same time.

The above screening tools combined – FAST-VAN – provide a high level of predictably for identifying LVO occlusions that may benefit from mechanical thrombectomy. The Stroke ROPE guideline outlines how an EMS provider should choose hospital destination based on the patient's presenting symptoms and the transport time to each facility. Traffic delays should be considered when factoring in time of transport.

Hospital notification is a priority treatment when new onset focal neurological symptoms are present.

Stroke Center Levels/Designations[10]

The Joint Commission, American Heart Association, and American Stroke Association developed program requirements for hospital certification as a stroke center. Louisiana Emergency Response Network (LERN) follows these requirements and recognizes the following categorization of stroke facilities:

- Stroke Bypass Hospital (**Bypass**, formerly known as LERN Level 4): These facilities lack the capability to provide the standard of care for acute stroke. Transfer protocols are in place for transfer to higher levels of care with a written and agreed upon relationship with more acute hospitals.

- Acute Stroke Ready Hospital (**ASRH**, formerly known as LERN Level 3): Facilities in this category have the following capabilities:
    - A CT scan is able to be performed within 25 minutes of patient arrival
    - Vascular neurology is not available
    - Neurosurgery is not available.
    - Treatment capability includes IV thrombolytic and medical management of stroke

[9] The original CPSS, generated in 1997, did not include **T**ime. LSN up to 24 hours is currently considered standard of care.
[10] http://lern.la.gov/wp-content/uploads/Stroke-Level-Requirements.pdf

- Interventional therapy is not available
- A dedicated stroke unit is not usually available

- Primary Stroke Center (**PSC**, formerly known as LERN Level 2): Facilities in this category have the following capabilities:
  - A CT scan is able to be performed within 25 minutes of patient arrival
  - Access to vascular neurology expertise is available within 15 minutes
  - A neurosurgeon is available within 2 hours
  - Treatment capability includes IV thrombolytics and medical management of stroke
  - Interventional therapy is not routinely available
  - A dedicated stroke unit is available

ASRH and PSC stroke facilities provide acute stroke care in urban and rural areas where transportation and access are limited. Timely transfer to a higher level facility is often indicated; however, their designation recognizes models of care that have shown utility, including "drip-and-ship" and telemedicine.

- Primary Stroke Center with Endovascular Capability (**PSC-E**): Facilities in this category are similar to Primary Stroke Centers as outlined above, but also are able to perform mechanical thrombectomy.

- Thrombectomy Stroke Center (**TSC**): Hospitals in this category are similar to PSC-E; however, the facility has more services for stroke patients and the clinicians involved have higher training and certification reporting requirements than PSC-E centers.
  - A CT scan is able to be performed within 25 minutes of patient arrival
  - Access to vascular neurology expertise is available within 15 minutes
  - A neurosurgeon is available within 2 hours
  - Treatment capabilities include intravenous thrombolytic and endovascular therapies, like intra-arterial thrombolytic and mechanical thrombectomy

- Comprehensive Stroke Center (**CSC**, formerly known as LERN Level 1): Facilities in this category are capable of managing all forms and severities of stroke, both ischemic and hemorrhagic, and can provide 24/7 access to specialty care. CSC facilities have the following capabilities:
  - CT scan is able to be performed within 25 minutes of patient arrival
  - Access to vascular neurology expertise is available within 15 minutes
  - A neurosurgeon is available within 30 minutes
  - IV thrombolytic, endovascular therapies (e.x. intra-arterial thrombolytic, thrombectomy, coiling) and surgical therapies (e.x. aneurysm clipping, carotid endarterectomy, hematoma removal/drainage) are able to be performed.

Region 1 Hospital Stroke Levels

| Hospital | Stroke Level |
|---|---|
| East Jefferson General Hospital ** | TSC |
| New Orleans East Hospital | PSC |
| Ochsner Baptist Medical Center | ASRH |
| Ochsner Medical Center ** | CSC |
| Ochsner Medical Center-Kenner | PSC |
| Ochsner Medical Center-West Bank | ASRH |
| St. Bernard Parish Hospital | ASRH |
| Touro Infirmary | PSC |
| Tulane Lakeside | ASRH |
| Tulane Medical Center ** | CSC |
| University Medical Center – New Orleans ( Formerly LSU Interim Public Hospital) | PSC |
| West Jefferson Medical Center ** | CSC |

**** = Endovascular Capable 24/7/365 (hospitals with intermittent endovascular capabilities must update the ESF-8 portal with their status)**

| | |
|---|---|
| **CSC** | **Comprehensive Stroke Center (Formerly Level 1)** |
| **TSC** | **Thrombectomy Capable Stroke Center (New Designation)** |
| **PSC E** | **Primary Stroke Center with Endovascular Capabilities (Formerly Level 2)** |
| **PSC** | **Primary Stroke Center (Formerly Level 2)** |
| **ASRH** | **Acute Stroke Ready Hospital (Formerly Level 3)** |
| **Bypass** | **Stroke Bypass Hospital (Formerly Level 4)** |

Providers within Region One should aim to transport patients with a suspected large vessel occlusion (i.e. VAN positive) to a CSC, TSC, or PSC-E. If the total transport time (from scene to the nearest CSC/TSC/PSC-E) is expected to be greater than 15 minutes, then providers should transport to a PSC or ASRH to ensure rapid assessment and treatment. Traffic delays should be considered when determining expected time of transport.

**Adrenal Crisis**[11,12]

Adrenal crisis is a life-threatening emergency due to an acute deficiency in hormones produce the adrenal gland – mineralocorticoids and glucocorticoids. This condition is most commonly seen in patients on steroids who have an acute illness or physiological stress, or have their steroids withdrawn. Addison's disease is the most common cause of adrenal insufficiency. Persons with a history of chronic lung disease, autoimmune disease, or organ transplant frequently fall into the cohort of patients with chronic steroid use.

Symptoms of adrenal crisis vary and are non-specific – patients may present with weakness, confusion, fever, nausea, vomiting, abdominal pain, hypoglycemia, or shock. A history of surgery, infection, burn, trauma, fluid loss, cardiovascular event (ex. MI), or failure to take medications should all be queried.

[11] www.litfl.com/weak-and-vomiting-an-endocrine-emergency/
[12] www.coreem.net/core/adrenal-crisis/

Hypotension or shock out of proportion to the severity of the illness is the key feature of adrenal crisis. Treatment for adrenal crisis is steroid replacement. Administration of Methylprednisolone 125mg or Hydrocortisone 100mg is preferred. Adrenal crisis can be fatal if not diagnosed and treated aggressively. Providers should consider this diagnosis early and contact Medical Control for consultation.

**Sickle Cell Pain Crisis**

Many patients with a sickle cell pain crisis will not exhibit vital sign abnormalities. Patients may also not show behavior considered consistent with pain (e.g. walking, engaging in conversation, or having a calm appearance) while their pain levels remain high. The patient's pain should still be taken seriously.

In addition to pain crises, patients with Sickle Cell Disease (SCD) are at risk for several life-threatening complications. Often the presentation of these complications is atypical. Potentially serious condition other than pain crises may include:

(a) Acute chest syndrome
    i. Hypoxia
    ii. Chest pain
    iii. Fever
(b) Stroke
    i. Focal neurologic deficit
(c) Shock
    i. Septic
    ii. Cardiogenic
    iii. Hypovolemic
(d) Meningitis
    i. Headache
    ii. Altered mental status
    iii. Fever
(e) Septic arthritis
    i. Severe pain in a single joint
    ii. Fever
(f) Splenic sequestration crisis (usually young pediatric patients)
    i. Abdominal pain, LUQ
    ii. Splenic enlargement (palpate with care)
    iii. Hypotension, tachycardia

Reserve oxygen for patients who are hypoxic. Supplemental oxygen is thought to suppress bone marrow and increase transfusion requirement. Only give supplemental oxygen to sickle cell patients whose $SpO_2$ is < 92%. Reserve fluid boluses for sickle cell patients that are overly hypovolemic; overhydration may have detrimental effects, including atelectasis or increased sickling. These individuals will usually provide a story of fluid losses (e.g. vomiting or diarrhea) and/or shows signs of sepsis. If fluid is required, saline boluses should be 10 ml/kg up to 1L.

**Back Pain**

Acute, nontraumatic back pain is a common patient complaint. While musculoskeletal etiologies generally are not emergent, providers should consider and assess for life threatening signs and symptoms, including shock.

(a) Spinal cord compression (e.g. from spinal epidural abscess, malignancy, spinal epidural hematoma for patients on anticoagulants)
   i. Urinary and/or bowel incontinence
   ii. Inability to walk due to weakness
   iii. New neurologic deficits in extremities
   iv. Loss of sensation in saddle distribution

(b) Aortic dissection or ruptured abdominal aortic aneurysm (AAA)
   i. Unequal femoral or distal lower extremity pulses
   ii. "Pulsatile" abdominal mass
   iii. Associated abdominal pain and/or chest pain
   iv. Known history of abdominal aortic aneurysm or dissection

(c) Pyelonephritis
   i. Fever
   ii. Nausea, vomiting
   iii. Urinary frequency/urgency
   iv. Dysuria
   v. Hematuria
   vi. Abdominal pain
   vii. Costovertebral angle tenderness to percussion

Providers should assess and document neurologic findings (ex. motor and/or sensory loss in arms/legs) in patients with back pain. Providers should additionally assess and document changes in perfusion or pulses. Consider transport to an appropriate specialty center if an aortic emergency is suspected – Medical Control can assist in decision making.

## V. MEDICATION INFUSIONS

**Crystalloid Fluid Bolus**

A fluid bolus (fluid challenge) is given at a rate of "wide open," typically through the largest IV catheter possible (14 – 18 gauge). Patients should be reassessed after each 250 – 500ml of fluid, particularly their lung sounds. This is especially the case when treating persons with cardiovascular disease and the elderly. When a fluid bolus is not going to be needed or anticipated, saline locks may be used.

**Dextrose**

The traditional treatment for hyperglycemia has been 50ml of D50W (aka "an amp of D50"); however, drug shortages, profound hyperglycemia, and the risk of tissue injury from extravasation have caused D50 to fall out of favor. Providers may administer dextrose via the following concentrations:

D50 (50% Dextrose): 25g in a 50ml prefilled syringe

D25 (25% Dextrose): 2.5g in a 10 ml prefilled syringe (usually reserved for pediatrics)

D10 (10% Dextrose): 10g in 100ml or 25g in 250ml bag

D50 is more viscous than other intravenous fluids and often requires two hands to administer. Providers may need to apply light pressure to the D10 bag if a very small catheter is used (22-24G)[13]. All concentrations have similar times for patient return to normal mentation.

**Magnesium Sulfate ($MgSO_4$)**

Recommended doses and rates vary based on the indication. Add 2-4 gm of $MgSO_4$ to 100 ml of NS or D5W and infuse as follows:

Asthma: 2g in 100ml given over 10 minutes = 100 gtts/min using a 10 gtt/ml macrodrip set

Torsade de pointes: 2g in 100ml over 10 minutes = 100 gtts/min using a 10 gtt/ml macrodrip set

Eclampsia: 4g in 100ml over 10 minutes = 200 gtts/min using a 10 gtt/ml macrodrip set

**Ketamine**[14]

Ketamine has multiple routes of administration but is most commonly given intramuscularly or intravenously. Ketamine has been shown to cause hypoventilation requiring close airway monitoring and occasional airway intervention, such as bag mask ventilation or supplemental oxygen via nasal cannula.

Giving IV push ketamine slowly over one minute has been suggested to prevention hypoventilation. Alternatively, providers may administer ketamine via a slow infusion over 10-15 min when the safety of the provider or the patient is not in jeopardy.

via IV push: dose as per guideline given over 1-3 min

via infusion: dose as per guidelines mixed in 100ml given over 10 minutes

Additional adverse reactions reported with the use of ketamine are nausea and vomiting, increased airway secretions, laryngospasm, emergence phenomenon, associated intubation, and cardiac arrest following ketamine administration. It is prudent to monitor the patient closely for adverse events. If giving ketamine for agitation, providers should always have a bag mask ventilation device, advanced airway equipment, and cardiac monitoring including $SpO_2$ and $EtCO_2$.

Ketamine should never be used to chemically incapacitate someone solely for a law enforcement purpose and not for a legitimate medical reason.

**Vasopressors** – see Cardiac Preambles

[13] www.aliem.com/d50-vs-d10-severe-hypoglycemia-emergency-department/

[14] www.reliasmedia.com/articles/147052-ketamine-use-in-emergency-medicine

## VI. CAPNOGRAPHY[15,16]

Capnography includes the noninvasive measurement of $CO_2$ partial pressure during respiration (primarily exhalation). This can be displayed as a color (colorimetric or qualitative), number (quantitative), and as a function of time with waveform. More specifically, the quantitative monitor provides a numeric value which is the end-tidal carbon dioxide ($EtCO_2$) plateau in phase 3.

A normal waveform displays several phases, and interpretation of this waveform can provide valuable information. Just like the various stages of an electrocardiogram represent different phases of the cardiac cycle, different phases of a capnogram correspond to different phases of the respiratory cycle. Knowing how to analyze and interpret each phase will contribute to the utility of capnography.

Capnography is most commonly used in the prehospital to verify endotracheal tube placement and to monitor the effectiveness of CPR during cardiac arrest. It can also be valuable tool to assess the clinical picture with other patient complaints.

ETT placement

Capnography used with visualization of the ETT passing through the vocal cords is the standard of care for confirming ETT placement during intubation. Capnography can also be easily applied to alternative airways like supraglottic devices. No matter which device is in use, capnography can provide immediate indication of the loss of proper position or function. Providers should continue to use $ETCO_2$ monitoring to reassess ETT location prior to and after patient movement.

Flattened waveforms are commonly seen esophageal intubation, ETT obstruction, technical malfunction of the monitor or tubing, and complete airway obstruction distal to the ETT, and prolonged cardiac arrest.

Cardiac Arrest

$EtCO_2$ monitors may give a low reading during the first few minutes of cardiac arrest. Though the body still makes CO2 during arrest, it will not reach the alveoli without circulating blood. As CPR increases circulation the EtCO2 should increase in a patient with a viable downtime. EtCO2 often gives the first indicator of ROSC as evidenced by an abrupt & sustained rise in the $EtCO_2$ level – a specific level is not required, but rather the sudden increase (usually at least 10 mmHg).

The EtCO2 level may help guide decision-making in assessing whether continued resuscitation in cardiac arrest is futile. Values < 10 mmHg after 20 minutes of active resuscitation have consistently demonstrated minimal chance of survival; however, EtCO2 should not be used as the only factor in the determine to cease resuscitation.

Respiratory Distress

Capnography can provide dynamic monitoring in patients with acute respiratory distress. Patient with acute obstructive disease processes of the lung (e.g. asthma, COPD, bronchitis) have bronchospasm that is produced a unique waveform shape – a “shark-fin appearance” – as a result of regional airway obstruction. Patients respiratory distress from CHF typically do not have bronchoconstriction, so the waveform on their capnogram will not necessarily have the shark fin appearance unless the patient has a pulmonary comorbidity.

By analyzing the $CO_2$ waveform over time, medics can monitor the severity of asthma or COPD and the effectiveness of therapy provided. $ETCO_2$ values in asthma attacks will change depending on severity of the disease. Early in an acute asthma attack, hyperventilation may occur, lowering $ETCO_2$ levels with a slightly abnormal waveform. As the attack progresses, the $ETCO_2$ may read in the normal range with a more prominent

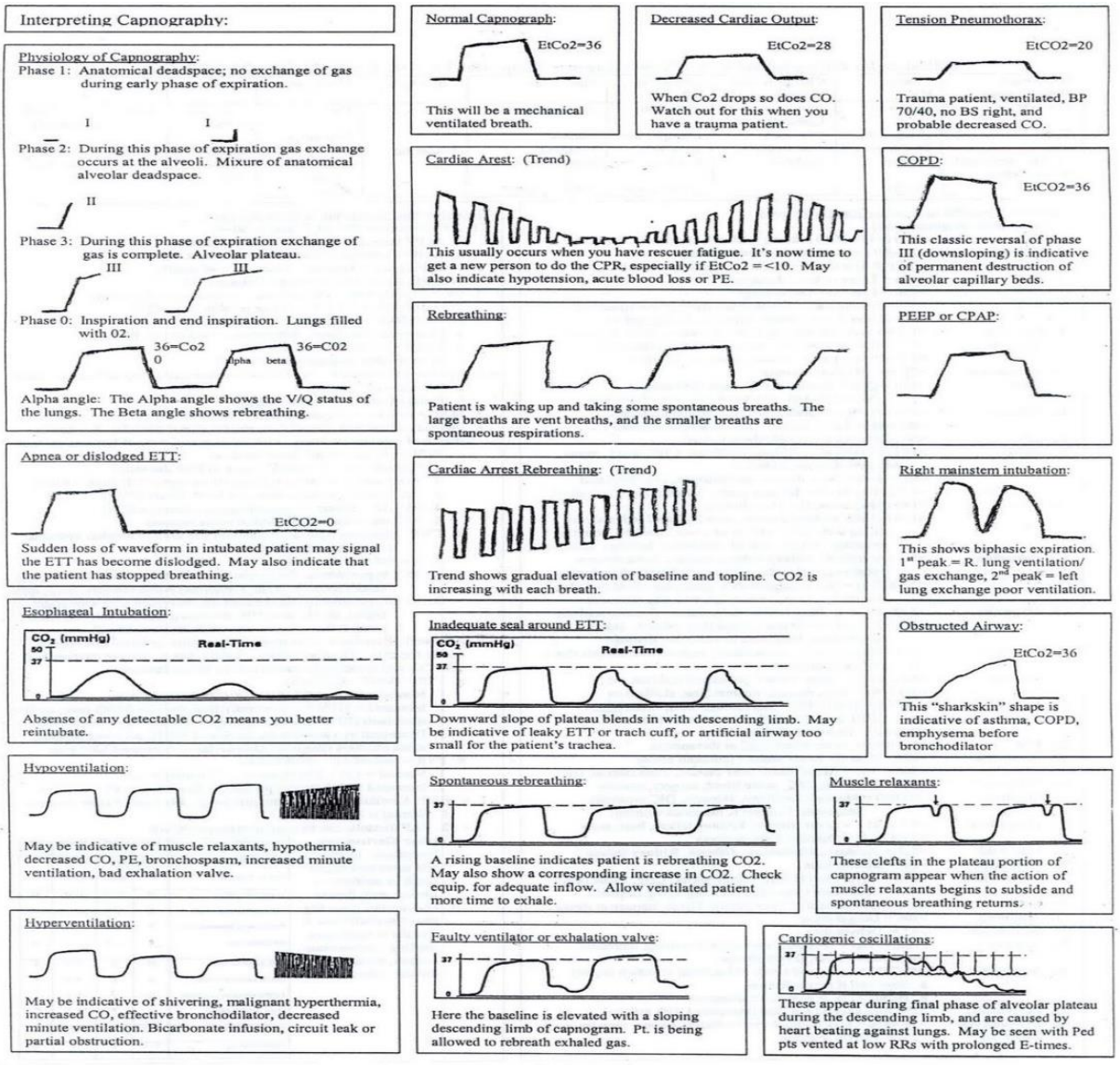
[15] http://www.emdocs.net/capnography-useful-ed-part/

[16] https://www.emsworld.com/article/10287447/capnography-clinical-tool

looking shark fin waveform on the monitor. Finally, as the attack becomes severe, the $ETCO_2$ rises and the wave becomes indistinguishable in its shark fin form. Once treatment is decided upon and bronchoconstriction decreases, the $ETCO_2$ number may increase initially as gas exchange improves. Recognize that the waveform will appear to be normalizing. The return of a normal waveform indicates resolution of the bronchoconstriction. The same concepts will apply with a COPD patient; however, the initial numbers may be high due to retaining $CO_2$ in their disease process.

Other Capnography Indications

Waveform capnography is a direct measure of the changes in elimination of $CO_2$ from the lung and indirectly indicates changes in the production of $CO_2$ at the cellular level. Monitoring $ETCO_2$ can provide an early warning sign of acidosis and/or shock. A patient with low cardiac output from a shock state does not deliver as much $CO_2$ per minute back to the lungs to be exhaled, which will result in a decreased $ETCO_2$ regardless of any change in breathing rate. Capnography should be used on all trauma and cardiac patients and any patient at risk for shock. Capnography can also help paramedics optimize ventilation of intubated patients with head injury. Hyperventilation of patients with increased intracranial pressure decreases intracranial blood flow, thereby increasing the risk of cerebral ischemia. Avoiding hyperventilation is associated with decreased mortality.



THIS PAGE INTENTIONALLY LEFT BLANK

# Routine Medical Care

The following will be utilized on <u>all</u> medical emergencies – those requiring Basic (BLS) or Advanced (ALS) Life Support

- Ensure scene safety and BSI/PPE precautions[1]
- Consider need for additional resources
- Bring oxygen and equipment[2] to the patient
- Assess ABCs and ensure proper positioning of the patient
- Follow appropriate Spinal Precautions[3]

↓

Patient assessment upon contact
Obtain initial vital signs[4]

↓

Airway management +/- oxygen therapy[5] as clinically indicated
and in accordance with **Airway Management** guidelines

↓

**<u>If ALS:</u>**
Apply cardiac monitor
Obtain $SpO_2$; consider $EtCO_2$
Consider 12-Lead EKG

↓

**<u>If ALS:</u>**
IV/IO with Saline Lock if clinically indicated

↓

Continue treatment as per appropriate guideline

**As scene safety and conditions allow, routine medical care should be completed prior to moving the patient to the ambulance.**

[1] Body substance isolation i.e. eye protection (goggles/face shield), respirator/surgical mask, gloves, gown

[2] Advanced airway equipment, suction, cardiac monitor, and departmental issued ALS gear

[3] According to **Spinal Motion Restriction** guideline

[4] Initial vital signs include: Blood pressure, heart rate, respiratory rate, pain scale, temperature and GCS

[5] Oxygen Flow Rates:
- Low Flow 2 lpm NC
- Supplemental 4 lpm NC
- High Flow 15 lpm NRB or BVM

# Do Not Attempt Resuscitation (DNAR)

Do not initiate resuscitation in the following situations prior to contacting Medical Control:

- Obvious signs of death
  - Body decomposition
  - Lividity
  - Rigor mortis
  - Fetal maceration
- Presence of legal documents stating resuscitation should be withheld
  - POLST (Physician Orders for Life Sustaining Treatment)
  - MOLST (Medical Orders for Life Sustaining Treatment)
  - Advanced Directive, Living Will, DNR
- Guidance from a healthcare proxy or power of attorney to withhold resuscitation in the absence of formal written directions
- Patient's personal physician is present at the scene and decides that resuscitation is not to be initiated[1]

↓

- Disturb as little evidence as possible in case it becomes a crime scene
- Obtain EKG rhythm strip showing asystole in at least two leads[2] (unnecessary if injuries are incompatible with life)
- Include EKG rhythm strip in patient care report (or document why it was not obtained)

↓

Document on-scene findings:

- Medical history
- Medications
- Last time patient was spoken to
- Trauma or deformity
- Unusual findings/circumstances
- Position found
- Skin temperature
- Pupils
- Names of significant bystanders

↓

Contact **Medical Control** for DNAR and/or Time of Termination[3]

[1] If the patient's physician decides that resuscitation should not be initiated, the on-scene should pronounce the patient after they have confirmed cessation of spontaneous circulatory and respiratory function. If the on-scene physician decides that resuscitation should be initiated, usual procedures should be followed (as per ROPE guidelines) unless the on-scene physician agrees to assume responsibility for patient care after discussion with the online Medical Control physician. See ROPE Introduction for further details.

[2] EKG electrodes may be placed posteriorly on patient's limbs if necessary

[3] Medical Control physicians are authorized to give orders to withhold or terminate resuscitation (DNAR) and to provide a Time of Termination (TOT). Physicians are not authorized to pronounce a patient (i.e. provide a Time of Death) unless they are present at the scene, have witnessed, and can confirm cessation of spontaneous circulo-respiratory function.

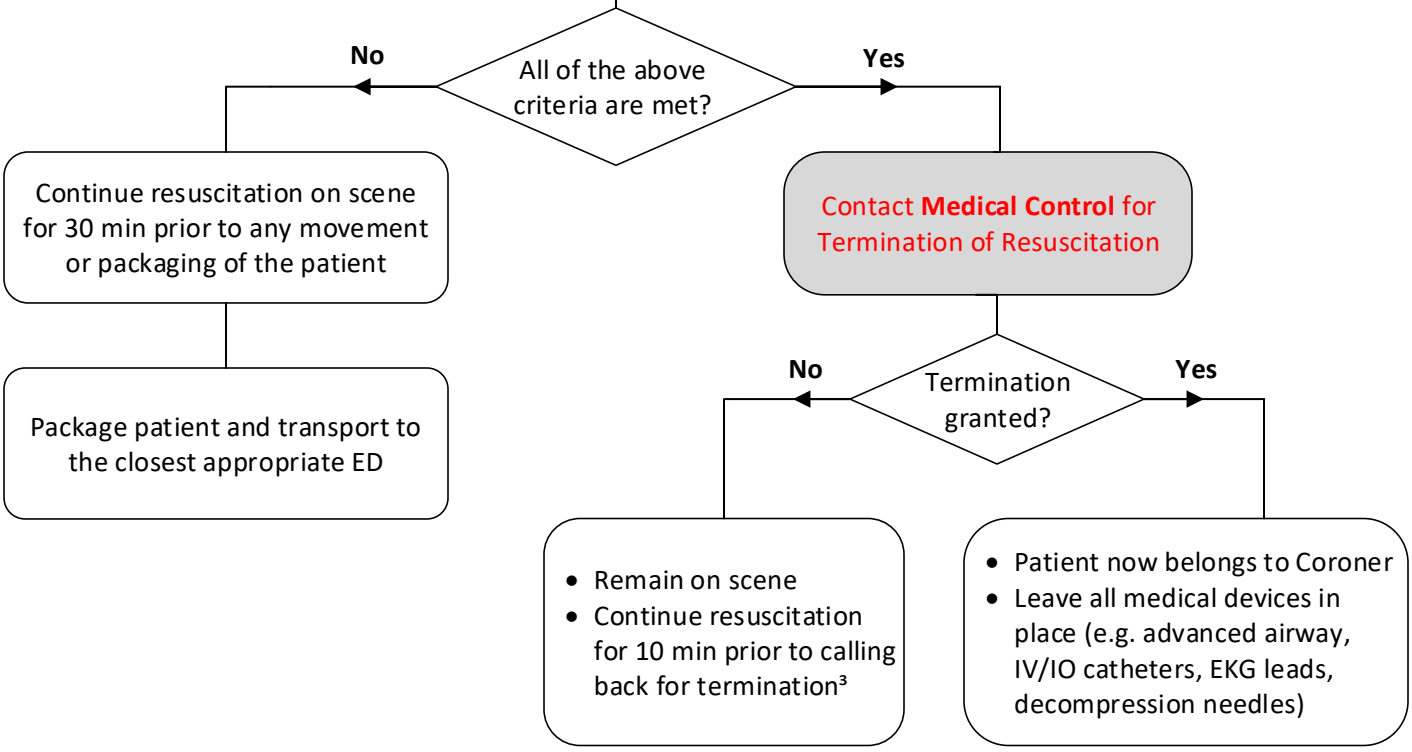
- For traumatic DNAR, see the **Adult Traumatic Prehospital Termination of Resuscitation** guideline.

# Nontraumatic Termination of Resuscitation

EMS may transport any patient perceived to be viable or if scene dynamics or public perception necessitates transport. Provider safety takes precedence over length of on-scene resuscitation.[1]

**ALL** of the following **MUST** be met to consider Termination of Resuscitation

- **18 years of age or older**
- Pulseless and apneic prior to EMS arrival
- > 30 min of chest compressions with interruptions only for rhythm checks
- > 30 min resuscitation by an ALS provider following appropriate pulseless cardiac guideline[2]
- No suspicion of hypothermia
- Persistent asystole, agonal rhythm, or PEA < 40bpm without an identifiable reversible cause
- No ROSC at any time during resuscitation
- ETT or supraglottic airway in place with proper documentation of capnography (qualitative or quantitative)
- Patent IV / IO line
- Verification of proper BLS and ALS treatments by an on-duty paramedic and/or online medical director
- All EMS personnel involved in the patient's care agree that discontinuation of resuscitation is appropriate
- Patient's immediate family members on scene have been informed of the rational for termination
- A safe environment for EMS/first responders
- Law Enforcement/Coroner on scene or already notified



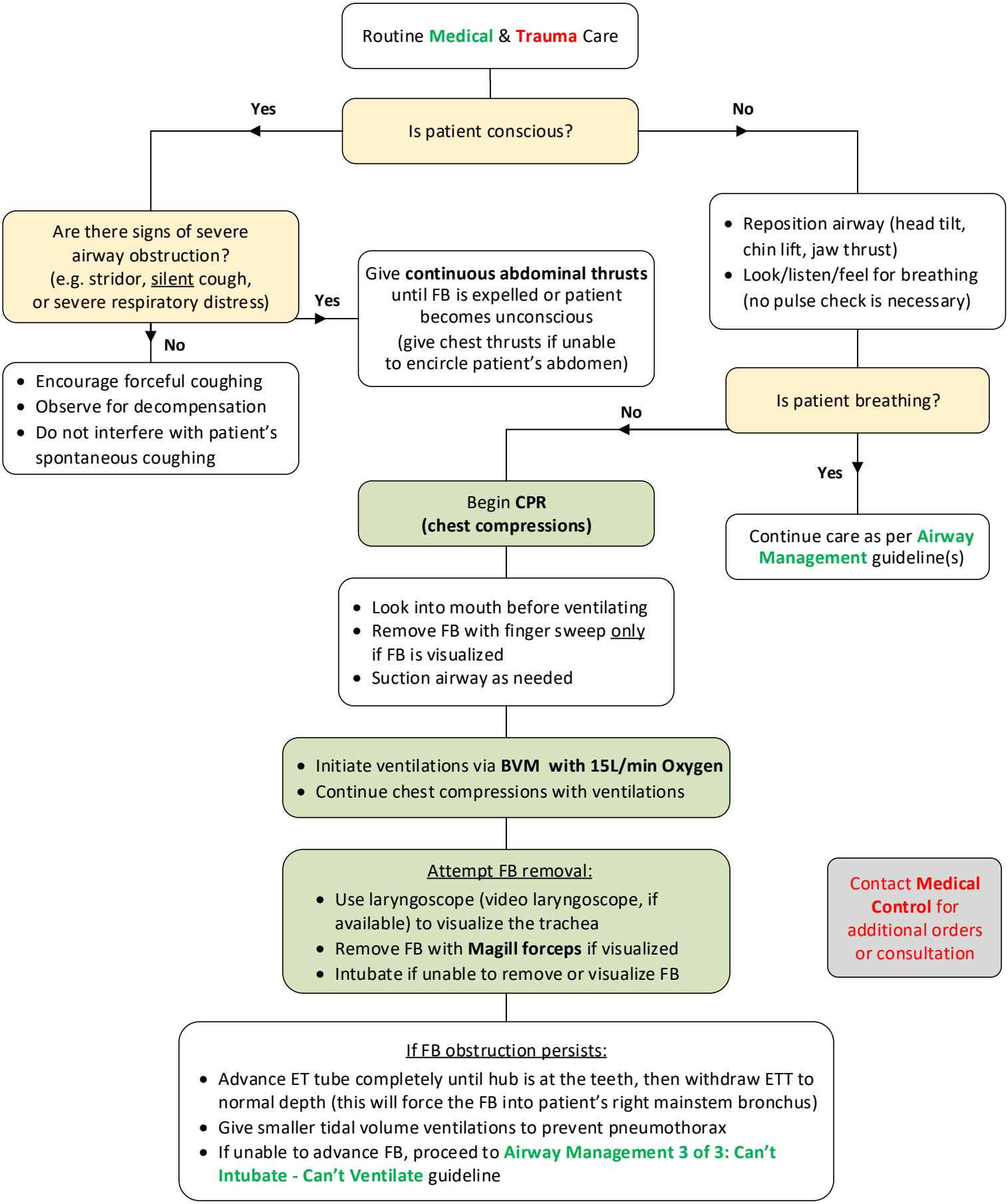

**This guideline may only be executed by NRPs – it is not applicable to EMRs, EMTs, or AEMTs**

[1] If a scene has become too dangerous to provide patient care, law enforcement must be dispatched and providers must document the event in the patient care report.

[2] The following conditions may have a better outcome despite resuscitation efforts beyond 30 minutes & should be transported: hypothermia, lightning strike/electrocution, pregnancy with estimated gestational age > 20 weeks. Pregnant patients > 20 weeks gestation should be transported promptly – prior to 30 min – to a facility capable of performing a perimortem cesarean delivery.

[3] If Medical Control does not grant "Termination" after two requests, transport to the closest appropriate ED.

# Upper Airway Obstruction – Foreign Body (FB) Aspiration



# Airway Management (1 of 3)

## Initial Assessment

Routine Medical Care including $SpO_2$ and $EtCO_2$

Assess patient's ability to adequately oxygenate & self ventilate (i.e. maintain normal $SpO_2$ and $EtCO_2$)

## Can Ventilate & Can Oxygenate

- Administer oxygen via nasal cannula or NRB
- Maintain SpO2 ≥ 94%

Is patient maintaining adequate oxygenation?

**Yes** → Continue to appropriate guideline based on patient signs/syptoms

**No** → Manage airway via **Can Ventilate & Can't Oxygenate**

## Can Ventilate & Can't Oxygenate

Assist oxygenation[1]

- Non-invasive positive pressure ventilation (CPAP, BPAP)

or

- Bag-valve mask (BVM) with OPA/NPA as tolerated

[1] Choose least invasive manner first when able

Is respiratory distress improving after maximal noninvasive support?

**Yes** → Continue to appropriate guideline based on patient signs/syptoms

**No** → Prepare for Intubation

- Manage via **Can't Ventilate & Can Intubate** guideline
- Consider nasal intubation if patient is conscious

Continue to appropriate guideline based on patient signs/syptoms

# Airway Management (2 of 3)

## Can't Ventilate & Can Intubate – Nasotracheal Intubation

Prepare for Intubation[1]

- Insert NPA and preoxygenate[2] via BVM for 2min (right nare is typically larger)
- Consider benzodiazapine (**Midazolam** 2.5mg IV/IO or **Diazepam** 2-5mg IV/IO) for anxiety
- Consider **Ondansetron** 4mg IV/IO to decrease aspiration risk

Perform Nasotracheal Intubation

- Attach BAAM® device to ETT; explain to patient importance of deep inspirations
- Advance lubricated ETT through nasopharynx and into oropharynx
- Listen for change in pitch via BAAM® – advance ETT when sounds are at their peak

- Confirm Tube Placement
  - Lung/Epigastric Auscultation; chest rise
  - $EtCO_2$ capnography (record waveform in ePCR)
- Secure nasotracheal tube with adhesive tape

## Can't Ventilate & Can Intubate – Endotracheal Intubation

[1] Tools For Intubation

- Cuffed ETT
- 10-12 ml syringe
- Stylet
- ETT introducer (Bougie)
- Video Laryngoscope (if available)
- $EtCO_2$ detector
- Stethoscope
- Commercial ETT restraint

Prepare for Intubation[1]

- Insert OPA/NPA and preoxygenate for 3-4 minutes, if able
- Prepare for apneic oxygenation (NC @ 15L/min) during intubation
- Consider **Ondansetron** 4mg IV/IO to decrease aspiration risk
- Consider suctioning airway prior to first intubation attempt

Preoxygenation and apneic oxygenation decrease hypoxia during intubation and subsequent cardiac arrest

Perform Endotracheal Intubation

- Remove OPA and advance ETT into trachea within 30 seconds
- Visualize ETT passing through the vocal cords (insertion qualifies as an attempt if ETT passes the teeth)

Confirm ETT Placement

- Lung/Epigastrium auscultation; chest rise
- $EtCO_2$ capnography (record waveform in ePCR)

Successful Intubation?

**Yes**

- Secure ETT with commercial ETT restraint device and document depth of ETT at level of patient's incisors
- Reconfirm ETT placement by using continuous $ETCO_2$ capnography
- Measure and apply cervical collar to patient
- Proceed to **Post-Intubation Advanced Airway Management**

**No**

- Reinsert OPA/NPA & oxygenate via BVM for 2 min
- Reattempt intubation using the ETT Introducer (Bougie) – max 2 attempts (1 attempt for trauma)
- Proceed to **Airway Management (3 of 3): Can't Ventilate and Can't Intubate** guideline

# Airway Management (3 of 3)

## Can't Ventilate & Can't Intubate

Confirm ventilation by observing chest rise and monitoring RR and $EtCO_2$ via capnography

- If not already done, attempt intubation ONCE by the most experienced provider
- Reinsert OPA/NPA; perform maneuvers to open airway
- Continue oxygenation via BVM (+/- PEEP valve)

Notify **Medical Control** or receiving ED of failed airway as early as possible

Facial Trauma or Swelling?

**No**

Insert supraglottic airway (SGA) according to manufacturer guidelines

- Confirm adequate ventilation
- Return to using BVM if SGA insertion fails
- Proceed to routine care guideline and transport if ventilation remains adequate

Consider cricothyroidotomy **if inadequate ventilation persists and procedure is approved by your agency's Medical Director**

**Yes**

Perform surgical airway (needle or surgical cricothyroidotomy) as outlined in **Advanced Practice** guidelines **if approved by agency's Medical Director**

- Confirm adequate ventilation
- Proceed to routine care guideline

Transport patient to the nearest Emergency Department for definitive airway management

## Post-Intubation Advanced Airway Management

**DOPES** Mnemonic[1]

**D**isplacement of ETT

**O**bstruction (e.g. mucus plug, kinked tube)

**P**neumothorax, PNA, pulmonary edema, PE

**E**quipment failure

**S**tacked breaths (e.g. asthma, hyperventilation)

Provide post-intubation analgesia & sedation as needed

**(1) Fentanyl** 25-50mcg IV/IO q 2 min prn (max 200mcg)

+/ –

**Midazolam** 5mg IV/IO/IM q2min prn (max 20mg) or

**Lorazepam** 2–4mg IV/IO/IM q2min prn (max 10 mg) or

**Diazepam** 5mg IV/IO or 10mg IM q2min prn (max 10 mg)

or

**(2) Ketamine** 2mg/kg IV/IO or 4mg/kg IM (may repeat x 1 prn)

- Deliver ventilations with only sufficient volume to achieve chest rise (i.e. avoid hyperventilation); initial RR = 12 bpm
- Adjust ventilations based on patient's $SpO_2$ & $EtCO_2$
- Manage ongoing or sudden hypoxia using the DOPES mnemonic[1]

- Continuously monitor ETT placement during treatment & transport
- Document $EtCO_2$ value and record capnography waveform with each set of vital signs, when the patient is moved, and just prior to patient transfer in the ED

# Adult Universal Respiratory Distress

Consider pulmonary & non-pulmonary causes:
pulmonary embolism, pneumothorax, pulmonary edema ("cardiac asthma"), MI, pneumonia, sepsis, metabolic acidosis (DKA, AKA), anxiety

Multiple causes can occur together and be contributing to a patient's symptoms.

Consider management of more than one condition and use more than one guideline when needed

Signs of Respiratory Distress

- $SpO_2$ <90%
- Nasal flaring
- Unable to speak sentences
- Supraclavicular/intercostal/ subcostal retractions
- Absence of wheezing with obvious SOB
- Apprehension, combativeness, anxiety
- Cyanosis
- Lethargy

The goal should be to **maximize oxygenation and ventilation regardless of the cause**

Consider CPAP early and anticipate possible deterioration needing advanced airway management

Routine Medical Care
including $SpO_2$ & $EtCO_2$ monitoring

Is the airway patent?
- No → **Upper Airway Obstruction** guideline
- Yes

Are ventilations adequate? (based on condition, $EtCO_2$, and pathophysiology of disease)
- No → Support ventilation as per **Airway Management** guideline(s)
- Yes

Is anaphylaxis likely?
- Yes → **Anaphylaxis/Allergic Reaction** guideline
- No

Is wheezing present?
- Yes → **Wheezing** and/or **CHF/Edema** guideline
- No

Does patient have a known infection or display s/s of infection?
- Yes → **Shock** guideline
- No

- Maintain adequate oxygenation
- Obtain 12- lead EKG
- Continue to monitor for patient deterioration

Contact **Medical Control** for additional orders or consultation

# Anaphylaxis | Allergic Reaction

Distinguish between anaphylaxis and non-anaphylactic allergic reaction[1]

Consider other specific guidelines – e.g. **Airway Management**, **Respiratory Distress**, **Shock**

Routine Medical Care

Determine Severity of Reaction

**Non-Anaphylactic Allergic Reaction**

**Diphenhydramine** 50 mg IV/IM

Patients with respiratory symptoms should receive IM Epinephrine – also consider giving Albuterol as outlined in **Wheezing** guideline

**Anaphylaxis**

**Epinephrine** 1mg/ml (1:1000) 0.3mg – 0.5mg IM (Thigh is preferred site) **May repeat x 1 after 5 min**

**Crystalloid fluid bolus** 1000 ml for SBP < 90 mm/Hg repeat x 1 prn

**Diphenhydramine** 50 mg IV/IO/IM

**Methylprednisolone** 125 mg IV/IO

Consider **Epinephrine** infusion 2-20 mcg/min IV/IO as per **Shock** guideline

**Non-Anaphylactic Allergic Reaction** – symptoms involve only one organ system; generally considered a mild or moderate reaction

**Anaphylaxis** – more severe reaction that meets one of the following criteria:

A. Two or more body systems affected rapidly after exposure
- Skin involvement (rash, generalized itching)
- Mucosa involvement (angioedema, throat tightening sensation)
- Respiratory compromise (dyspnea, wheezing, stridor)
- Persistent GI involvement (vomiting, diarrhea, abd pain)
- Altered mental status, syncope, incontinence

or

B. Hypotension after exposure to a known allergen

Consider **Push Dose Epinephrine** while preparing vasopressor infusion

Mix in syringe 1ml of 0.1mg/ml (1:10,000) Epinephrine with 9 ml of NS (syringe = 10mcg/ml of Epinephrine)

Give 1ml IV/IO q3-5 min prn

- **The first-line treatment of anaphylaxis is epinephrine.** Consider immediate IM Epinephrine prior to IV/IO access in critically ill patients. Administration to the thigh is the fastest IM site – use either the vastus lateralus or the rectus femoris muscle. If patient has their own epinephrine auto-injector, the provider may assist them in using it. Corticosteroids are adjunctive therapy after epinephrine.
- IM administration of epinephrine is recognized as generally safe. Adverse cardiovascular events are most common when Epi is given IV. Consider the risks & benefits of Epi use in patients >60 yo or persons with a cardiac history. Consult **Medical Control** for guidance.
- Patients who take β-blockers have an increased risk of developing a more severe reaction; these patients also may have a paradoxical response to Epinephrine. The use of inhaled Ipratroprium (aka Atrovent) with Albuterol may help respiratory symptoms in these cases.
- A dystonic reaction (e.g. to phenothiazine) is NOT an allergic reaction; it is an adverse reaction. Patients may receive Diphenhydramine 50 mg IV/IM.

# Wheezing/Bronchospasm

Consider pulmonary & non-pulmonary causes: pulmonary edema ("cardiac asthma"), MI, pneumonia, pulmonary embolism, pneumothorax

Obtaining a history is critical to identifying the cause of wheeze and severity of illness – if patient says they have been intubated in the past… BE PREPARED!

Routine Medical Care including $SpO_2$ and $EtCO_2$ monitoring

COPD patients not in respiratory distress should have a goal $SpO_2$ of >90%; however, do not withhold oxygen if patient c/o SOB or appears dyspneic

Give high-flow oxygen & dual therapy via nebulizer:

- **Albuterol Sulfate** 5mg
- **Ipratropium Bromide** 500mcg (i.e. 0.5mg)

Determine Level of Distress

**Mild**

Give **Albuterol** 5mg prn via nebulizer, may repeat x 1

**Moderate**

- Give **Albuterol** 5mg nebulized prn
- Give **Methylprednisolone** 125mg IV/IM/IO or **Dexamethasone** 16mg IV/IM/IO/PO[2]

**Severe**

- Look for tension pneumothorax if you haven't done so already
- Give CPAP early (max 5cm $H_2O$)
- Give **Albuterol** 5mg nebulized prn
- Give **Methylprednisolone** 125mg IV/IM/IO or **Dexamethasone** 16mg IV/IM/IO/PO[2]
- Consider **Magnesium Sulfate**[3] 2g IV/IO over 10 min (mixed in 100 ml NS or D5W)
- Consider **Epinephrine** 1mg/ml (1:1000) 0.3 mg – 0.5mg IM[4]

Contact **Medical Control** for additional orders or consultation

Signs of Respiratory Distress

- $SpO_2$ <90%
- Nasal flaring
- Unable to speak sentences
- Supraclavicular/intercostal/subcostal retractions
- Absence of wheezing with obvious SOB
- Apprehension, combativeness, anxiety
- Cyanosis
- Lethargy

[1] Bronchospasm will cause the $EtCO_2$ (capnography) waveform to have a "shark-fin" appearance. The more pronounced the shark fin and the higher the $EtCO_2$, the greater the risk of respiratory failure. Treat aggressively, but manage airway in the least invasive way possible.

[2] It is safe to give the IV form of Dexamethasone orally. Remember, corticosteroids will not have an immediate effect – they will help resolve bronchospasm over hours and decrease hospital length of stay.

[3] Magnesium Sulfate may cause hypotension; be prepared to give patient a fluid bolus if needed. Consider the risk and benefits of its use prior to administering Magnesium Sulfate to patients with renal failure.

[4] IM administration of epinephrine is recognized as generally safe. Adverse cardiovascular events are most common when Epi is given IV. Consider the risks & benefits of Epi use in patients >60yo or persons with a cardiac history. Consult **Medical Control** if you need guidance.

# Shock

[1] Manage primarily as guided in **Allergic Reaction/Anaphylaxis** guideline

**[2] Don't forget to alert the hospital if you have a sepsis patient!**

Routine Medical Care / Trauma Care
- Include temperature
- Look for associated injuries

Place 1 or 2 large bore IV's ≥ 18g
(consider IO after two unsuccessful attempts)

Consider etiology of shock state

**General Signs of shock**
- Altered mental status
- Delayed/flash capillary refill
- Weak or decreased pulses
- Tachycardia
- Elevated RR
- Hypoxemia
- Hypotension for age
- Decreased urine output

[1]Anaphylactic | [2]Septic | Hypovolemic | Neurogenic

**Crystalloid Fluid** bolus: 1000-2000mL
(LR is preferred over NS)

Obstructive

- High flow **$O_2$** via NRB
- Evaluate lung sounds
- Decompress tension pneumothorax

Cardiogenic

- Evaluate lung sounds
- **Crystalloid Fluid** bolus: 250-500ml if lungs sounds clear bilaterally

- Reassess vital signs, MAP, and Shock Index (SI)
- if persistent shock is believed to be due to hypovolemia, repeat **Crystalloid Fluid** bolus 500ml to a maximum of 2000mL

[3] May give **Push Dose Epinephrine** while preparing vasopressor infusion

Mix in syringe 1ml of 1mg/10ml Epinephrine with 9 ml of NS (syringe = 10mcg/ml of Epinephrine)

Give 1ml IV/IO q3-5 min prn

[3] Consider Vasopressor Infusion:

**Norepinephrine** 2-12 mcg/min
or
**Epinephrine** 2-20 mcg/ming
or
**Dopamine** 5-20 mcg/kg/min

*titrate to MAP ≥ 65mmHg*

Contact **Medical Control** to give steroids if patient has Addison's disease or other forms of adrenal insufficiency

**Hypovolemic**
- Hemorrhage – trauma or medical (ex. GI bleed)
- Vomiting/Diarrhea
- Burns

*obtain a good history*

**Cardiogenic**
- Heart Failure
- Arrhythmias
- Cardiomyopathy
- Valvular Disease

* look for clinical signs*

**Obstructive**
- Tension pneumothorax
- Hemopneumothorax
- Massive PE
- Cardiac tamponade

*often have a narrow pulse pressure*

**Pulse Pressure = SBP – DBP**

**Distributive**
- Septicemia

*look for source & fever*
*may have a low $EtCO_2$*

- Anaphylaxis

*often warm/flush skin*

- Neurogenic

*usually h/o trauma*
*often bradycardic*

**Mean Arterial Pressure**
**MAP = SBP + (2 x DBP) / 3**

**Shock Index**
**SI = HR/SBP**
(SI > 1 is poor)

# Altered Mental Status

**Potential Causes & Corresponding Guidelines**

| | | |
|---|---|---|
| **A**lcohol | → | Drug Overdose |
| **E**pilepsy | → | Seizure |
| **I**nsulin | → | Diabetic Emergency |
| **O**piates | → | Drug Overdose |
| **U**remia | → | *N/A (dialysis needed)* |
| **T**rauma | → | Traumatic Cardiac Arrest<br>Traumatic Shock<br>Head Injury |
| **T**emperature | → | Hypo-/Hyperthermia |
| **I**nfection | → | Shock |
| **P**sychosis | → | Behavioral Emergency<br>Excited Delirium |
| **S**troke | → | Stroke |
| **S**eizure | → | Seizure |

Routine Medical Care (including $CO_2$ & temperature)

Upper airway or respiratory compromise? — Yes → **Airway Management guideline(s)**

No

Signs of opiate/opioid overdose? — Yes → **Drug Overdose guideline**

No

Signs of shock?[1] — Yes → **Shock guideline**

No

Obvious signs of trauma? — Yes → **Routine Trauma Care & appropriate Trauma guideline**

No

Capillary Blood Glucose (CBG) < 60 mg/dl — Yes → **Diabetic Emergency guideline**

No

History of agitation or erratic behavior? — Yes → **Excited Delirium guideline**

No

Recent or current seizure activity? — Yes → **Seizure guideline**

No

Positive Cincinnati Prehospital Stroke Scale? — Yes → **Stroke guideline**

No

**Consider other causes of AMS:**
ex. encephalopathy, dysrhythmia, hypoxia, hypercapnea, CO poisoning, toxiciology

Consider restraints (chemical and/or physical) EARLY for the safety of the patient and the provider

[1]**Shock** is defined as impaired tissue perfusion and may be manifested by any of the following:

- Altered mental status
- Tachycardia
- Poor skin perfusion
- Low blood pressure

Maintain a high index of suspicion. Traditional signs of shock may be absent early in the process.

Contact **Medical Control** for additional orders or consultation

# Overdose | Acute Poisoning

Routine Medical / Trauma Care
Including $EtCO_2$ and $SpO_2$
**(ensure adequate oxygenation/ventilation)**

Look for associated injuries/illnesses, refer to **Spinal Motion Restriction** guideline[1] if trauma suspected

Ask for:
Time of ingestion
Dose of ingestion
Quantity of Ingestion

Look for:
needle marks, bites, bottles, paraphernalia, trauma, weapons

If needed, call national **Poison Control Center** 1-800-222-1222

Assess Blood Glucose,
If ≤ 60 mg/dL → **Diabetic Emergency** guideline

↓LOC, compromised respiratory function, and/or significant hypotension?

**No** → Supportive Care; contact **Medical Control** as needed

**Yes**

Signs of Compromised Respiratory Function
- SpO2 < 94%,
- drooling
- shallow respirations
- RR ≤ 10/min
- rising $etCO_2$ above patient's baseline

- Naloxone if suspected opiate overdose[2] (heroin, pain medications)
  **Naloxone** 2-4mg IN q2-3min prn
  or
  **Naloxone** 0.5-2mg IV/IM/IO q2-3min prn
- Fluid bolus if hypotension: **NS/LR** 500 ml IV/IO

Consider chemical sedation and/or physical restraints

Obtain 12 Lead EKG

Determine & treat cause of overdose/poisoning

**Alcohol**
**NS/LR** fluid bolus IV prn (max 2L)

**Phenothiazines (dystonic reaction)**
**Diphenhydramine** 25 – 50 mg IV/IO/IM

**ASA, Tricyclics, or Unknown Med with widened QRS > 120ms**[3]
**Sodium Bicarbonate** 1-2mEq/kg IV/IO repeat prn until QRS < 120ms

**$Ca^{2+}$ Channel Blocker**[4]
**Calcium Chloride** 500-1000mg IV infusion over 10-20 minutes

**Stimulants (cocaine, PCP, meth, bath salts)**
**Benzodiazepines** prn as per **Agitated/ Combative** or **Excited Delirium** guideline

**Carbon Monoxide**
**$O_2$ @ 15 L/min via NRB**
Measure CO, if able, as per CO guideline

**SSRIs, MAOIs, Benzos, Barbituates, APAP, or Beta Blockers**[4]
**NS/LR** fluid bolus IV prn (max 2L)
Contact **Medical Control** for additional orders

[1] Patients with altered mental status cannot be clinically cleared from a cervical collar

[2] Administer Naloxone until mentation improves and adequate ventilation/oxygenation is confirmed by RR, $SpO_2$, and $EtCo_2$. IV doses greater than 0.5mg increase the risk of flash pulmonary edema – this chance increases in proportion to the administered dose. Synthetic opioids (e.g. fentanyl, carfentanil) tend to require doses greater than 2mg.

[3] Symptoms include abnormal breathing, focal seizures, coma, AV blocks, ventricular arrhythmias, QRS >120ms, dominant R wave in aVR

[4] Antihypertensive and antiepileptic overdoses frequently cause hypotension.

# Diabetic Emergency

Routine Medical Care
(including temperature)

Assess Blood Glucose

CBG ≤ 60mg/dL

**Oral Glucose**[1] (given by EMT or NRP)
or
**Dextrose 50%** 12.5g – 25g IV/IO
(25g = 50 ml)
or
**Dextrose 10%**[2] 12.5g – 25g IV/IO
(25g = 250 mL)

- Repeat CBG if altered LOC persists and treat accordingly
- Look for other causes of altered LOC if maximal doses of dextrose do not correct patient's mental status[3]

Contact **Medical Control** if further orders are needed.

Asymptomatic hyperglycemia[5] does not require treatment.

Hypoglycemia always requires treatment

When unable to obtain a reading then assume CBG is low if patient is altered & takes insulin

CBG > 250mg/dL and signs of ketoacidosis

**Crystalloid fluid bolus** 1000ml IV/IO

12-Lead EKG
(assess for ACS and/or hyperkalemia[4])

Reassess patient for fluid overload & cerebral edema

Repeat **Crystalloid fluid bolus**
1000 ml IV/IO prn x1

Additional **Crystalloid fluid** for extended transports as ordered by **Medical Control**

Consider refusals after hypoglycemia only if **ALL** of the following are true:

- Repeat CBG > 80mg/dL
- Patient returns to normal mental status
- A clear cause of hypoglycemia has been identified (e.g. missed a meal)
- Patient has no other symptoms (e.g. chest pain, SOB, intoxication, seizure)
- Patient only takes metformin and/or insulin
- Patient can promptly obtain and eat a meal
- A reliable family member is present that can reactivate 911 if needed

Signs of Ketoacidosis

- Ill appearance
- Dyspnea
- Deep rapid (Kussmaul) respirations
- Tachycardia +/- weak pulses
- Nausea or vomiting
- Abdominal pain or cramping
- Headache or double vision
- Altered LOC
- Fruity/acetone breath or odor
- Muscle wasting or weight loss
- Flushed/dry skin, skin tenting
- Dry mucous membranes

**Remember other causes of ketoacidosis – ex. starvation & alcohol**
Common theme: absent and/or unrecognized glucose
Common prehospital treatment: crystalloid fluids

[1] Oral glucose/carbohydrates (including items in the patient's home) may be provided if there is no risk of aspiration related to the patient's mental status.

[2] To make **Dextrose 10%**: Dilute 50 mL **Dextrose 50%** in 200 mL of **NaCl** – makes 250 mL of **Dextrose 10%.** Titrate to effect.

[3] Ask or look for an insulin pump on your patient. It should not be disabled unless hypoglycemia cannot be corrected – contact Medical Control for approval to disable the pump.

[4] EKG changes of hyperkalemia: peaked T waves, long PR interval, widened QRS complex, loss of P wave, sine wave, asystole

[5] Look for causes of hyperglycemia - the I's: **I**nfection, **I**nsufficient **I**nsulin, **I**schemia (i.e. acute MI), and **I**t's new-onset diabetes.

# Stroke

**Cincinnati Stroke Scale**
- Facial Droop
- Arm Drift
- Speech Deficit

**VAN Assessment**
Arm Weakness +
any one of the following:
- Visual Disturbance: field cut, double vision, new blindness
- Aphasia: inability to speak or understand
- Neglect: forced gaze, ignoring one side, unable to feel on both sides at the same time

- Routine Medical Care
- Look for signs of trauma[1]

Supplemental **Oxygen** to keep $SpO_2 \geq 93\%$

Assess blood glucose
if CBG < 60 mg/dL
**Dextrose 50%** 12.5-25g IV/IO (25g = 50ml)
or
**Dextrose 10%** 12.5-25g IV/IO (25g = 250ml)
(per **Diabetic Emergency** guideline)

All new onset neurological complaints consistent with stroke should be treated by EMS as a **"Stroke Activation"**

IV thrombolytic and/or mechanical clot retrieval may be indicated for patients with large vessel occlusion (i.e. VAN+)

Decisions about a patient's eligibility for treatment will be made at the receiving facility based on history, exam, and radiologic findings.

Do NOT treat Hypertension

Critically ill patients with compromise of airway, breathing, or circulation **may** be transported to the closest ED

- Assess initial neurological function using the **Cincinnati Stroke Scale** exam.
- Determine when "Last Seen Normal"[2] and document specific time (e.g. "LSN 13:30" not "1 hour ago")

**Quick & efficient transport is critical.** When able, also transport a family member or friend who has pertinent medical information

VAN positive and LSN ≤ 24 hours[2,3]

Assess for Large Vessel Occlusion stroke (LVO) using the **VAN** Assessment

VAN positive & LSN > 24 hours[2,3]
or
VAN negative

If **< 15 minutes of additional transport time** to reach CSC, TSC, or EC-PSC then transport to it

**If > 15 min transport additional transport time**

Transport to closest appropriate facility that is not a Bypass Hospital

Position patient supine for transport. If aspiration risk or decreased LOC, Elevate the head of the stretcher 30°

Receiving ED MUST be contacted as early as possible for prehospital "**Stroke Activation**" - notify hospital of LSN time

LOUISIANA EMERGENCY RESPONSE NETWORK

[1] If patient has associated trauma and GCS ≤ 13, treat per *Head Injury* trauma guideline and consider transport to a Trauma Center - *ABCs before D*

[2] Last seen normal (LSN) is the time the patient reports being in normal state. If patient is unable to provide history, LSN is last seen in a normal state as stated by a bystander. If patient was awake at the time of symptoms onset or the acute deficit was witnessed, last normal = time of stroke onset (TSO).

[3] Patients with an unclear time of onset, i.e. "Wake-Up" strokes, should be treated with the same urgency as those with a clear TSO. Some patients will have MRIs showing they are eligible to receive emergent treatment- IV thrombolytic +/- mechanical clot removal (i.e. thrombectomy).

[4] **CSC = Comprehensive Stroke Center (fka Level 1). TSC = Thrombectomy Stroke Center (new designation). PSC = Primary Stroke Center (fka Level 2). EC = Endovascular Capable (i.e. thrombectomy able)**. Traffic delays should be considered when factoring in time of transport.

- Consideration for stroke mimics (e.g. hypoglycemia, seizure, sepsis, migraine, intoxication) should not change a provider's choice in hospital destination. Transport based on the most immediate life-threatening or disabling condition… that will usually be the stroke.

# Seizure

**Signs of Eclampsia**

- SBP >160, DBP >110
- Confusion
- Pulmonary edema
- RUQ or epigastric pain
- Seizures

**Common Seizure Types**

**Tonic-clonic:** a regular pattern of contraction and extension of the arms and legs

**Absence seizures:** brief loss and return of consciousness, generally not followed by a period of lethargy

**Complex partial seizures:** focal seizures with altered mental status (as opposed to simple partial seizures where the level of consciousness is normal)

Routine Medical Care

Is patient > 20 weeks pregnant (uterus appears above umbilicus) or < 6 weeks postpartum?

**Yes**

- Give **Magnesium Sulfate**
  - 4g IV/IO in NS or D5W infusion over 10 minutes
  - 10g IM (5g in each buttock) if unable to obtain IV access
- Refer to **Obstetric Complication** guideline

**No**

Is patient seizing?

**Yes**

Adminster **Midazolam** 10mg IM if IV access not already obtained

- Check capillary blood glucose
- Treat hypoglycemia if CBG < 60mg/dl per **Diabetic Emergency** guideline
- Obtain IV access

Is patient seizing after 5 min?

**Yes**

- Give Benzodiazepine (Midazolam is 1st choice if available)
  - **Midazolam** 2.5mg IV/IM/IO (max dose = 10mg) or does not include initial IM dose if seizing upon arrival
  - **Diazepam** 5mg IV/IM/IO (max dose = 10mg) or
  - **Lorazepam** 2mg IV/IM/IO (max dose = 8mg)

  (Diazepam & Lorazepam should not be given intranasally)

  **Repeat q2min until max dose or seizure stops**
- Provide oxygenation if status epilepticus present; titrate to maintain $SpO_2$ > 94%
- Prepare for assisted ventilations, as needed, once patient is post-ictal

**No**

- Look for signs of trauma and/or head injury
- Obtain IV access prior to transport

**No**

- Check capillary blood glucose
- Treat hypoglycemia if CBG < 60mg/dl per **Diabetic Emergency** guideline
- Obtain IV access

Contact **Medical Control** for additional orders or consultation

Generalized or complex partial seizure activity begins in the presence of EMS?

**Yes**

- Magnesium Sulfate should be used as the first-line treatment for eclampsia and should be given prior to benzodiazepines.
- Transport all new onset seizures to an ED with a functional CT scanner. If seizure is secondary to trauma, transport to a Trauma Center
- Transport pregnant patient on the left side or manually displace the uterus to the left to facilitate blood return to the heart
- Status epilepticus is defined as continuous seizure activity for 5 minutes or more without return of consciousness, or recurrent seizures (2 or more) without an intervening period of neurologic recovery. Status epilepticus should be treated for all seizure types where consciousness is lost even briefly (e.g. absence). Simple partial status epilepticus does not require repeat doses of benzos.

# Agitated/Combative Patient

Do not attempt to enter or control a scene where physical violence or weapons are present. Dispatch law enforcement immediately. Maintain scene safety and leave the scene if it becomes unsafe at any point.[1]

Routine Medical / Trauma Care

- Provide verbal reassurance
- Use calming techniques
- Establish rapport with patient

Look for medical causes of agitation[4]

- Obtain CBG and temperature
- Apply cardiac monitor
- Perform 12 lead EKG

[4] Medical Causes of Agitation

- Hypoxemia
- Head trauma
- Post-ictal state
- Hypoglycemia
- Drug Overdose
- Drug withdrawal
- Chronic mental Illness
- Excited Delirium
- *AEIOUTIPS*

Do not agitate patient with a prolonged exam

Consider restraints[2] early if patient has ANY of these:

- Easily agitated
- Verbal outbursts
- Sudden mood changes
- Aggressive behavior
- Hallucinations
- Delusional thoughts
- Suicidal or homicidal thoughts

Does patient have signs of Excited Delirium?[5]

**No**

Sedate with a benzodiazepine:

**Midazolam** 2.5-5 mg IM/IV/IN (max 10mg)
**or**
**Diazepam** 5mg IV or 10mg IM (max 10 mg)
**or**
**Lorazepam** 2mg IV or 4 mg IM (max 8 mg)

(diazepam & lorazepam cannot be given IN)

If agitation persists after 5 min:

Repeat **benzodiazepine** if max dose not already reached[3]

Contact **Medical Control** if additional sedation is needed

**Yes**

[5] Signs of Excited Delirium:

- High body temperature
- Profuse sweating
- Incoherent speech
- Dilated Pupils
- Nakedness
- Running into traffic
- Mirror/glass attraction
- Inconsistent breathing
- Instant tranquility

Proceed to **Excited Delirium** guideline

- High-flow $O_2$ via NRB mask
- $EtCO_2$ Monitoring
- Anticipate respiratory depression and need for ventilatory support

- Monitor VS – especially LOC, $EtCO_2$, and EKG rhythm
- If temp > 104°F, cool via **Hyperthermia (Heat Stroke)** guideline

[1] In case of threat during transport: Stop, Communicate your location/needs, Stand (with your partner). Provider safety 1st!

[2] Secure all four extremities to maximize safety. Placement of the stretcher in sitting position prevents aspiration and reduces the patient's strength by place the abdominal muscles in flexed position. Restraints should not restrict chest wall motion, compress the neck, or compromise the airway.

[3] Cocktails/mixtures of drug classes should be avoided to prevent complications, including arrhythmias and respiratory depression.

# Excited Delirium

Use of this guideline should trigger concern for shock, respiratory distress, and/or cardiac arrest.
The goal is to limit patient exertion, inhibition of chest wall/diaphragm during respirations, and time being restrained.
**Prolonged struggle increases the chance of patient death.**

[5]Signs of Excited Delirium:

- High body temperature
- Profuse sweating
- Incoherent speech
- Dilated Pupils
- Nakedness
- Mirror/glass attraction
- Running into traffic
- Inconsistent breathing
- Instant tranquility

Approach patient calmly
Attempt verbal de-escalation
Remove/limit unnecessary stimulation

Routine Medical / Trauma Care

Sedate with a single agent:

(1) **Midazolam** 5mg IV/IM or
**Lorazepam** 4mg IV/IM or
**Diazepam** 10mg IV/IM

(2) **Ketamine** 4mg/kg IM or
**Ketamine** 2mg/kg IV
(max IM/IV dose = 400mg)

Patients with excited delirium are presumed to have a catecholamine surge, either exogenous (ex. drugs), endogenous (ex. sepsis, head injury, hypoxia), or a combination of the two (ex. exertion + cocaine).

**This is a medical issue, not behavioral.**
Patients are likely to develop hyperthermia and severe acidemia due to lactic acidosis.

**Hyperthermia has a strong association with mortality.**

**"Instant tranquility" should also be considered a sign of impending arrest.**

Cocktails/mixtures of drug classes place the patient at increased risk of arrhythmias and respiratory depression

If agitation persists after 5 min,
sedate with same class of drugs as initial agent:

(1) Repeat **benzodiazepine** at the **same** dose
(2) Repeat **ketamine** at **half** of the initial dose

*do not crossover/mix drug classes*

- Apply cardiac monitor (including $EtCO_2$ monitoring) ASAP
- Give high-flow $O_2$ via NRB mask
- Anticipate respiratory depression and need for ventilatory support

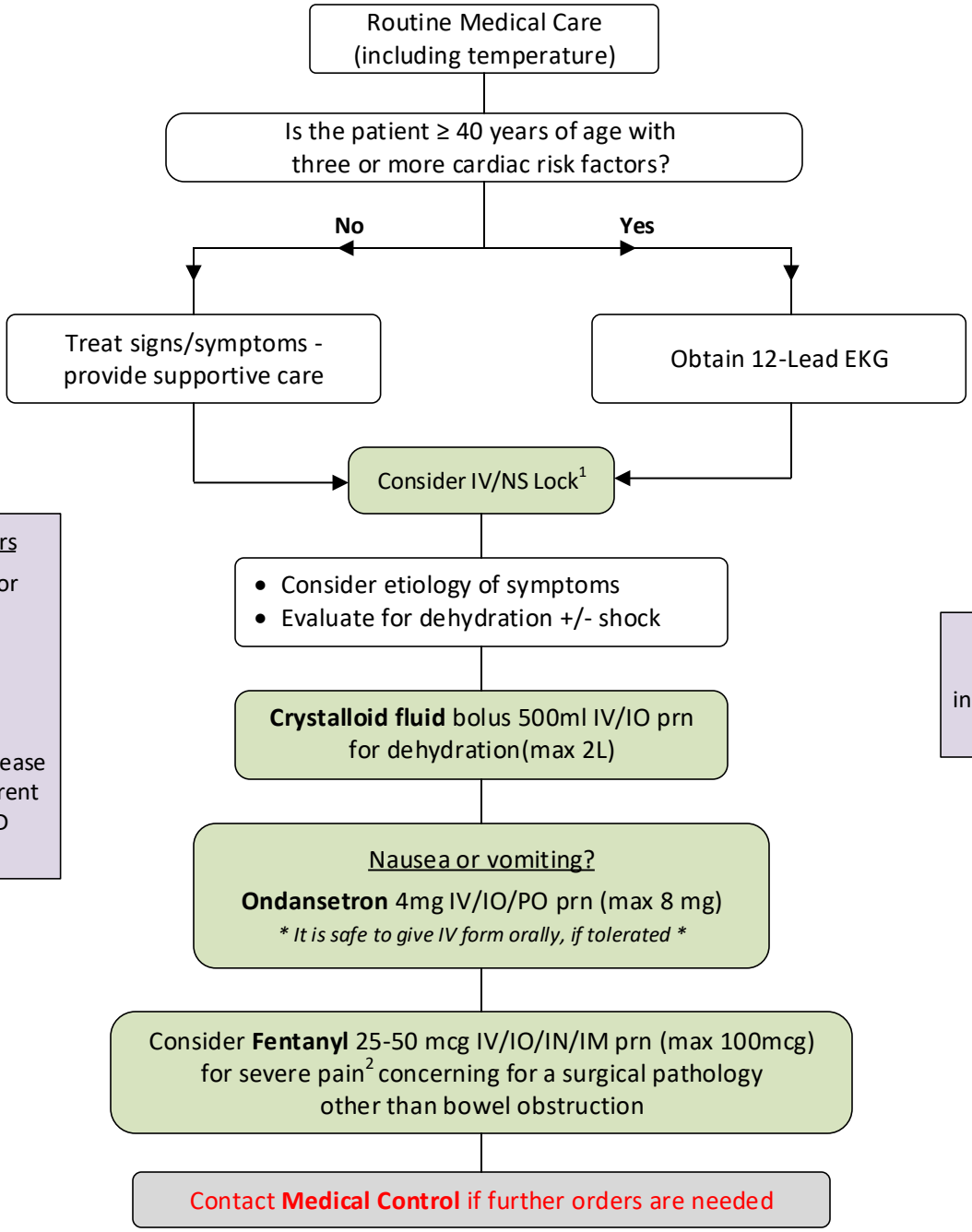
Give cold **Crystalloid Fluid bolus** 1L IV/IO
if no indication of CHF or pulmonary edema

Contact **Medical Control for** additional sedation or consultation

- Measure temperature; cool via **Hyperthermia** guideline if > 104°F
- Look for underlying medical cause(s) of altered mental status

- Keep it simple. Psychotic & stressed patients do not process complicated messages. Do not irritate the patient with a prolonged exam.
- Coordinate closely with law enforcement and aim to initiate sedation at the same time as physical restraints. Restraints should not restrict chest wall motion, compress the neck, or compromise the airway. Never restrain patient in prone position.
- If an excited delirium patient experiences cardiac arrest, they should be given **Sodium Bicarbonate** (2 ampules) early in resuscitation followed by 1 ampule (50mEq) every 10min during the remainder of the resuscitation.
- Tonic-clonic movements are common after the administration of ketamine. They should not be confused with an emergence reaction which usually includes hallucinations, flashbacks, or irrational behavior mixed with periods of lethargy. Contact **Medical Control** for benzodiazepines if a true emergence reaction occurs.

# Non-Traumatic Abdominal Pain | Nausea & Vomiting




Cardiac Risk Factors

- Smoking (current or cessation ≤ 3mo)
- Obesity
- Diabetes Mellitus
- Hypertension
- High Cholesterol
- Cardiovascular disease
- Family history (parent or sibling with CVD before 65yo)

Manage shock primarily as instructed in **Shock** guideline

Possible Causes of Abdominal Pain

**Obtain a thorough history (SAMPLE/OPQRST) to help identify etiology (e.g. last BM, last menstruation, h/o hernia, etc)**

- Myocardial infarction °
- CHF °
- Aortic dissection °
- Aortic aneurysm °
- Bowel ischemia °
- Bowel obstruction
- GI Bleed[1]
- Pneumonia/PE
- DKA
- Gastroenteritis
- Peptic ulcer disease/gastritis
- Pancreatitis
- Diverticulitis
- Appendicitis
- Pregnancy (including ectopic)
- Pelvic disease (PID, cyst)
- Bladder/prostate disorder
- Kidney stone
- Gallbladder disease
- Liver disease

° Consider in patients with cardiac risk factors, especially the elderly

[1] Start two, large bore IVs if GI bleed is suspected

[2] Research has shown that analgesia does not interfere with the evaluation of an acute abdomen. Avoid opiates in patients who are pregnant or who have dental pain, chronic pain (not on hospice), or care plans that prohibit the use of narcotics.

# Drowning

Coordinate rescue efforts 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.

Routine Medical/Trauma Care

- Look for associated injuries
- Consider **Spinal Motion Restriction**[1]

Once patient is in shallow water, open airway and evaluate respiratory function

## Respiratory Distress

- Give high flow oxygen (10-15 lpm) via NRB
- Maintain SpO2 > 93%
- Evaluate oxygen & ventilation as outlined in **Airway Management** guidelines

<u>If fluid is auscultated (i.e. rales) in the lungs:</u>

- **Albuterol** 5mg via nebulizer q5min prn x 3
- **CPAP** up to 10 cm$H_2O$ PEEP, as needed

- Insert IV Saline Lock
- Monitor/Treat hypoperfusion as per **Shock** guideline
- Continue to monitor respiratory status; be prepared for deterioration

## Respiratory / Cardiac Arrest

- Give five rescue breaths – this can be done while patient is still in the water[2]
- Once patient is out of the water, begin chest compression and apply defibrillator pads to the patient's dry chest
- Perform early & aggressive airway management with intubation
  - Anticipate the patient needing suction
  - Consider using a PEEP valve (5-10 cm $H_20$) if persistent hypoxemia is present
- Follow appropriate **Cardiac Arrest** or **Hypothermic Cardiac Arrest** guideline[3]

Contact **Medical Control** if additional orders or consultation is needed

[1] Unnecessary spinal motion restriction can impede adequate opening of the airway and delay delivery of rescue breaths. Routine spinal motion restriction in the absence of circumstances that suggest a spinal injury is not recommended

[2] Cardiac arrest from drowning is due primarily to lack of oxygen. <u>It is important that CPR follow the traditional ABC sequence not CAB.</u> Five initial breaths (as opposed to two) are recommended because the initial ventilations can be more difficult to achieve due as water in the airways interferes with effective alveolar expansion.

[3] Paramedics should use sound clinical judgment when deciding if resuscitation efforts should be initiated. If water temperature is < 43°F, survival is possible in patients submerged up to 90 minutes. If water temperature > 43°F (6°C), survival is more likely when patient is submerged < 30 minutes. If there is any doubt or if the events leading to the submersion are unclear (e.g. traumatic injury), it is recommended that resuscitation be initiated and the victim be transported to an ED unless there are obvious signs of death(see **Do Not Attempt Resuscitation** guideline).

# Hyperthermia | Heat Exposure

Hyperthermia increases heart demand and can cause dysrhythmias, acute MI, and heart failure. Monitor closely.

Routine Medical Care / Trauma Care

- Include temperature & CBG
- Apply cardiac monitor
- Look for associated injuries/illnesses
- Consider *Spinal Motion Restriction,* if needed

Ice Bath Immersion is critical for exertional heat stroke. Consider staying on-scene longer if it is rapidly available.

Move victim to a cool or shaded area
Remove clothing and loosen restrictive garments
Apply cold packs to the axilla, groin, and posterior neck
Determine severity of exposure

**Heat Exhaustion**

- Normal mentation
- Elevated body temperature
- Cool, moist skin
- Headache
- Generalized weakness
- Nausea/Vomiting
- Possible syncope
- Aches in legs or abdomen (i.e. heat cramps)

**PO Fluids**[2]
as tolerated

**Crystalloid Fluid**
**if unable to tolerate PO**
500mL IV/IO prn (max 2L)
Goal: MAP ≥ 65 or as clinically indicated for dehydration

**Differential Diagnosis**

- Excited Delirium
- Delirium Tremens (DTs)
- Hyperthyroid Storm
- Fever/Infection
- Exercise/Exertion
- Neuroleptic Malignant Syndrome (often due to antipsychotics)
- Sympathomimetic OD (ex. cocaine, amphetamines)
- Anticholinergic Toxidrome (ex. antihistamine OD)
- CNS lesion/tumor

Contact **Medical Control** if additional orders or consultation is needed

**Heat Stroke**

- Altered L.O.C.
- Very high body temperature (likely > 104°F )
- Hot, dry skin
- Sweating may have stopped
- Tachypnea
- Hypotension
- Seizures
- Coma

**Ice Bath Immersion**[1]
(If available on scene)
or
**Evaporative Cooling**

- Fan the patient
- Mist skin with tepid $H_20$

**Crystalloid Fluid**
500mL IV/IO PRN, Max of 2L
Goal: MAP ≥ 65 or as clinically indicated for dehydration

Look for other causes of altered LOC using **Altered Mental Status** guideline[3]

[1] Ice baths are often available at commercial sporting events. Consider using a KED to assist with placement/removal of patient into bath.

[2] PO fluids of choice are sports drinks/products with electrolytes

[3] Treat generalized seizures with benzodiazepines as outlined in **Seizure** guidelines

**Cooling efforts – including ice bath immersion - should continue until body temperature is less than 102.2°F (39°C) and patient displays improvement in mental status. Further cooling risks inducing overshoot hypothermia.**

# Hypothermia | Cold Exposure

Hypothermia may be primary (i.e. due to increased loss of heat) or secondary (i.e. due to another condition causing decreased heat production). Consider secondary causes in your differential diagnosis: sepsis, toxins, psychiatric illness, hypoglycemia, hypothyroidism, CNS dysfunction (e.g. stroke, head injury)

Early signs of Frostbite/Frostnip
- Numbness
- Clumsy feeling in affected part
- White, blanched skin

Late signs of Frostbite/Frostnip
- Dark, hard, woody skin
- Decreased or loss of sensation
- Bruising or blistering skin

Routine Medical Care / Trauma Care[1]
- Include temperature & CBG
- Look for associated injuries/illnesses
- Consider **Spinal Motion Restriction**, if trauma is suspected

**Hypothermia can occur even in normal temperatures**

Clinical classification:
- **Mild**: normal mental status, shivering, normal VS including body temp 32.1-35°C (89.8-95°F)
- **Moderate/Severe:** altered LOC, no shivering, ↓BP, ↓HR, ↓RR, temp <32.1°C (89.8°F)

Remove wet garments & dry patient

Determine Severity of Exposure

**Localized Cold Injury** (frostbite, frostnip)

- Dress injured area in clean cloths
- Do not rub skin
- Do not break blisters

- Monitor for signs of worsening hypothermia
- Consider transport to a Burn Center for frostbitten extremities

Contact **Medical Control** if additional orders are needed

**Systemic Hypothermia**

Is patient alert?

Yes
- Cover patient with dry sheets or hypothermic blanket(s); apply hot packs[3] if available
- **Obtain 12-lead EKG[2]**
- Start IV, apply cardiac monitor
- Monitor VS, including EtCO2
- **Do not allow patient to walk or stand**
- Transport to local facility

No

Is there a pulse?[2]

Yes
- Cover patient with dry sheets or hypothermic blanket(s); apply hot packs[3] if available
- **Obtain 12-lead EKG**
- Start IV, apply cardiac monitor
- Monitor VS, including EtCO2
- **Consider/treat causes of Altered Mental Status**
- Transport to local facility

No
- Limit patient movement
- Initiate CPR
- Treat as per **Hypothermia Induced Cardiac Arrest** guideline

Hypothermia can happen even in warmer regions – especially if person is elderly, septic, homeless, immersed, or altered.

[1] Pulse oximetry may be inaccurate if patient is cyanotic. Give oxygen if patient has any respiratory distress.

[2] Hypothermia may produce severe bradycardia – **take at least 60 seconds to palpate a pulse**. Do not treat physiologic bradycardia unless there is also profound hypotension unresponsive to fluids.

[3] Hot packs can be activated and placed in the axillary and groin areas. Care should be taken not to place the packs directly against the patient's skin. Warm the patient compartment of ambulance during transport.

# Hypothermia Induced Cardiac Arrest

**<u>This guideline should only be used when hypothermia is believed to be the primary cause of the patient's arrest</u>**

Secondary causes of hypothermia (e.g. sepsis, toxins, hypoglycemia) and cardiac arrest should be managed according to the corresponding cardiac guideline, including recognition of reversible Hs and Ts.

**Routine Medical Care/Trauma Care**[1]

Confirm pulselessness by performing <u>ALL</u> pulse checks for up to 60 seconds

Attach monitor and defibrillator pads
Confirm cardiac rhythm prior to initiating CPR[2]

**VF/VT**

- Initiate CPR
- Defibrillate **ONCE** @ max Joules
- **Epinephrine 0.1mg/ml** (1:10,000) 1mg IV/IO **ONCE**
- Measure body temperature[3]

**Asystole**

- Initiate CPR
- **Epinephrine 0.1mg/ml** (1:10,000) 1mg IV/IO **ONCE**
- Measure body temperature[3]

**PEA**

- Do **NOT** initiate CPR
- Monitor rhythm – true PEA will rapidly deteriorate to asystole
- Treat Hs and Ts
- Measure body temperature[3]

- Do not give any additional shocks or epinephrine until temp > 86°F
- Remove wet clothing if not already done
- Initiate rewarming procedures[4]
- Treat as per standard **Cardiac Arrest** guideline if temp > 86°F

- Transport <u>early</u> (i.e. < 30min into resuscitation) to a facility capable of performing active rewarming unless prehospital temp > 89.6°F (30°C) is able to be confirmed
- Avoid jostling or excessive stimulation during transport – this may precipitate further dysrhythmias
- Contact **Medical Control** early if consultation is needed

[4] **<u>Rewarming Should Include:</u>**

- Hot packs (wrapped in a towel) applied to torso
- Dry sheets or warming blankets over patient
- Warmed ambulance
- Warmed IVF (if available)

<u>Hypothermia can happen even in warmer regions – especially if person is elderly, septic, homeless, immersed, or altered.</u>

[1] The most experienced provider should intubate to limit manipulation. Avoid hyperventilation which can cause ventricular fibrillation in hypothermic patients. Use $etCO_2$ monitor to maintain normal $pCO_2$ levels (35-45 mmHg).

[2] Consider withholding CPR if patient has an organized rhythm or other signs of life. Do not perform cardiac pacing or give Atropine if body temperature is < 86°F (30°C). Hypothermic patients have decreased metabolic needs and can better tolerate decreased blood flow states like PEA or severe bradycardia. **Consult with Medical Control**.

[3] If the temperature is unable to be measured, assume temp is < 86° F, begin rewarming, and plan for transport.

# Emergency Childbirth

Routine Medical Care

Active contractions 2-3 minutes apart?
If so, evaluate for bleeding, discharge and/or body presentation

Delivery Imminent?[1]

**Yes**

Crowning?

**Yes**

- Deliver Infant(s)
- If infant is stuck, proceed to **Obstetric Complications** guideline
- Delay cord clamping for 1-3 min after delivery in vigorous term infants[2]
- Keep newborn warm
- Transport to **requested obstretic facility**.

**No**

<u>If breech, shoulder dystocia, hemorrhage and/or prolapsed cord:</u>

- Refer to **Obstetric Complications** guideline
- Transport immediately to the **closest ED with obstetric services**

**No**

- Place patient in left lateral recumbent position
- Transport to **requested obstetric facility**
- Reassess likelihood of delivery while en route

<u>If patient is bleeding/hemorrhaging:</u>

- Refer to **Obstetric Complications** guideline
- Transport immediately to **closest ED with obstetric services**

<u>Postpartum Care of Mother</u>

- Allow placenta to deliver spontaneously; do not pull on umbilical cord[3]
- Place tissue in plastic bag and transport
- To promote uterine contraction & control bleeding: massage uterus and allow stable infant(s) to nurse
- If perineum is torn, apply direct pressure with sanitary pads
- Assess maternal blood loss, give IV/IO **Crystalloid fluid bolus** 500ml prn[4] (max 2L) if concern for hypovolemia or signs of poor perfusion

<u>Postpartum Care of Infant</u>

- Monitor/Treat as per **Neonatal Resuscitation** guideline
- Only suction nose/mouth if airway is obstructed or newborn is having difficulty clearing secretions
- Obtain/document APGAR score @ 1 and 5 min
- After 1-3 min, double clamp cord 6" from infant abdominal wall and cut between clamps with a sterile scalpel.
- Transport infant secured in seat or isolette

[1] Signs of imminent delivery: crowning, bulging perineum, urge to push, urge to move bowels. <u>Obtain IV access for any imminent delivery or if patient says she is "high risk</u>."

[2] If resuscitation is needed, clamp cord and cut ASAP.

[3] Do not delay transport awaiting placenta delivery. All products of conception must accompany mother to the ED.

[4] Lactated Ringers is crystalloid fluid of choice if available.

If possible, transport between deliveries when multiple births are expected.

<u>**Delivery Procedure**</u>

1) **Position mother supine on a flat surface, if possible**
2) **Protect perineum with gentle hand pressure**
3) **Support and control delivery of head as it emerges**
4) **As shoulders emerge gently guide head/neck downward to deliver anterior shoulder**
5) **Support and gently lift head/neck to deliver posterior shoulder**
6) **Rest of infant should deliver with passive participation**

***Do not attempt to impair or delay delivery***

# Obstetric Complications

Routine Medical Care

- Give **high flow oxygen** (15 lpm) via NRB
- Obtain IV access & assess for shock – give IV/IO **Crystalloid fluid bolus** 500ml prn (max 2L) if signs of poor perfusion

**Prolapsed Umbilical Cord**

- Place mother in knee/chest position or in deep Trendelenburg, if possible
- Place gloved hand into vagina and lift presenting part to allow/increase fetal blood flow – you should feel pulsations
- Keep presenting part elevated until relieved by hospital staff
- Transport immediately to **closest ED with obstetric services**

**Bleeding/Hemorrhaging**[1]

- Place mother supine and keep warm
- Position mother on left side or manually displace uterus to the left
- Continue to treat shock as outlined above; reassess vital signs often
- Transport immediately to **closest ED with obstetric services unless bleeding is due to trauma**. If due to trauma, transport mother to a trauma center.

**Shoulder Dystocia**

- Identify "turtle sign" as an indication of this complication[2]
- Support – don't pull – baby's head; avoid excessive neck rotation
- Hyperflex mother's hip to severe supine knee-chest position
- Apply gently, open handed, suprapubic pressure directly over the infant's anterior shoulder
- Consider Gaskin "all fours" maneuver if not en route and patient able to tolerate position
- Transport immediately to **closest ED with obstetric services**

**Preeclampsia/Eclampsia**[3]

- Treat HTN only for prolonged transport – call **Medical Control** prn
- Treat seizures immediately with **Magnesium Sulfate ($MgSO_4$)** 4g IV/IO over 10 min or 10g IM (5g in each buttock) if unable to obtain IV access
- Give benzodiazepine as outlined in **Seizure** guideline if patient is still seizing after 5 min on $MgSO_4$ drip
- Monitor for magnesium toxicity (hypotension, somnolence)
- Restrict IV fluids to max 80 ml/hr – assess for pulmonary edema
- Transport immediately to **closest ED with obstetric services**

**Breech Birth**

- Allow buttocks & trunk to deliver spontaneously; do not attempt to pull an arm or leg through the vagina
- Support the body while the head delivers; let legs dangle if necessary
- If head fails to deliver within 30 seconds, place gloved hand into vagina and hold two fingers between infant's face and uterine wall to create an open airway
- Apply gentle abdominal pressure to uterine fundus
- Transport immediately to **closest ED with obstetric services**

[1] *Abruptio placentae* occurs when there is premature separtion of the placenta from the uterine wall - bleeding is usually painful. Bleeding may be minimal to none if blood is trapped behind the placenta and unable to exit the uterus. *Placenta previa* occurs when the placenta is completely or partially blocking the cervical os – bleeding is usually painless. Mothers with prenatal care are usually aware of this diagnosis – obtain a thorough history.

[2] Turtle Sign - infant's head will retract back into the vaginal canal after it has been delivered, like a turtle sticking its head out of its shell.

[3] Signs of Preeclampsia: Hypertension (SBP > 160 or DBP > 110), headache, confusion, visual changes, pulmonary edema, upper abdominal (RUQ or epigastric) pain. Eclampsia = preeclampsia + seizures. Either may occur from 20 weeks gestation up to six weeks post-partum.

THIS PAGE INTENTIONALLY LEFT BLANK

# Region One Protocol Effort

## Cardiac Guidelines

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Cardiac Preambles

## I. CARDIAC ARREST

**Operational Considerations**

Scene Time: All medical patients in cardiac arrest should be treated on scene where found for no less than 30 minutes. The most important therapy is effective and minimally interrupted chest compressions. Chest compressions are less effective when moving toward an ambulance or while in a moving vehicle.

Scene Safety: Law enforcement should immediately be requested when patient care cannot be delivered effectively on-scene. Patients should only be moved if the conditions remain unsafe or do not operationally allow for resuscitation.

Sprint Unit Support: When supervisor units or any other single paramedic response vehicle arrives on the scene of a cardiac arrest, their single responsibility is BLS CPR. This course of treatment shall continue until knowledgeable bystanders are able and willing to help or additional paramedics/EMTs arrive.

**Minimally Interrupted CPR**

Compressions should be started immediately during cardiac arrest as there is virtually no set-up time. (Even basic airway equipment requires some set-up time for sizing and deployment.) The goal for compressions is 100-120 compressions per minute. Push hard and fast allowing for complete chest recoil (2 inches for the average adult). Higher chest compression fraction rates are associated with better rates of survival to hospital discharge. Agencies should aim to achieve a chest compression fraction rate (the percentage of total resuscitation time that compressions are performed) of 80%.

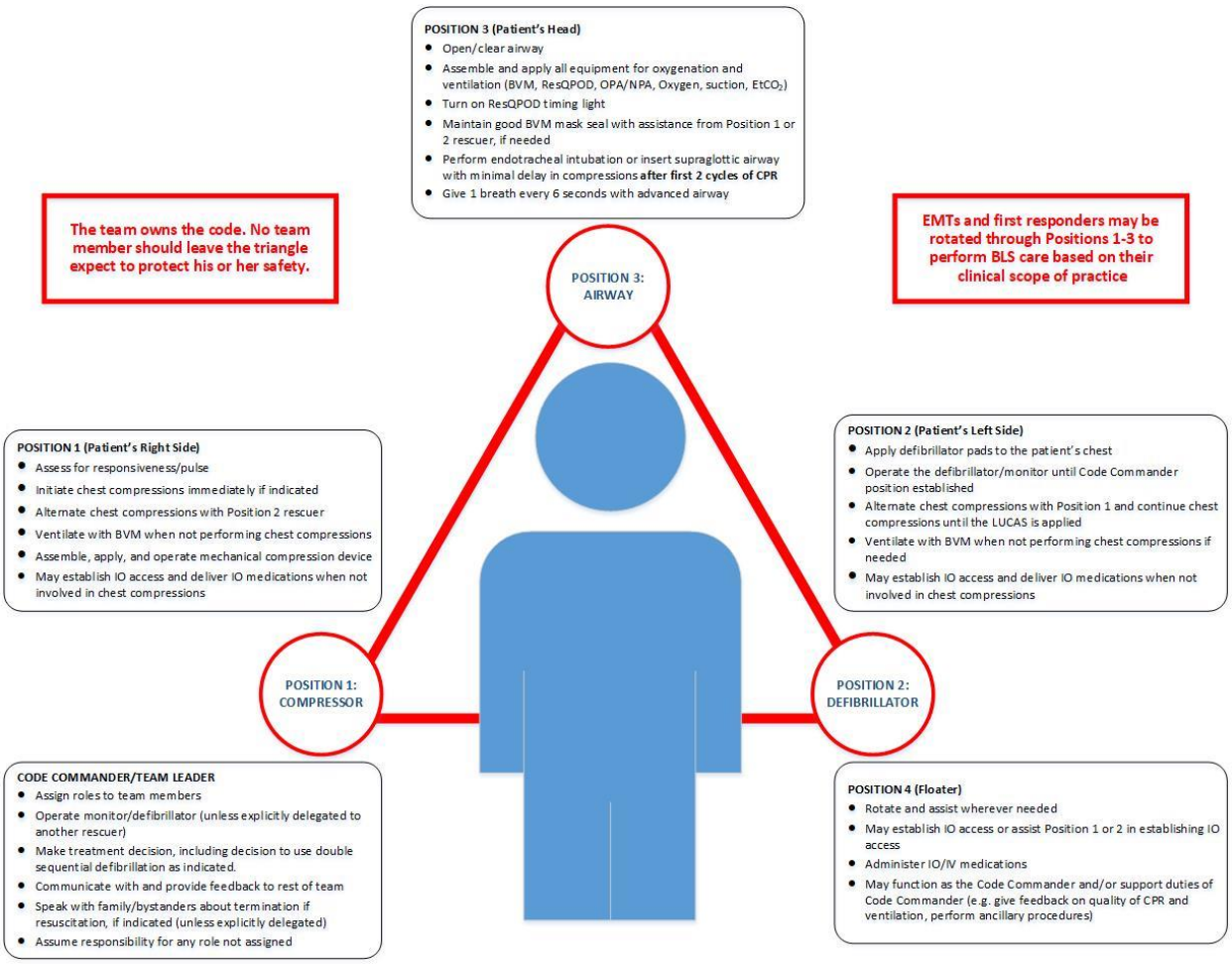
Quantitative end-tidal $CO_2$ should be used to monitor effectiveness of chest compressions. If $ETCO_2$ is less than 10 mmHg during the initial phases of resuscitation, attempt to improve chest compression quality.

Mechanical chest compression devices are a reasonable alternative to conventional CPR. Application time for mechanical devices should be kept to a minimum and training should reflect this goal in order to maximize compression fraction ratio.

**Pit Crew Resuscitation**

The pit crew model is a coordinated, patient centered approach to cardiac arrest that increase the likelihood of successful resuscitation. As the name implies, this approach is inspired by the preplanned, well-choreographed pit crews utilized in race car driving to get vehicles back on the track in a hurry. Each member of the pit has a clearly defined task for which they are well trained and able to perform efficiently. The team depends on each person's successful and timely completion of their particular job in order to achieve the best outcome.

A minimum of three healthcare providers are need by the patient's side to perform pit crew CPR as it is intended; however high-performance teams of up to six members have been identified. Roles are as follows:




**Defibrillation**

Defibrillation is most successful when administered as soon as possible after onset of VF/VT. When VF/VT has been present for more than a few minutes, myocardial reserves of oxygen and other energy substrates are rapidly depleted. A period of CPR prior to defibrillation helps to replenish these substrates and improves the odds of defibrillation success. This initial period of CPR may range from 30 seconds to 3 minutes prior to obtaining an initial rhythm analysis.

Applying defibrillation pads, powering on the defibrillator/monitor, analyzing cardiac rhythm, and charging the capacitor can all be accomplished during the initial CPR period, and defibrillation can occur as soon as the device is ready for us. If the patient is being monitored with pads in place at the time of a witnessed arrest, defibrillation should occur immediately.

The maximum setting on the defibrillator should be used for initial and subsequent defibrillation attempts. Defibrillation dosing should follow manufacturer's recommendation in the case of biphasic defibrillators. If the manufacturer's recommendation is unknown, use the highest setting possible. In the case of monophasic devices, the setting should be 360 Joules.

Minimizing disruptions in CPR surrounding shock administration should be a high priority. CPR should continue while the defibrillator is charging and should resume immediately after shock to increase the chest compression fraction rate. Precharging the defibrillator before a rhythm check and hovering over the chest during shock (rather than stepping away during defibrillations) help to decrease the length of peri-shock pauses. If a mechanical CPR device is used, CPR can continue during defibrillation.

Chest compressions should be continued for two minutes after defibrillation with no pauses or pulse checks regardless of the rhythm displayed on the cardiac monitor. Serial "stacked" shocks are not recommended. There is declining success with serial shocks when the first shock has failed, and the protracted interruption in CPR after a series of shocks has to date been shown to negatively affect patient survival to hospital discharge.

**Airway Management During Resuscitation**

Airway management is of secondary importance and should not interfere with compressions and defibrillation. Therefore, the first cycle of chest compressions should be initiated without delay while allowing time for basic airway equipment set-up/sizing.

The proper strategy of airway management is currently not defined. Recommended options for airway management within Region One include:

- BVM ventilation at 10 breaths per minute (1 breath every 10 compressions), applied during the upstroke between compressions, without interrupting the compressions
- Advanced airway placement may take place after vascular access has been established.
    1. Either a supraglottic airway or an endotracheal tube may be placed without interruption of compressions
    2. Ventilations are provided at 10 breaths/minute for adults with continuous compressions (i.e. no pauses to ventilate)

Oropharyngeal and nasopharyngeal airways should be used to maintain a patent airway and facilitate appropriate ventilation prior to advanced airway placement.

Hyperventilation during resuscitation is potentially harmful and should be avoided. Excessive ventilation rates result in increased intrathoracic pressures, reduced venous return to the heart, reduced cardiac output, and reduced coronary artery perfusion. Hyperventilation also causes increased $CO_2$ exhalation, reduced $CO_2$ in the arterial blood, contraction of cerebral blood vessels, and decreased cerebral blood flow, all resulting in the occurrence of cerebral ischemia. Proper ventilation with controlled peak inspiratory pressure will reduce the likelihood of barotrauma, keep GI distension to a minimum, and reduce the risk of aspiration.

**Medication Administration During Resuscitation**

Intravascular (IV) or intraosseous (IO) access should be obtained for emergency drug and fluid administration during resuscitation. All medications should be followed by a 20ml bolus of NS/LR.

Delivery of drugs via an endotracheal tube is the least-preferred route of administration and is associated with unpredictable, and generally lower, drug concentrations.

Though recent studies suggest more severe neurologic impairments amongst survivors of cardiac arrest given epinephrine, 2020 American Heart Association guidelines continue to support administration of 1mg of epinephrine every 3 to 5 minutes. Operationally, administering epinephrine every second cycle of CPR, after the initial dose, is reasonable.

Amiodarone may be used as an antiarrhythmic as indicated by protocol for VF/pulseless VT unresponsive to CPR, defibrillation, and vasopressor therapy. Lidocaine may be considered as an alternative to amiodarone. No antiarrhythmic drug has been shown to increase survival or neurologic outcome after cardiac arrest due to VF/pulseless VT.

The routine use of calcium, magnesium, and sodium bicarbonate is not recommended during resuscitations and should be reserved to treat specific reversible causes of arrest.

**Post-ROSC (Return of Spontaneous Circulation)**

It is advisable for providers to remains on scene and maximize hemodynamics once return of spontaneous circulation (ROSC) occurs. Stepwise intervention should focus on treating hypotension, hypoxia, hypo-and hypercapnia, and fever. The goal is to optimize functional neurologic outcome following arrest.

Most patients immediately post-resuscitation will require ventilatory assistance. Hyperventilation is a significant cause of hypotension and re-arrest in the post-resuscitation phase and must be avoided. Other common causes of post-resuscitation hypotension include hyperventilation, hypovolemia, and pneumothorax.

The condition of post-resuscitation patients fluctuates rapidly and continuously, and they require close monitoring. A significant percentage of post-ROCS patients will re-arrest. Post-ROSC patients also may have evidence of ST elevation MI on EKG. Providers should obtain a 12-lead EKG as soon as feasible after ROSC.

Ongoing trials exist to measure the efficacy of initiating targeted temperature management (TTM). Although early initiation of TTM appears to reduce neurologic disability, its implementation – including timing, equipment, and temperature goals - has been challenging in the prehospital environment. This therapy remains a major topic of clinical investigation.

**Decisions to Withhold or Terminate Resuscitation**

- Even if all criteria for death and DNAR (Do Not Attempt Resuscitation) are met, providers may decide to initiate CPR for scene safety and/or family wishes.

- When it is anticipated that resuscitation will be terminated in the field, attention should be focused on the family and/or bystanders. Explain the rationale for termination of resuscitation.

- If there is a personal physician is on scene who has an ongoing relationship with the patient, that physician may decide if resuscitation is to be initiated. If the physician decides resuscitation is to be initiated, ROPE guidelines should be followed unless the physician agrees to assume full authority

over patient care until face-to-face handoff to another physician as outlined in the Physician On-Scene policy in the ROPE Introduction.

- If a registered nurse from a home healthcare or hospice agency present at the scene who has an ongoing relationship with the patient and who is operating under orders from the patient's private physician, the authorized nurse may decide if resuscitation is to be initiated.

- If the physician or authorized nurse decides resuscitation is to be initiated, ROPE guidelines and usual direct medical oversight procedures should be followed.

- Any physician may give orders to withhold or terminate resuscitation. However, as promulgated by RS 9:111A, a physician's pronouncement of death must be preceded by the physician's personal evaluation and examination of the individual and cannot be delegated to another licensed health care provider. The exception to this rule is the Coroner. As per RS 9:111 A, the medical pronouncement of death by a coroner may be based on personal observation, information, or statements obtained from coroner investigators or emergency medical technicians at the scene who are reporting from firsthand observation of the physical condition of the deceased.

## II. SPECIAL CIRCUMSTANCES IN CARDIAC ARREST

**Pregnancy**

A significant portion of cases of maternal cardiac arrest are attributed reversible etiologies. This unique population may be more salvageable than most patients receiving CPR. In the case of cardiac arrest of a pregnant patient with gestational age (GA) > 20 weeks, an attempt at resuscitation should be made for the sake of the mother and the fetus. The best hope for fetal survival is maternal survival. Standard ACLS algorithms, including hand placement for compressions and use of defibrillation, should be applied for the pregnant patient. However, consider the following physiologic changes during patient care:

Airway – A difficult airway is common in pregnancy because of vascular engorgement of the upper pharynx and larynx leading to narrowing of the of the airway passage. The most experienced provider on scene should insert an advanced airway (ETT or SGA) as early as possible. The size of the ETT is commonly decreased by 0.5 – 1.0 mm compared to a non-pregnant female. Early intubation also decreases the risk of aspiration caused by a more relaxed gastroesophageal sphincter.

Breathing – Pregnant women are less tolerant of oxygen deprivation and more susceptible to hypoxemia. The patient's elevated diaphragm decreases their functional lung capacity in the midst of their body and fetus' increased demand for oxygen. This reinforces the benefit if early insertion of an advanced airway. Techniques used to confirm ETT placement do not change. Though chest wall compliance decreases with pregnancy, lung compliance does not change. Avoid hyperventilation and maintain similar ventilation volumes to non-pregnant patients.

Circulation – Compression of the inferior vena cava starts at approximately 20 weeks gestation in single pregnancies, thereby reducing stroke volume and cardiac output. *The GA is presumed to be over 20 weeks when the height of the uterine fundus is at or above the umbilicus. **Perform manual left lateral uterine displacement to relieve aortocaval pressure during high quality CPR.** Obtain IV/IO access above the diaphragm to prevent trapping of fluid/medication below the gravid uterus. Hemorrhage is a common cause of maternal cardiac arrest. Consider this etiology early and treat with crystalloid fluid and/or blood products, if available.

Although the heart is shifted to the left during pregnancy, it is not significantly elevated (as demonstrated by cardiac MRI) – **hand position during CPR should not be modified in the pregnant patient.** Rhythm analysis and defibrillation are performed similar to the nonpregnant patient with utilization of the same levels of energy. Medication dosages utilized also are not altered in maternal cardiac arrest.

When caring for a pregnant patient with a gestational age estimated to be >20 weeks do not resuscitate on scene for 30 min. Perimortem cesarean delivery (PMCD) at or greater than 20 weeks appears to improve outcomes of maternal cardiac arrest when resuscitation does not rapidly result in ROSC. Shorter time intervals from arrest to delivery appear to lead to improved maternal and neonatal outcomes. Transport promptly to the closest facility capable of performing a PMCD (preferably one with OB/GYN services but not required) for evaluation of a perimortem cesarean section. Capable receiving facilities should be contacted as soon cardiac arrest >20 weeks is recognized to allow for smooth delivery of care.

In situations where the medic can verify a prolonged down time or injuries incompatible with life, the medic should follow the standard DNAR guideline.

**Hypothermia-Induced Cardiac Arrest**[1]

Hypothermia can occur even in warmer climates. Persons most at risk of hyperthermia are the young and elderly, persons exposed to the outdoors for extended periods (ex. homeless, hikers), persons with altered mental status (ex. intoxication), and those with persistent medical condition such as sepsis, hypoglycemia, neuromuscular disease, malnutrition, hypothyroidism, and adrenal insufficiency.

Signs of life may be difficult to detect in the prehospital setting. The heart rate can be very slow and pulses difficult to palpate. Take up to one minute when feeling for a pulse. Breathing can be very slow and shallow but detectible in the absence of palpable pulses. Cardiac monitoring should be used to assess the patient's rhythm when providers are unsure if a pulse is present. Resuscitation should not be attempted if patient's chest wall is too stiff for compressions, obvious fatal injuries are present (ex. decapitation), or the patient has been submerged for more than an hour. Fixed/dilated pupils, apparent rigor mortis, and dependent lividity are not considered contraindication to resuscitation of a severely hypothermic patient.

It also may be difficult to determine core body temperature in the prehospital setting. Many thermometers today will measure temperatures below 86°F (30°C); however, providers who are unable

[1] Zafren et al. 2014. *Wilderness Environ Med; 25*:S66-S85.

to obtain a thermometer reading should assume the patient is *severely hypothermic* with a core body temp of less than 86°F (30°C).

Due to the neuroprotective effects of hypothermia, patients have survived long periods of CPR after hypothermic cardiac arrest. Resuscitation should focus on effective chest compressions and attempts at rewarming. Providers should initiate field-rewarming methods such as placement of large heat packs or heat blankets to the anterior chest or wrapped around the patient's chest. Heat sources should never be applied directly to the skin; providers should place a barrier between the skin and the heat source to prevent burns.

Ventricular dysrhythmias are often refractory to electricity when the patient is still hypothermic. It is reasonable to deliver one shock and one round of medication but delay further attempts until the patient is rewarmed. It is often useful to be in contact with Medical Control during these cases.

**Lightning Strikes/Electrical Injury**

Cardiopulmonary arrest after lightning strike or electrical injury may have good outcomes with prompt intervention. Patients may have dilated pupils due to autonomic dysfunction. An attempt at resuscitation should be made unless an extended downtime can be validated and/or injuries incompatible with life are present.

Once the scene is declared safe and smoldering clothing has been removed, early aggressive CPR, defibrillation, and airway control should be the focus of treatment. Because of the increased risk of tracheal edema, endotracheal intubation should be considered early even if spontaneous breathing has resumed. Defibrillation should be performed without delay. If there is any doubt in distinguishing asystole vs. "fine V-Fib" the paramedic should consider defibrillation.

When encountering a mass casualty incident where triage is necessary, victims of lightning strike who are in respiratory or cardiac arrest should be given highest priority (in contrast to their "black" distinction during MCIs of other causes).

## III. EKG ANATOMY & INTERPRETATION

Certain guidelines require 12-lead EKG testing. Other patient complaints and/or assessment findings may warrant 12-lead EKG testing as a diagnostic tool. Acute coronary syndrome (ACS) may not present as chest pain. Atypical or unusual symptoms are more common in women, the elderly, and diabetic patients. Patients with suspected ACS should receive at least two serial EKGs (performed 10 minutes apart) in the prehospital setting to evaluate for dynamic changes during transport.

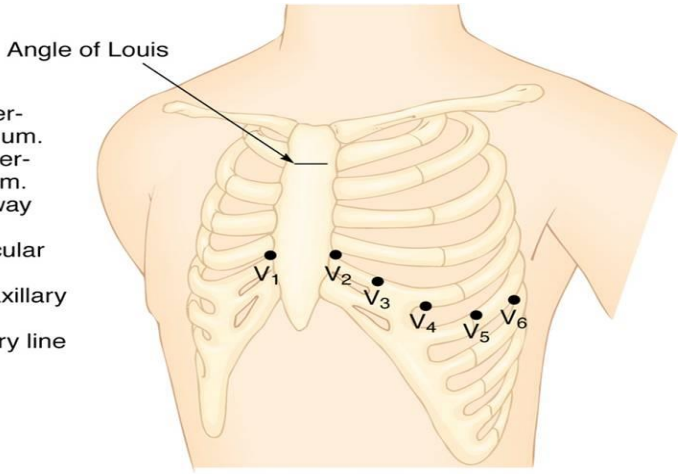
**EKG Indications**

- Chest pain or discomfort
- Epigastric pain
- Nontraumatic back, neck, jaw or arm pain
- Palpitations
- Shortness of breath
- Dizziness
- Syncope or near syncope

- Weakness or fatigue
- Diaphoresis unexplained by ambient temperature
- Unexplained nausea or vomiting
- Feel of anxiety or impending doom
- Suspected drug overdose
- Suspected diabetic ketoacidosis
- An unconscious patient
- Any patient with a coronary stent placed <60 days prior
- Any heart rate less than 50 or greater than 110
- Any patient you think may have symptoms that are cardiac in origin

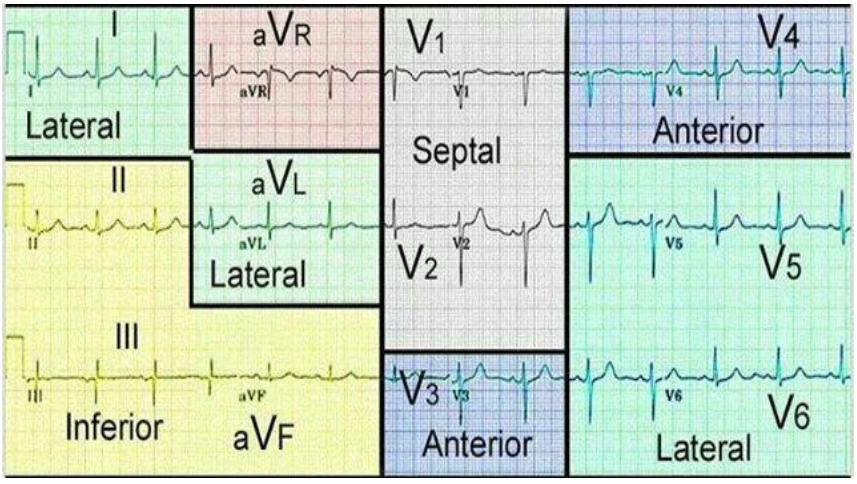
**EKG Lead Placement**

**Lead $V_1$** The electrode is at the fourth intercostal space just to the right of the sternum.
**Lead $V_2$** The electrode is at the fourth intercostal space just to the left of the sternum.
**Lead $V_3$** The electrode is at the line midway between leads $V_2$ and $V_4$.
**Lead $V_4$** The electrode is at the midclavicular line in the fifth interspace.
**Lead $V_5$** The electrode is at the anterior axillary line at the same level as lead $V_4$.
**Lead $V_6$** The electrode is at the midaxillary line at the same level as lead $V_4$.

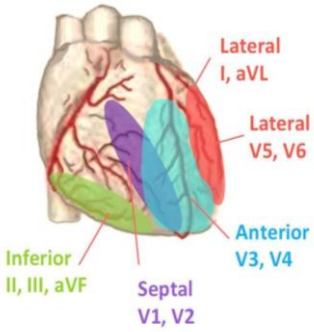


Chest Lead Placement

*Bledsoe B, Porter R, Cherry R. Essential of Paramedic Care 2nd ed. 2007. Upper Saddle River*



*rebelem.com*



*pinterest.com*

**EKG Leads and Corresponding Vascular Supply**

**Lateral Leads – I, aVL, V5, V6** — **LCx or Diagonal of LAD**
**Inferior Leads – II, III, aVF** — **RCA and/or LCx**
**Anterior/Septal Leads – V1-V4** — **LAD**

The most important cause of ST abnormality is myocardial ischemia or myocardial infarction. Currents flowing from ischemic regions of the heart to normal myocardium result in the appearance of ST segment elevation or depression. In general, ST elevation indicates myocardial injury (i.e. muscle death), while ST depression indicates myocardial ischemia (lack of oxygen that will develop into myocardial injury if untreated).

Definition of ST elevation myocardial infraction (STEMI):

- STE > 1mm in at least two contiguous leads in all leads other than V2-V3
- In leads V2-V3:
    - STE > 1.5 mm in leads V2-V3 in women
    - STE > 2mm in leads V2-V3 in men > 40 years of age
    - STE > 2.5 mm in leads V2-V3 in men < 40 years of age

The presence of reciprocal ST depression helps to confirm the diagnosis of STEMI.

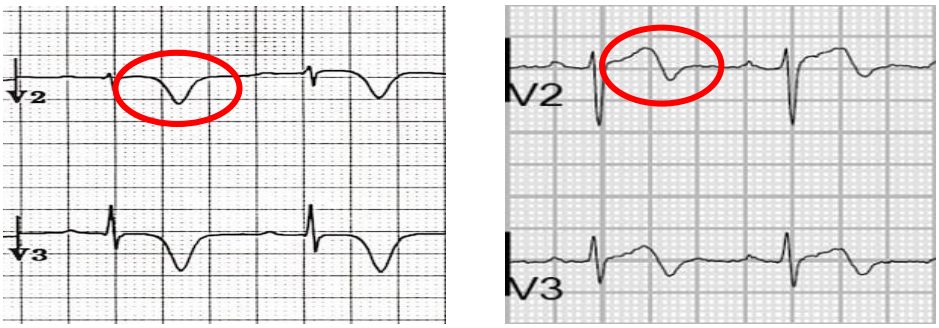
**Additional Indicators of Acute Coronary Occlusion**

Both of the following EKG patterns are subtle finding that have been seen in patients with high-grade proximal occlusions, most commonly to the LAD. Early identification and cath lab activation are key to decreasing patient mortality.

- DeWinter Syndrome – the de Winter EKG pattern is seen in the precordial leads. V1-V6 may show upsloping ST segment depressions with tall, symmetrical T waves. This pattern is transient and dynamic; it presents in the early stages of an MI.


*Life in the Fastlane – litfl.com*

- Wellens Warning – Wellens is a pattern of deeply inverted or biphasic T waves in V2-V3. Patients may be pain free by the EKG is taken.



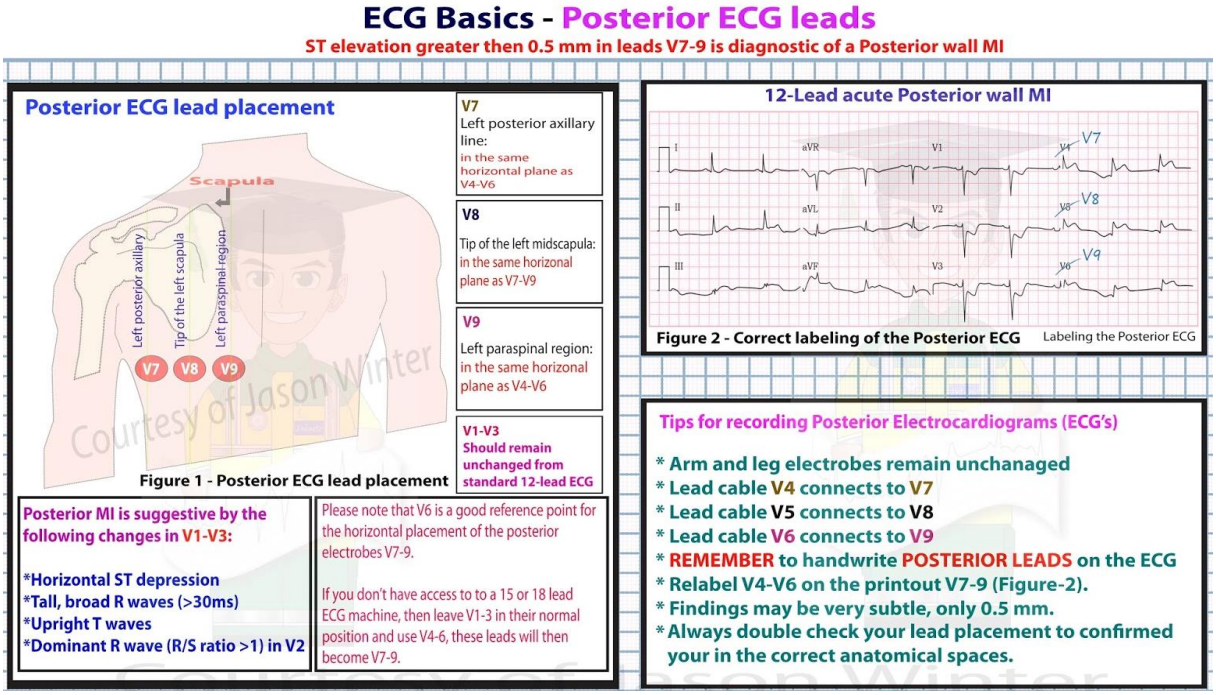

*Life in the Fastlane – litfl.com*

**Posterior Wall Infarction**

Posterior wall MIs commonly occur in the context of an inferior and lateral infarction, where the RCA or left circumflex artery are occluded. Occasionally a posterior MI is isolated (3-11% of all MIs) but may be missed when they are isolated. Patients with classic symptoms of ischemia will have more subtle EKG changes that require rapid recognition.

Because the posterior myocardium is not directly visualized by the standard 12-lead EKG, providers must look for reciprocal changes of STEMI in the anteroseptal leads V1-V3:

- ST depression
- Tall R waves
- Upright T waves




Flipping over the EKG is one way that providers can recognize posterior MIs – it will look like a typical STEMI when inverted. Posterior infraction is confirmed by the presence of ST elevation and Q waves in the posterior leads V7-V9. The degree of ST elevation seen in V7-V9 is typically modest but should still be recognized as a STEMI if ≥ 0.5mm of elevation is present. When the strip is printed, providers must remember to write "V7, V8, V9" over lead V4, V5, and V6, respectively.

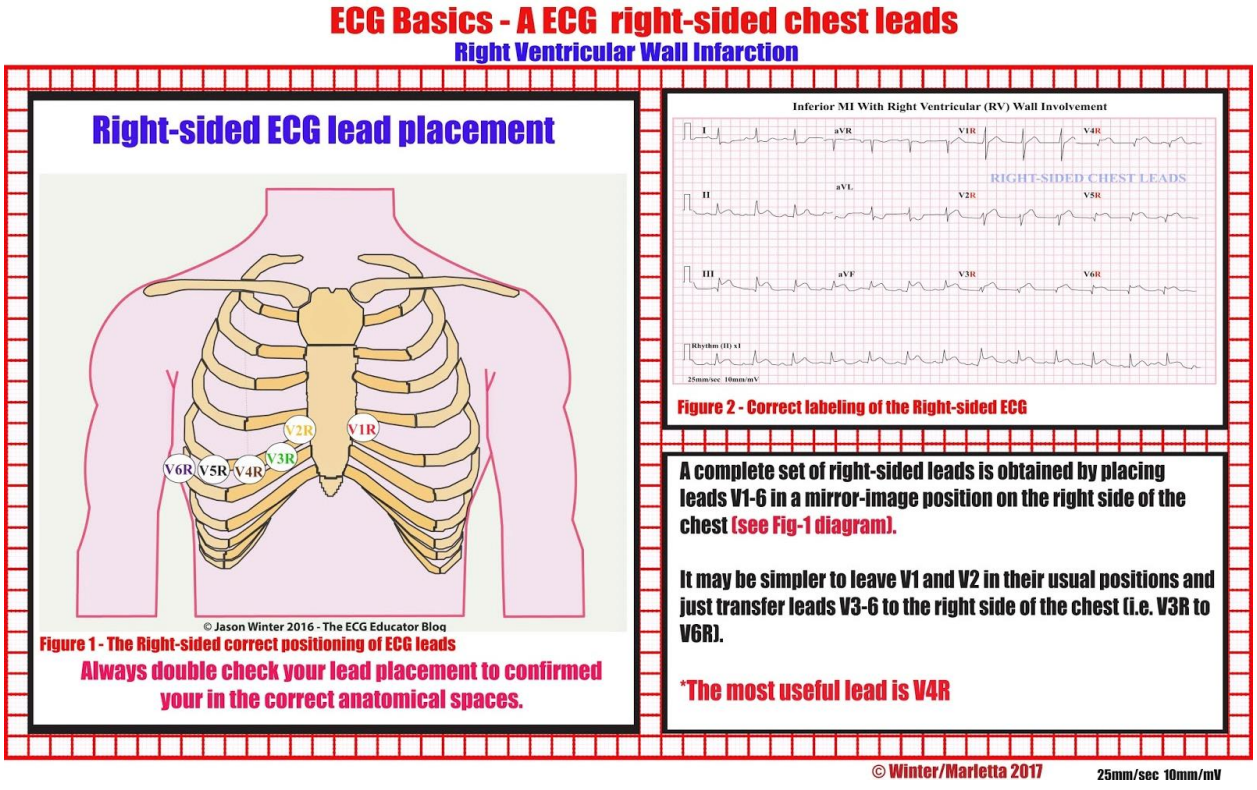
**Right Ventricular Infarction**

Right ventricular infarcts complicate up to 40% of inferior STEMIs. Isolated RV infarction is extremely rate. The coronary artery involved is usually an occlude right coronary artery (RCA). Patients with RV infarction are very preload sensitive (due to poor RV contractility) and develop severe hypotension in response to nitrate or other preload-reducing agents. Hypotension in RV infarctions is treated with fluid boluses and discontinuation of nitrate use.

In patients presenting with inferior STEMI, right ventricular infarct is suggested by the presence of

(a) ST elevation in V1
(b) ST elevation in lead II > lead II

RV infarction is confirmed by the presence of ST elevation in the right-sided leads (V3R-V6R). The most useful lead is V4R. ST elevation in V4R has a high accuracy for the diagnosis of RV MI. When the strip is printed, providers must remember to write "R" beside the V leads to mark that they are right leads, not left.




## IV. ADDITIONAL CARDIAC PEARLS

### Acute Coronary Syndrome

Risk factors for a Major Cardiac Event

Consider the following risk factors for patients with symptoms suggestive of ACS. If the patient's history is even moderately suspicious for ACS, having three or more of the following risk factors (or a history of atherosclerotic or chronic kidney disease) significantly increase their risk of an acute cardiac event.

1. Male or post-menopausal female
2. Hypertension
3. High cholesterol
4. Diabetes Mellitus (type I or II)
5. Chronic kidney disease
6. Use of tobacco products (current or cessation ≤ 3 months)
7. Obesity (BMI > 30 kg/$m^2$)

8. Physical inactivity
9. Family history [2,3] of atherosclerotic disease before the age of 65

**Bradycardia & Transcutaneous Pacing[4,5,6]**

Bradycardia should be managed via the least invasive manner possible. However, in cases of impending hemodynamic collapse, providers should proceed directly transcutaneous pacing. Push dose epinephrine (to be discussed later) in addition to or in place of atropine may also be used when symptoms of hemodynamic instability are present. Many clinicians have difficulty performing the infrequent skill of transcutaneous pacing (TCP). Failure to achieve true electrical and mechanical capture is common and frequently due to poor pad placement or insufficient milliamperes and the rhythm contraction of the patient's body from the pacer shocks makes assessment even more difficult.

False capture is due to electrical artifact created by current through passing pacing pads. The EKG electrodes pick up the signal produced by the current and display it as artifact on the EKG screen to signify when the current is being delivered. To minimize the size of the current displayed on the EKG screen, monitors with integrated pacemakers intentionally blank out for a brief period. Occasionally some of the EKG artifact may remain after the blanking period and that portion is seen immediately following the pacer spike. This false capture is frequently confused with true electrical capture.

The classic features of false capture (depicted below) include a near-vertical upstroke or down-stroke of the "phantom" QRS complex followed by a slightly curved return to the isoelectric line, a non-distinct ST segment and unimpressive T-waves. The patient's underlying rhythm (circled in red) can often be seen in what should be an absolute refractory period of the preceding QRS complex.


*Example of false capture*

[2] Immediate family only: mother, father, brother, sister

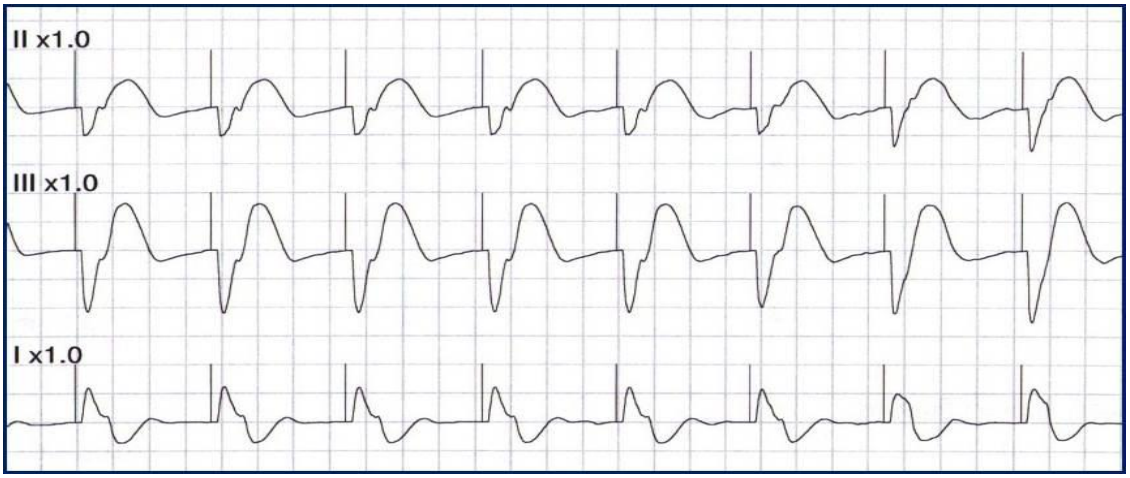
[3] Prior myocardial infarction, prior stents, CABG/cardiac bypass surgery, CVA/TIA, peripheral arterial disease)

[4] https://www.aclsmedicaltraining.com/blog/transcutaneous-pacing-tcp-without-capture/

[5] http://ems12lead.com/2008/11/15/transcutaneous-pacing-tcp-the-problem-of-false-capture/

[6] https://www.physio-control.com/uploadedFiles/learning/clinical-topics/Pacing_Artifact_3207454-000.pdf

True electrical capture will show wide QRS complexes with tall, broad T waves as seen below.




It is scientifically impossible to have the patient's underlying rhythm produce a QRS complex during the absolute refractory period produced by a pacer shock. In addition to assessing the patient's response to treatment, providers may take the following measure to distinguish between electrical capture and artifact:

(a) Increase the current of pacing (warn the patient first). False QRS complexes will increase in size as current is increased. True QRS complexes should not change in size regardless of the millamperes used.

(b) place the pacer in non-demand mode (on some cardiac monitors) in non-demand mode and examine the absolute refractory periods of the underlying rhythm and the (presumed to be) paced rhythm. If the paced rhythm and the underlying rhythm are marching through each other's absolute refractory periods, you don't have true electrical capture.

Increasing the EKG size helps to confirm that the pacer senses intrinsic cardiac activity. Once electrical capture is believed to have occurred, providers should consider checking a patient's femoral pulse when uncertain if a radial pulse is present – muscle tremors may complicate evaluation of the distal extremities. Pacing also may cause diaphragmatic stimulation and apparent hiccoughs in patients – this is expected and may be partly relieved with sedation.

**Hypertension**

Even with extremes of blood pressure, providers should use the complaint-specific guideline treat the symptom associated with the hypertension. Treat the patient, not the number.

If the patient's complaint is high blood pressure, a 12-lead EKG should be obtained. Asymptomatic hypertension should not be treated in the prehospital setting. However, transport to the ED will allow for physician evaluation, possible treatment, and the arranging of follow-up care that the patient may not otherwise receive. For the patient whom a provider suspects is unlikely to comply with the need for follow-up care, every effort should be made to convince the patient to consent to transport to the ED for

evaluation. BLS care during transport is appropriate for the patient elevated blood pressure who has no complaints.

**Adult Syncope**

Syncope is heralded by both the loss of consciousness and the loss of postural tone and resolves spontaneously without medical interventions. Syncope typically is abrupt in onset and resolves equally quickly. EMS providers may find the patient awake and alert on initial evaluation. Convulsive movements may occur with syncope. These are called myoclonic jerks and should not be confused with seizures; no post-ictal state, tongue biting, or incontinence will be present. Presyncope is defined as the prodromal symptoms of syncope. It usually lasts for seconds to minutes and may be described by the patient as "nearly blacking out" or "nearly fainting."

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.

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

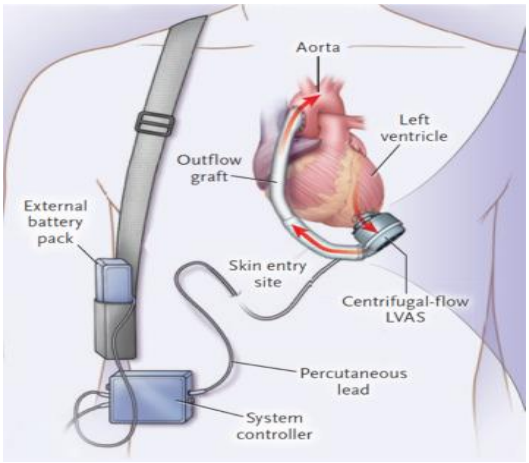
Treatment of syncope should be directed at abnormalities discovered in the physical exam and may include management of cardiac dysrhythmias, cardiac ischemia/infarct, hemorrhage, shock, and the like. Consider high risk 12-lead EKG features including, but not limited to:

a. Evidence of QT prolongation (generally over 500ms)
b. Delta waves (seen with Wolff-Parkinson-White syndrome)
c. Brugada syndrome (incomplete RBBB pattern in V1/V2 with ST segment elevation)
d. Hypertrophic obstructive cardiomyopathy

Syncope should be considered in geriatric patients suffering falls from standing. They also may sustain significant injury and should be diligently screened for trauma.

## V. IMPLANTABLE VENTRICULAR ASSIST DEVICES[7][8]

**Left Ventricular Assist Device (LVAD)**




The LVAD is a mechanical internal heart pump used to treat heart failure. The pump provides continuous blood flow from a weak left ventricle, propelling it to the aorta through a pump lace between the two. The pump and circulation connections are all in the body. The pump has a driveline which connects the outside battery packs to the pump. Each LVAD has a controller which displays pump parameters, warnings, and gives diagnostic information if an error has occurred. All controllers are branded with the model name of the system; this can be located by opening the pouch or pocket with the controller.

Auscultation of the LVAD should sound like a steady high-pitched motor (aka "hum") without clunking sounds. EKGs will have an abnormal morphology, so compare them prior EKGS – when available – to find subtle changes. Some VADs may cause electromagnetic interference with EKG monitoring; adjustment of lead placement may reduce the level of interference.

LVAD patients lack a reliable pulse, blood pressure reading, and oxygenation saturation. Assessment of the LVAD patient should focus on evaluating patient perfusion by clinical signs rather than traditional methods of vital sign measurement. **Treat the patient, not the pump!** If the patient has signs of adequate perfusion, assess and treat for non-LVAD causes of patient deterioration. Common complications in VAD patients include:

- Sepsis/Infection (don't forget to look at the skin where the driveline exits)
- Stroke/TIA
- Bleeding (VAD patients are on anticoagulation)
- Arrhythmias
- Cardiac tamponade
- CHF
- Aortic insufficiency

LVAD patients are preload dependent. Dehydration is common and nitrates should be used very cautiously. Look for causes of low fluid volume, especially hemorrhaging owing to anticoagulation.
Pacing and defibrillation can be safely performed on VAD patients. Clinical judgement must be used when deciding whether or not to perform chest compressions. Medical Control and the patient's VAD Coordinator can help to guide this decision.

[7] HFSA/SAEM/ISHLT clinical expert consensus document on the emergency management of patients with ventricular assist devices. *The Journal of Heart and Lung Transplantation, 38(7):*677-698.
[8] Photo provided by Givertz et al. 2019.

**For any VAD related issue, the patient's VAD Team can be contacted 24/7/365. Within Region One, Ochsner Medical Center's VAD Coordinator if available via page at 504-842-3000. Do not stop the pump unless advised by the VAD Coordinator.**

Device-related complications in VAD patient are uncommon but do occur. User-related complications happen much more often. Alarm types vary between VAD brands; however, as a general rule, the more persistent the alarm sound with red lights, the worse the problem and the higher potential for critical failures. Most VADs also have yellow warning lights that indicate a malfunction that is non-emergent but should be evaluate. A good first pass at solving alarming LVAD's is to check all connections: is the driveline fractured, is it connected to the controller, and are the batteries connected and charged. The LCD display on the controller will also help to identify the problem.

- If patient is experiencing VAD-related complications or cardiovascular problems, expedite transport to the medical facility where VAD was placed if patient's clinical condition and time allows

- If patient has a functioning VAD and is experiencing a non-cardiovascular-related problem, transport to a facility that is appropriate for the patient's main presenting problem without manipulating the device

The International Consortium of Circulatory Assist Clinicians produced an EMS Field Guide document to assist prehospital providers caring for VAD patients. There are multiple pages for each model of device approved for home use. The Consortium assigned a color for each device (as depicted below). The color borders of each page match the color code tag usually visible on the patient's controller. The current version of the EMS Field Guide can be accessed online at www.mylvad.com/medical-professionals/resource-library/ems-field-guides.

**Prehospital personnel are advised to transport as much of the VAD equipment as possible with the patient so advanced troubleshooting can be performed at the VAD center.**

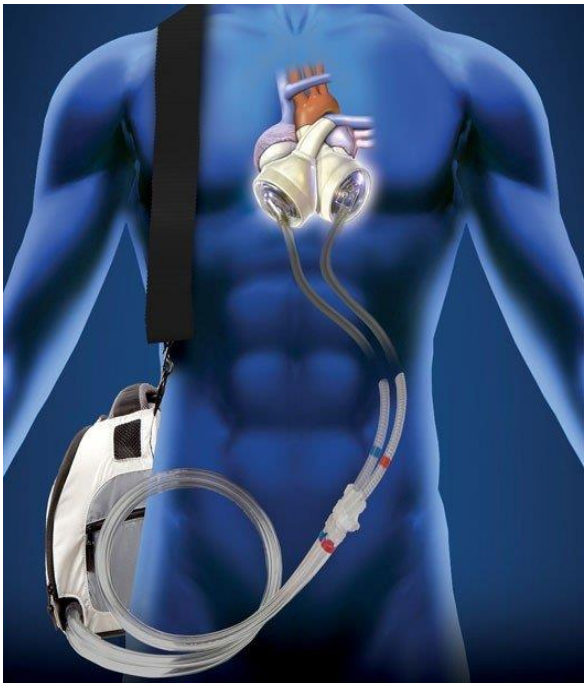





***Look for a tag on the patient's VAD Controller***

**Total Artificial Heart (aka Artificial Heart)[9]**

A total artificial heart (TAH) is a device that replaces both the right and left ventricles of the heart in addition to the four heart valves. A TAH occupies the space of the removed, failing heart. Patients with a TAH will have a pulse, and a blood pressure (both systolic and diastolic) should be able to be measured. Heart can usually be auscultated without a stethoscope. Asystole is the patient's underlying cardiac rhythm there is no need to obtain an EKG. **Patients with TAHs do not respond to external CPR. Additionally, do not give vasopressive IV drugs to patients with a TAH.**



Currently there is only one commercially approved TAH – the SynCardia temporary TAH. The Freedom portable driver the external machine used to drive the SynCardia. The EMS field guide to LVADs also has reference pages for the TAH Freedom Driver System.

## VI. VASOPRESSOR USE

In emergencies, peripheral administration of vasopressors can be safe and is unlikely to cause tissue injury if done for short period of time. Peripheral administration of vasopressors should ideally be given in larger, more proximal veins; the patient's antecubital fossa is considered a first line site for administration. If extravasation is suspected, providers should stop the infusion immediately, obtain alternate IV or IO access, and notify the receiving facility of the possible extravasation.

**Bolus Dose Vasopressors, aka Push Dose Epinephrine**

Administration of bolus doses of vasopressors has been shown to be effective in hemodynamically unstable patients. Using "code" or "cardiac" epinephrine serves a temporary means of increasing blood pressure and preserving end-organ perfusion while volume resuscitation and vasopressor infusion are being initiated.

To make push dose epinephrine it first needs to be diluted. This is done be using a 10ml Normal Saline (NS) flush syringe, discarding 1 ml of NS, and drawing 1ml of cardiac epinephrine (0.1mg/ml, 1:10,000) into the syringe. Push doses are then administered in 1-ml aliquots.

Providers may consider Push-Dose Epinephrine when outlined in a disease-specific guideline. The appropriate trigger and endpoint for utilizing push dose epinephrine remains to be determined. Additionally, the adverse effects of overdose are marked if providers do not mix push-dose epinephrine

[9] Photo provided by newswise.com

correctly. All providers should use caution when drawing up and administering this medication. Medical Control should be consulted as needed.

**Vasopressor Infusions**

**1. Epinephrine**

Initial Epinephrine infusion rates usually range from 2-10 mcg/min.

For an Epinephrine solution containing 8 mcg/ml:

1. Mix 2mg of Epinephrine 1mg/ml (1:1000) into 250 ml of NS or D5W
2. Label bag "Epinephrine 8mcg/ml"
3. Administer infusion through a microdrip set (60 gtt/ml) at the following rates:

**Epinephrine Infusion 8mcg/ml via Microdrip (60 gtt/ml) Set**

| Dose | 2mcg/min | 3mcg/min | 4mcg/min | 5mcg/min | 6mcg/min | 7mcg/min | 8mcg/min | 9mcg/min | 10mcg/min |
|---|---|---|---|---|---|---|---|---|---|
| drops/min | 15 | 22 | 30 | 38 | 45 | 52 | 60 | 68 | 75 |

**2. Norepinephrine**

Initial Norepinephrine infusion rates usually range from 2-12 mcg/min.

For a Norepinephrine solution containing 8 mcg/ml:

1. Mix 2mg of Norepinephrine into 250ml of NS or D5W
2. Label bag "Norepinephrine 8 mcg/ml"
3. Administer infusion through a microdrip set (60gtt/ml) at the following rates:

**Norepinephrine Infusion 8mcg/ml via Microdrip (60 gtt/ml) Set**

| Dose | 2mcg/min | 3mcg/min | 4mcg/min | 5mcg/min | 6mcg/min | 7mcg/min | 8mcg/min | 9mcg/min | 10mcg/min |
|---|---|---|---|---|---|---|---|---|---|
| drops/min | 15 | 22 | 30 | 38 | 45 | 52 | 60 | 68 | 75 |

For a Norepinephrine solution containing 16 mcg/ml:

1. Mix 4mg of Norepinephrine into 250ml of NS or D5W
2. Label bag "Norepinephrine 16 mcg/ml"
3. Administer infusion through a microdrip set (60gtt/ml) at the following rates:

**Norepinephrine Infusion 16mcg/ml via Microdrip (60 gtt/ml) Set**

| Dose | 2mcg/ min | 3mcg/ min | 4mcg/ min | 5mcg/ min | 6mcg/ min | 7mcg/ min | 8mcg/ min | 9mcg/ min | 10mcg/ min | 11mcg/ min | 12mcg/ min |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Drops/ min | 8 | 11 | 15 | 19 | 22 | 26 | 30 | 34 | 38 | 41 | 45 |

Note: drops/min is the same as ml/hr when using a 60gtt/ml set

### 3. Dopamine

Initial Dopamine infusion rates usually range from 10-20 mcg/kg/min.

For a Dopamine solution containing 1.6mg/ml:

1. Mix 400 mg of Dopamine into 250ml of NS or D5W
2. Label bag "Dopamine 1.6 mg/ml"
3. Administer infusion at the following rates using a microdrip set (60 gtt/ml) and based on the patient's ideal body weight:

**Dopamine Infusion 1.6 mg/ml via Microdrip (60 gtt/ml) Set**

| | Patient weight in kg | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Infusion Rate** | **20** | **30** | **40** | **50** | **60** | **70** | **80** | **90** | **100** |
| **10 mcg/kg/min** | 8 | 11 | 15 | 19 | 23 | 26 | 30 | 34 | 38 |
| **15 mcg/kg/min** | 11 | 17 | 23 | 28 | 34 | 39 | 45 | 51 | 56 |
| **20 mcg/kg/min** | 15 | 23 | 30 | 38 | 45 | 53 | 60 | 68 | 75 |

## VII. ADDITIONAL CARDIAC INFUSIONS

### Amiodarone

Loading Dose

The recommended initial IV loading dose of Amiodarone is 150mg. When given to patients with a pulse it should be administered over ten minutes. While the drug may be infused undiluted, it is preferable to mix Amiodarone into NS or D5W.

To administer Amiodarone 150 mg over 10 minutes:

1. Mix 150 mg of Amiodarone into 150 ml of NS or D5W.
2. Label bag "Amiodarone 150 mg"
3. Using a 10 gtt/ml macrodrip set administer infusion at 150 drops/min
   Using a 15 gtt/ml macrodrip set, administer infusion at 225 drops/min.

If using a premixed bag of Amiodarone with a different volume or concentration, providers must calculate the appropriate drip rate.

Maintenance Infusion

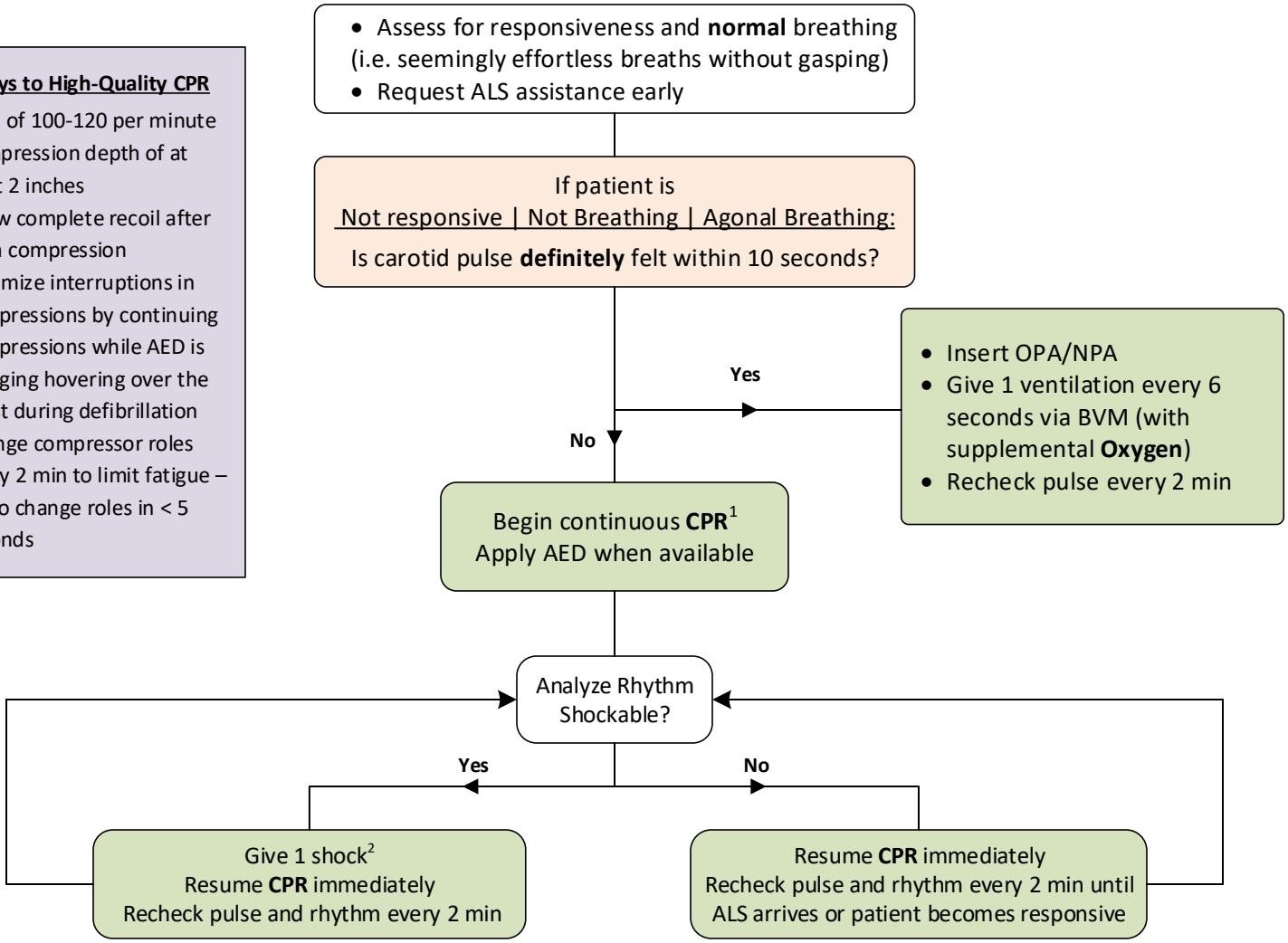
Following the loading dose (either pushed during resuscitation or given over 10 min), a continuous infusion of Amiodarone should be given at 1mg/min – (60 drops/min when using a microdrip – 60 gtt/ml - set). Additional boluses of Amiodarone 150 mg are sometime indicated for recurrent arrythmias; Medical Control should be contacted if an additional bolus is considered indicated.

THIS PAGE INTENTIONALLY LEFT BLANK

# BLS Cardiorespiratory Arrest

**Keys to High-Quality CPR**

- Rate of 100-120 per minute
- Compression depth of at least 2 inches
- Allow complete recoil after each compression
- Minimize interruptions in compressions by continuing compressions while AED is charging hovering over the chest during defibrillation
- Change compressor roles every 2 min to limit fatigue – try to change roles in < 5 seconds




Following the initial rhythm check and/or shock:

- Consider applying a mechanical CPR device, if available
- Consider inserting a supraglottic airway (without interruption of compressions)
- Apply Impedance Threshold Device, if available

[1] **Promptly initiating and maintaining effective and continuous chest compressions is most important – CPR is a treatment! Airway management should not interfere with chest compressions or defibrillation. Provide ventilations at 10 breaths per minute.**

[2] In cases of witnessed arrest or adequate & uninterrupted bystander CPR performed prior to first responder arrival, it is reasonable to defibrillate as soon as possible after chest compressions are initiated. **CPR should not be delayed while applying pads or charging.**

[3] An impedance threshold device prevents unnecessary air from entering the lungs during the decompression phase of CPR – this decreases pressure and allows more blood to return back to the heart. Remove the ITD upon return of spontaneous circulation.

**The effectiveness of CPR decreases with movement.**
**Resuscitation should occur on-scene for a minimum of 30 minutes if it is safe and operationally possible.**

# Cardiac Arrest

Remember:
"Pit Crew" CPR includes one team member working solely as the CODE leader when able

Confirm patient is apneic and pulseless
Begin **CPR**[1]

- Apply cardiac monitor and defibrillation pads
- Assess cardiac rhythm

## Ventricular Fibrillation/ Pulseless Ventricular Tachycardia

**Defibrillate**[2]
&
Resume **CPR** immediately

- Establish IV/IO access (proximal humerus IO is preferred)
- **Epinephrine 0.1mg/ml** (1:10,000) 1mg IV/IO q 3-5 min
- **Crystalloid Fluid** bolus 1-2L IV/IO
- Insert advanced airway (ETT or SGA)
- Initiate continuous $EtCO_2$ monitoring
- Apply Impedance Threshold Device (ITD)[3], if available

If VF/pVT persists:

**Defibrillate** → **CPR** → Rhythm Check q2min until ROSC, asystole, or PEA

After 3rd shock: **Amiodarone** 300mg IV/IO
After 5th shock: **Amiodarone** 150mg IV/IO prn

If VF/pVT persists:

- Consider double sequential defib after 3rd shock
- Consider **Lidocaine** 1mg/kg IV/IO, if available
- If torsade de pointes: **Magnesium Sulfate** 2g IV/IO

Search and treat reversible causes

## Asystole/PEA

- Establish IV/IO access (proximal humerus IO is preferred)
- **Epinephrine 0.1mg/ml** (1:10,000) 1mg IV/IO q 3-5 min
- **Crystalloid Fluid** bolus 1-2L IV/IO
- Insert advanced airway (ETT or SGA)
- Initiate continuous $EtCO_2$ monitoring
- Apply Impedance Threshold Device (ITD)[3], if available

Search and treat reversible causes

Continue **CPR** with rhythm/pulse check q2min until ROSC or Termination of Resucitation (all pauses should last < 10 seconds)

**Reversible Causes of Cardiac Arrest**

Hydrogen Ion (Acidosis) – consider Sodium Bicarbonate 1mEq/kg IV/IO
Hyperkalemia – Calcium Chloride 10% 1000 mg IV/IO + Sodium Bicarbonate*
Hypothermia – rewarming (see **Hypothermic Cardiac Arrest** guideline)
Hypoxemia – Supplemental Oxygen
Hypoglycemia – Dextrose
Hypovolemia – Crystalloid Fluid bolus
Tension Pneumothorax – needle decompression°
Toxins – e.g. Opiates (Naloxone), TCAs (Sodium Bicarbonate)*
Thrombosis, pulmonary°
Thrombosis, cardiac
Tamponade°

*** Look for wide QRS**
**° Look for narrow QRS**

**Promptly initiating and maintaining effective and continuous chest compressions is most important– CPR is a treatment!**
**Airway management should not interfere with chest compressions or defibrillation. Provide ventilations at 10 breaths per minute.**

[1] In cases of witnessed arrest or adequate & uninterrupted bystander CPR performed prior to first responder arrival, it is reasonable to defibrillate as soon as possible after chest compressions are initiated. **CPR should not be delayed while applying pads or charging.**

[2] Defibrillation dosing is determined by the defibrillator's manufacturer guidelines. If unknown, use the highest setting possible.

[3] An impedance threshold device prevents unnecessary air from entering the lungs during the decompression phase of CPR – this decreases pressure and allows more blood to return back to the heart. Remove the ITD upon return of spontaneous circulation.

- The effectiveness of CPR decreases with movement. Resuscitation should occur on-scene if it is safe and operationally possible.
- Rarely, effective CPR can induce varying states of consciousness (e.g. eye opening, speech, spontaneous movement). Give **Ketamine** 1mg/kg IV/IO for sedation and amnesia. Also consider pseudo-PEA (i.e. severe shock) in these patients and monitor closely for ROSC.
- Cardiac arrest in pregnancy: Focus on high-quality CPR and left lateral uterine displacement. Defibrillate the same as non-pregnant patients. Consider early transport for peri-mortem C-section. See **Cardiac Preambles** and/or consult **Medical Control** for further guidance.

# Post Resuscitation Care

Repeat Primary Assessment

**Remain on scene to stabilize the patient**

Positive outcomes decrease with hypoxia hyper/hypocapnia, hypotension, and fever. Focus on the prevention of these elements

Optimize Oxygenation & Ventilation

- Insert advanced airway (if not already done) as per **Airway Management** guideline
- Ventilate at 10 breaths/min (1 every 6 seconds)[1]
- Maintain SpO2 92-98% and EtCO2 30-40mmHg
- Elevate head of bed 20-30 if able
- Avoid hypoxemia and hyperventilation

Manage Shock
(SBP <90mmHg or MAP < 65mmHg)

- **Crystalloid fluid bolus** 500 ml
- Consider Vasopressor Infusion
  **Norepinephrine** 2-12 mcg/min
  or
  **Epinephrine** 2-30 mcg/min
  or
  **Dopamine** 5-20 mcg/kg/min

*titrate to MAP > 65mmHg*
(use **Shock** guideline as needed)

[3]Consider **Push Dose Epinephrine** while preparing vasopressor infusion

Mix in syringe 1ml of 1mg/10ml Epinephrine with 9 ml of NS (syringe = 10mcg/ml Epinephrine)

Give 1ml IV/IO q3-5 min prn

Obtain 12-lead EKG

- Alert hospital if STEMI
- If VT/VT during resuscitation, give **Amiodarone** 150mg IV/IO (if bolus dose was not already given) over 10 minutes followed by 1mg/min IV/IO infusion
- Treat other dysrhythmias per appropriate **Cardiac** guideline[2]
- Identify and treat reversible causes of arrest (i.e. H's and T's)

- Transport to appropriate receiving facility[4]
- Monitor closely for deterioration and/or re-arrest[5]
- If re-arrest occurs, treat as per **Cardiac Arrest** guideline

Consult **Medical Control** for additional orders or consultation

[1] Avoid hyperventilation! Hyperventilation decreases venous return to the heart and can lead to hypotension.
[2] Ventricular ectopic beats should be presumed to represent unstable VT if ≥ 3 sequential wide complex beats are visualized.
[3] Surface cooling: apply ice/cold packs to the axilla and groin or use a commercial device for passive cooling. Do not use cooled IV fluids.
[4] Prioritize transport to a facility with cardiac catheterization capability and/or continuous targeted temperature management.
[5] Be prepared for seizures due to brain injury. Treat observed seizures with benzodiazepines as per **Seizure** guideline.

# Bradycardia

This guideline is intended for symptomatic patients
(e.g. altered LOC, chest pain, pulmonary edema, seizure, syncope, shock, pallor, diaphoresis)
Bradycardic individuals who are perfusing well and do not have symptoms usually do not require emergency treatment

Trancutaneous pacing (TCP) is a temporizing measure to transvenous pacing and a pacemaker.

Notify receiving hospital of TCP prior to arrival.

Routine Medical Care
confirm HR <60

Obtain 12 lead EKG
& identify rhythm

Atropine is NOT effective for Mobitz II 2° and 3° AV blocks as well as transplanted and total artificial hearts.

Initiate transcutaneous pacing immediately.

Is patient adequately perfused?

**Yes**

- Support ABCs
- Look for & treat reversible causes of bradycardia
- Treat other complaints per appropriate guideline
- Monitor/reassess rhythm during transport

**No**

- Prepare for trancutaneous pacing (TCP)
- Consider **Atropine** 1mg IV/IO q3-5 min[1] (max total dose = 3mg)
- In periarrest situations[2], consider **Push Dose Epinephrine** (alternative to atropine) 10 mcg IV/IO q2min to maintain MAP ≥ 65mmHg

Initiate TCP if patient remains symptomatic:

- Premedicate with **Midazolam** 2.5 – 5 mg IV/IO/IN or **Ketamine** 1mg/kg IV/IO/IM (max 200mg), if possible, for sedation[3]
- Set rate between 70-80 bpm
- Start strength at 50 mA, increase output quickly until complete capture is achieved (i.e. a wide QRS complex follows every pacer spike)
- Confirm capture – palpate pulse and observe HR on pulse oximeter[4]
- As a safety margin, set strength 10mA above amount used to capture

**Consider Reversible H's & T's**

- Hypovolemia
- Hypoxemia
- Hydrogen ion (acidosis)
- Hypo/hyperkalemia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins (e.g. β or $Ca^{2+}$blockers)
- Thrombosis, pulmonary (PE)
- Thrombosis, cardiac (MI)

Consider **Push Dose Epinephrine** while preparing pressor infusion

Mix in syringe 1ml of 1mg/10ml Epinephrine with 9 ml of NS (syringe = 10mcg/ml Epinephrine)

Give 1ml IV/IO q3-5 min prn

If patient still symptomatic:

Consider **Epinephrine Infusion** 2mcg/min IV/IO (max 10mcg/min) *titrate to MAP ≥ 65*

The differential diagnosis for bradycardia is broad - consider MI, hypoxia, pacemaker failure, hypothermia, overdose, cholinergic agents, head injury with increased ICP, stroke, spinal cord lesion, hyperkalemia, sick sinus syndrome, AV blocks, sinus bradycardia, athleticism.

[1] Do not delay pacing in order to administer atropine. Caution using atropine in the setting of acute MI; most cases of bradycardia during STEMI are due to heart block and may involve the right ventricle. Pacing +/- epinephrine is preferred in these instances.

[2] Bradycardic periarrest occurs when patients are in a decompensated state with progressive instability and deteriorating vital signs. These patients require emergent therapy to avert progression to full arrest. Start with aggressive treatments in these patients.

[3] If patient is alert, explain to them the procedure you are about to do. Look for a wide QRS complex with tall, broad T-waves as a sign of successful capture; do not be fooled by pacing artifact and false capture. Document the time, rate, current, and response to treatment.

[4] During TCP, the monitor's heart rate reading should not be considered reliable. Use the heart rate on the pulse oximeter. If unable to obtain a heart rate, look for other signs and symptoms to determine if patient's perfusion is improving.

# Tachycardia

[1]Signs of poor perfusion include (but are not limited to) hypotension, altered LOC, weak pulses, delayed capillary refill, and hypoxemia

[2]Higher energies are recommended in patients that are overweight/obese (BMI ≥ 25 kg/m2) and associated with improved first shock success.

[3]Sync mode is indicated by a marker on the defibrillator screen noting each QRS complex.

[4]If unable to determine whether narrow rhythm is regular or irregular, give Adenosine 6m IV/IO as a diagnostic tool to slow the rate. IO Adenosine should only be given in proximal humerus.

[5]Success rates with Valsalva maneuvers vary. Maneuvers should be performed while preparing adenosine and should not delay adenosine use.

[6]The Modified Valsalva Maneuver has been shown to be more effective than the standard valsalva procedure and may be attempted if/when feasible.

[7]Monitor for hypotension & bradycardia after Diltiazem and Metoprolol use.

Routine Medial Care
Confirm HR >150

Obtain 12 lead EKG

Is rhythm sinus tachycardia?

**Yes**

- Identify and treat underlying cause (ex. pain, dehydration)
- Measure Shock Index – manage per **Shock** guideline, if needed

**No**

Is patient adequately perfused?[1]

**No**

- Premedicate with **Midazolam** 2.5-5mg IV/IO/IM for sedation, if needed/able
- **Cardiovert based on rhythm**[2]:
  - Narrow Regular, Wide Regular → 100 J synchronized[3]
  - Narrow Irregular → 200 J synchronized[3]
  - Wide Irregular → Attempt 200 J synchronized[3]. If unable to capture QRS complex, defibrillate at max Joules

**Yes**

- Identify EKG rhythm
- Measure QRS complex

## Narrow QRS[4] (< 0.12 sec)

### Regular rhythm
Consider SVT

Valsalva Maneuver[5,6]
or
Apply Ice to Face

**Adenosine** 6-12mg
rapid IV/IO

If no rhythm change:

**Adenosine** 12mg rapid IV/IO

If no rhythm change:

**Dilatiazem** 10 mg slow IV/IO[7]
(may repeat x 1 after 5 min)
- or -
**Metoprolol** 5 mg slow IV/IO[7]
(may repeat x 2 after 5 min)

### Irregular rhythm
Consider Afib/AFlutter

**Dilatiazem** 10 mg slow IV/IO[7]
(may repeat x 1 after 5 min)
- or -
**Metoprolol** 5 mg slow IV/IO[7]
(may repeat x 2 after 5 min)

Contact **Medical Control** for additional orders or consultation

## Wide QRS (≥ 0.12 sec)

### Regular rhythm
Consider VT

**Amiodarone** 150 mg in 100 ml $D_5W$ over 10 minutes

Upon conversion,
**Amiodarone**
1 mg/min IV/IO infusion

If torsades de pointe (polymorphic VT):

**Magnesium Sulfate**
1-2 grams IV
over 10 minutes

### Irregular rhythm
Consider Afib with aberrancy, MAT, polymorphic VT

**Amiodarone** 150 mg in 100 ml $D_5W$ over 10 minutes

Upon conversion,
**Amiodarone**
1 mg/min IV/IO infusion

If torsades de pointe (polymorphic VT):

**Magnesium Sulfate**
1-2 grams IV
over 10 minutes

# Chest Pain – Suspected Acute Coronary Syndrome (ACS)

The term ACS includes unstable angina (UA), non-ST elevation MI (NSTEMI), and ST elevation MI (STEMI).
Assess and treat life-threatening arrythmias prior to utilizing this guideline

**[2]Remember to look for Posterior STEMIs!**

- You will see ST depressions (often >2mm) in V1-V3.
- Posterior EKG (leads V7-V9) with ST elevation will confirm the diagnosis.

**Isolated LBBB in a stable patient is not an indication for STEMI activation**

NTG Contraindications

- SBP < 100mmHg
- Recent use of erectile dysfunction medication (Viagra/Levitra within 24 hours, Cialis within 48 hrs)

Suspected RV infarct[3] is a relative contraindication (monitor for hypotension)

Routine Medical Care

**Aspirin** 162-325mg[1] PO

12-Lead EKG

EKG shows ST elevation MI[2]?

**Yes**

- Minimize scene time (<15 min)
- Alert receiving hospital and transmit EKG as early as able

**No**

If SBP > 100 mmHg:

**SL Nitroglycerin** 0.4mg SL q3min prn for chest pain (max 3 doses)

followed by

**Topical Nitroglycerin** 1 inch paste applied to left anterior chest wall

- Consider analgesia for severe, unrelieved chest pain:
  **Fentanyl** 25-50mcg IV/IO/IN/IM q2min prn (max 200mcg)
  - or –
  **Morphine** 2-4mg IV/IO/IM q2min prn (max 10mg)
- Consider **Ondansetron** 4 mg IV prn for nausea/vomiting with active pain
- Give oxygen if $SpO_2$ <90%, dyspnea, or signs of CHF (goal $SpO_2$ = 90-94%)

- Transport to a hospital with cardiac catheterization capability
- Perform serial EKGs while en route to hospital
- Observe and treat patient for signs of clinical deterioration (e.g. dysrhythmias, SOB, shock) – apply defib pads if not already done

- ACS can present atypically – consider a cardiac etiology when patients reports SOB, sweating, nausea/vomiting, dizziness, syncope, or vague/generalized complaints. Atypical symptoms are most common in women, the elderly and diabetic patients.
- Document the patient's cardiac risk factors (outlined in the Cardiac Preambles) in the EMS Run Report.

[1] Document patient's own aspirin use within the last 24 hours. **Aspirin (ASA)** is contraindicated in patients with current and recent GI bleeding. The term "recent" includes bleeding requiring hospitalization or blood product transfusion within the last 6 months.

[2] **Nitroglycerin (NTG)** SL tablets and spray may be used interchangeably. If blood pressure drops significantly after a single NTG dose, discontinue NTG use. Treat NTG-induced hypotension (SBP <100) with **Crystalloid fluid bolus** 250 ml IV.

[3] Consider an RV infarct in all inferior STEMIs (leads II, III, AvF) with hypotension. ST elevation in lead V4R (obtain a right sided EKG) helps to make this diagnosis. Hypotension and bradycardia are common.

[4] **Morphine** use in NSTEMI is controversial and may inhibit antiplatelet medications. Use opiates judiciously.

# CHF | Acute Pulmonary Edema

**Medical History Indications**

- Hx of CHF, MI, AFib, Renal Failure
- Use of diuretics
- New or increasing dyspnea on exertion (DOE)
- Increasing Pillow orthopnea
- Paroxysmal Nocturnal Dyspnea
- Prior Intubation

**Physical Exam Indications**

- Dyspnea
- Cough with sputum
- JVD at 30° elevation
- Lower extremity edema
- Rales / Rhonchi
- Tachycardia
- Hepatojugular Reflux[1]

Routine Medical Care

Early **CPAP**[2] 5-10cm $H_2O$

Blood Pressure
and
12-Lead EKG
to assess for STEMI[3]

**SBP ≥ 100mmHg and severe respiratory distress**

[4] **SL Nitroglycerin** 0.4mg q5min prn for dyspnea
no max dose if SBP≥ 100mmHg
(may give 0.8mg q5min prn if age < 65 yo and SBP > 200mmHg)

followed by

**Topical Nitroglycerin** 1 inch paste applied to anterior chest wall

If failing above therapy:

- Discontinue CPAP and ventilate using BVM with PEEP valve
- Consider/prepare for advanced airway
- Consider potential CHF complications and alternative diagnoses (e.g. equipment failure, pneumothorax, shock)

Recycle and record BP q2-5min

**NTG Contraindications**

- SBP < 100mmHg
- Recent use of erectile dysfunction medication (Viagra/Levitra within 24 hours, Cialis within 48 hrs)

Suspected RV infarct[3] is a relative contraindication (monitor for hypotension)

[4]Consider **Push Dose Epinephrine** while preparing vasopressor infusion

Mix in syringe 1ml of 0.1mg/ml (1:10,000) Epinephrine with 9 ml of NS (syringe = 10mcg/ml of Epi)

Give 1ml IV/IO q3-5 min prn

Contact **Medical Control** for additional orders or consultation

**SBP < 100mmHg and severe respiratory distress**

[5] Initiate Vasopressor Infusion:

**Norepinephrine** 2-12 mcg/min

or

**Epinephrine** 2-20 mcg/min

or

**Dopamine** 5-20 mcg/kg/min

*titrate to MAP ≥ 65mmHg

- Discontinue CPAP if SBP < 90mmHg and patient is showing signs of deterioration (e.g. worsening dyspnea, sustained hypotension, declining mental status)
- Prepare for advanced airway as outlined in **Airway Management (2 of 3)** guideline - **Can't Ventilate & Can Intubate**

Recycle and record BP q2-5min

[1] Hepatojugular reflux indicates right sided heart failure. With the patient sitting at a 30° angle, lightly palpate the abdomen over the liver. If the jugular veins rise ≈ 4cm = positive reflux.

[2] Providers may give **Midazolam** 2.5mg IV/IO/IM x1 prn for anxiolysis to facilitate patient's cooperation with CPAP device.

[3] Consider myocardial infarction as a cause of pulmonary edema – transport to a facility with a cardiac catheterization lab if needed.

[4] Repeated doses of SL Nitroglycerin should be prioritized over topical nitroglycerin which takes at least 10 minutes to take effect. Diuretics have little value in treating acute pulmonary edema and are no longer considered first-line treatment.

[5] Consider an RV infarct in all inferior STEMIs (leads II, III, AvF) with hypotension. ST elevation in lead V4R (obtain a right sided EKG) helps to make this diagnosis. Hypotension and bradycardia are common.

# Ventricular Assist Devices (VADs)

This guideline is intended for LVAD patients with a respiratory or cardiac complaint. Patients with a functioning VAD and a non-cardiopulmonary complaint should be managed be the appropriate **Medical**, **Trauma**, and/or **HAZMAT** guideline. See **Cardiac Preambles** for further guidance on ventricular assist devices.

Flow through many VADs is continuous, not pulsatile.

Patient may not have a palpable pulse or accurate pulse oximetry

**Look for the VAD model name on their controller (usually in the patient's pouch or pocket)**

Routine Medical Care including $EtCO_2$

- Assess oxygenation ventilation
- Treat any respiratory complaint(s) per appropriate medical guideline

Clinically assess circulation/perfusion

- e.g. mental status, skin color, capillary refill
- Do not rely on blood pressure readings unless a Doppler BP is able to be obtained[1]

Transport patient to an LVAD facility – preferably their own

Always transport patient's backup equipment bag with fully charged batteries and bring a caregiver when available

Is patient adequately perfused?

**Yes**

Adequate Perfusion (i.e. patient is stable)

- Assess/treat complaint according to appropriate guideline(s)
- Obtain 12 lead EKG[2]
- Contact patient's VAD Coordinator – especially prior to treating any stable dysrhythmia[3]

**No**

Assess LVAD

- Is the controller alarming?
- Auscultate chest for humming or whirling sound of the pump

Is LVAD functioning?

**Yes**

- Treat hypoperfusion[1] with **Crystalloid fluid bolus** 250ml IV/IO
- Monitor $EtCO_2$ (≤20 mmHg is consistent with hypoperfusion)
- If patient remains hypoperfused after IVF, start CPR with manual chest compressions and treat as per **Cardiac Arrest**[3] guideline
- Okay to pace, cardiovert, or defibrillate the hypoperfused/unstable patient[2]
- Contact patient's VAD coordinator

**No**

- Address display warnings on controller
- Ensure driveline is firmly attached to controller and controller is connected to a working power source
- Press battery charge indicator button to assess charge level
- Replace battery or controller if needed
- If LVAD does not restart, start CPR with manual chest compressions and treat as per **Cardiac Arrest**[3] guideline
- Contact patient's VAD coordinator

Contact **Medical Control** for additional orders or consultation

[1] Although automatic non-invasive BP cuffs are often ineffective in measuring systolic and diastolic pressures, if they do obtain a MAP it is usually accurate. A doppler BP measures the MAP. Avoid futile repeat attempts to obtain a blood pressure, pulse, or $SpO_2$.

[2] VAD patients still have underlying heart function and rhythms that should be assessed. Do not disconnect the LVAD to pace, cardiovert, or defibrillate. Apply defibrillator pads in the anterior/posterior position.

[3] The decision whether to cardiovert and perform CPR should be made based upon best clinical judgment. Early consultation with the patient's VAD coordinator and/or Medical Control is advised. Patients with a total artificial heart (TAH) will not respond to CPR.

# Region One Protocol Effort

# Trauma Guidelines

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Trauma Preambles

The role of EMS in the treatment of critical trauma is recognition, rapid transport, and injury stabilization while in route to the most appropriate facility.

## I. SCENE TIME

For critical trauma, the standard of care is an on-scene time of less than 10 minutes. Life threatening injuries identified on primary survey should be managed immediately with rapid transport to a trauma center; the secondary survey should be performed in route. Make every effort possible to expedite transport to the trauma center in less than 10 minutes.

When EMS dispatchers are aware of a "significant traumatic incident" (when scene time is critical) they should transmit a solid tone for no less than 3 -5 seconds when 8 minutes has elapsed, if available. The transmission of this tone will stand as a reminder to the crew(s) on scene that they are approaching a 10 minute scene time. After the tone is transmitted a verbal notification will be broadcasted. "Unit #" or "All units on Main St. this is your 8 minute notification," (repeat once) end the broadcast with "no notification response is needed."

## II. TRAUMA ASSESSMENT

**Primary Assessment**

The primary assessment of trauma is performed to identify life-threatening problems. The provider should also recognize other significant problems that if not promptly treated will become life-threatening. Each of these conditions should be managed as soon as they are identified. Additionally, information gathered from the scene assessment should help the provider anticipate possible internal injuries.

Components of the primary assessment can and should be performed simultaneously. Pearls of each include the following:

- Massive Hemorrhage
  - Though airway management is generally the first step of resuscitation, patients with obvious external bleeding should be treated using the MARCH framework – this places the primary focus on controlling hemorrhage.
  - "The Street" is considered one of the major locations for traumatic blood loss. Immediately control any major points of bleeding to stem the flow of blood.
    - Hold pressure first
    - Apply tourniquets to limb wounds - "High and Tight"
    - Apply pressure dressings, wound packing, and/or topical hemostatic agents to head, neck, and torso wounds

- Airway (with cervical spine control)

- Suspect laryngeal trauma if the patient has laryngeal tenderness/swelling/bruising, voice changes, stridor, or respiratory distress
- Anticipate the potential for progressive airway compromise in patients with trauma to head and neck, including patients who have suffered burns
- Consider providing an advanced airway for patients with an altered level of consciousness (GCS ≤ 8)

- Breathing
  - The conversion of a simple pneumothorax into a tension pneumothorax is dynamic and sometimes rapid. A simple pneumothorax is identified by decreased or absent breath sounds. Signs and symptoms of a tension pneumothorax include
    - Tachypnea and rapidly worsening respiratory distress
    - Absent breath sounds on the affected
    - Hypotension
    - Tachycardia
    - Tracheal deviation
    - JVD
  - Needle decompression is NOT indicated for simple pneumothorax. Medical Control consultation on needle decompression may be considered, but is not required, especially when the patient is in traumatic cardiac arrest. Should clinical presentation dictate a tension pneumothorax and Medical Control is unable to be reached, proceed with the treatment.

- Circulation:
  - Internal hemorrhage in the abdomen and pelvis are common unidentified sources of shock. The primary places that patients can bleed internally are (1) the thorax, (2) the abdomen, (3) the pelvis, and (4) the long bones. Monitoring vital signs closely and understanding compensated versus decompensated shock enables treatment of massive hemorrhage early.
    - **Compensated shock:** the body is able to maintain a normal blood pressure and organ perfusion by increasing its heart rate and constricting its blood vessels. Signs and symptoms of compensated shock include
      - Tachycardia
      - Narrowing pulse pressure
      - Weak, thready peripheral pulses (ex. radial)
      - Pallor or peripheral cyanosis
    - **Decompensated shock:** the body is no longer able to maintain a normal blood pressure and organ perfusion is compromised. Signs and symptoms of decompensated shock include
      - Hypotension
      - Tachycardia
      - Weak, thready central pulses (ex. femoral, carotid)
      - Central cyanosis
  - If the pelvis is unstable and the patient is hypotensive, apply a pelvic binder or sheet to stabilize the patient (pelvic binders offer no clinical benefit to controlling hemorrhage of isolated femur fractures).

Disability and Exposure are desired but not required parts of the primary trauma assessment. They should not be conducted until the ABCs have been assessed and managed.

**Balanced Resuscitation & Permissive Hypotension**

Excessive resuscitation with isotonic fluid in exsanguinating patients can increase blood pressure, disrupt unstable blood clots ("pop the clot"), and lead to worsening of bleeding.
Uncontrolled / Internal hemorrhage should be managed by "balanced resuscitation" ensuring that vital organs are perfused while not interfering with the body's own hemorrhage control. Only once bleeding is definitively controlled (i.e. surgery) should aggressive attempts be made to restore normal physiology and blood pressure.

It is recommended that a systolic BP of < 80mmHg, a change in mental status, or lost radial pulses be treated with 250ml incremental IV boluses while en route to a trauma center. Patients who appear well perfused (ex. strong pulses, warm extremities) with a systolic BP of >80mmHg can be monitored closely and frequently without the administration of a crystalloid fluid bolus during transport.

In the right setting, resuscitation also should involve the early use of blood products (instead of crystalloid fluids like NS or LR) in ratios resembling that of whole blood. Tailor all resuscitation with fluid to the clinical setting and suspected etiology of hypovolemic shock. Be certain to consider non-hemorrhagic causes of hypotension (i.e. cardiac tamponade, tension pneumothorax).

Permissive hypotension is currently contraindicated in children and in patients with traumatic brain injury.

## III. TRAUMATIC BRAIN INJURY

Common signs and symptoms of increased intracranial pressure include:

- Confusion
- Altered level of consciousness
- Dilated or unequal pupils
- Markedly increased systolic blood pressure
- Bradycardia
- Abnormal respiratory patterns

Priorities for the treatment of head injury patients include airway management, maintenance of adequate oxygenation & blood pressure as well as appropriate C-spine control & immobilization. Patient with suspected head injury should have the head of the bed elevated to 30$^{o}$ during transport to decrease intracranial pressure (use reverse Trendelenburg if spinal precaution is needed).

Patients with traumatic brain injury may deteriorate as intracranial swelling and hemorrhage increase. If mental status declines during transport, reassess ABCs, repeat their neurologic status assessment, including GCS, and manage accordingly. Cushing's response refers to the ominous combination of markedly increased arterial blood pressure and resultant bradycardia indicating cerebral herniation.

Hypoxia should be avoided in head injury in order to maintain cerebral perfusion. Head trauma patients should receive oxygen to keep Sp02 > 95%, preferably via nonrebreather mask. Patients with poor respiratory effort may require ventilation with a BVM at 8-10 breaths/min. Hyperventilation is no longer recommended as prophylactic intervention immediately after severe TBI.

Additionally, hypotension should be avoided in head injury. Hypotension decreases cerebral perfusion and worsens brain injury and must be corrected. Treat for hypovolemic shock if the patient's systolic BP is < 100mmHg.

**Glasgow Coma Scale/Score**

GCS is used to assess level of consciousness and make field triage decisions. It is a component of vital signs during trauma resuscitation. GCS can reliably be used with children older than 5 years with no modification. A pediatric GCS has been developed for pediatrics.

| | Adult | Pre-verbal Children | Score |
|---|---|---|---|
| Best Eye Opening | Spontaneous<br>To speech<br>To pain/pressure<br>No response | Spontaneous<br>To speech<br>To pain only<br>No response | 4<br>3<br>2<br>1 |
| Best Verbal Response | Oriented<br>Confused<br>Inappropriate words<br>Incomprehensible sounds<br>No response | Coos & babbles<br>Irritable/cries<br>Cries to pain<br>Moans to pain<br>No response | 5<br>4<br>3<br>2<br>1 |
| Best Motor Response | Follows commands<br>Localizes pain<br>Withdraws to pain<br>Abnormal flexion<br>Extension<br>No response | Moves spontaneously & purposefully<br>Withdraws to touch<br>Withdraws in response to pain<br>Flexion in response to pain<br>Extension in response to pain<br>No response | 6<br>5<br>4<br>3<br>2<br>1 |

It is no longer recommended to assign 1 point to non-testable elements. Any aspect of the score that cannot be tested should be noted as “NT”, for non-testable. The total GCS should be documented as the combined score of testable components. For example, GCS: E2, V NT, M 4.

**GCS Classification of TBI**

Traumatic brain injury is often classified as follows:

- Severe: GCS 3 to 8*
- Moderate: GCS 9 to 12
- Mild: GCS 13 to 15

* Patient with severe brain injury (GCS ≤ 8) may require advanced airway placement*

GCS measurement should be repeated 5 minutes after the first score is obtained.

## IV. SPECIAL TRAUMA SCENARIOS

### Traumatic Cardiac Arrest (TCA)

Persons who expire in the prehospital setting have generally suffered high rates of bleeding in non-compressible areas. Survivors of traumatic cardiac arrest most frequently have pathologies that can be easily reversed once access to the patient is achieved. These pathologies include reversal of hypoxemia or hypoventilation, relief of tension pneumothorax, and immediate implementation of advanced life support in the group of patients who have sustained a "medical cardiac arrest" as part of or the cause of their "trauma episode."

Life-saving interventions (HOT interventions) during TCA address these reversible pathologies:

| | |
|---|---|
| Hypovolemia: | • Control external hemorrhage<br>• Splint pelvis/long bone fractures as needed<br>• IV/IO fluid/blood administration |
| Oxygenation/ Ventilation | • Airway management (BVM, endotracheal intubation, supraglottic airway)<br>• EtCO2 monitoring |
| Tension ptx | • Bilateral needle decompression |

External chest compressions may be delayed while treating reversible causes; however, they should not be considered futile, particularly if a medical cardiac arrest is suspected.

The only well-established operative intervention which can result in neurologically good outcome in TCA is immediate thoracotomy for penetrating chest trauma.

### Patient Extrication & Transport

If extrication from a vehicle is required, providers should first apply a cervical collar to the patient while they are still in the vehicle (if safe to do so). When indicated, adults and children in a booster seat should be allowed to self-extricate. For infants and toddlers already strapped into a car seat with a built-in harness, providers should extricate the child while strapped in his/her car seat.

When in other situations requiring patient extrications, a long board (preferably padded) may be used for extrication using the lift and slide (rather than logroll) technique. Prolonged immobilization on spine board can be very uncomfortable for the patient and can lead to ischemic pressure injuries to the skin.

Children have disproportionally larger heads. When securing pediatric patients to a spine board, their body should be elevated approximately 1-2 cm to accommodate the larger head size and avoid neck flexion when immobilized. Additionally, children are abdominal breathers so immobilization straps should go across their chest and pelvis – not across their abdomen – when possible.

**Protective Athletic Equipment & Suspected Spinal Injury**

Helmets and shoulder pads are ONLY to be removed if they interfere with securing an airway or the ability to perform chest compressions.

Helmets should always be removed manually (rather than the use of an automated device). One provider should manually immobilize the neck while the other provider manipulates the helmet. The face mask portion of the helmet should be removed first, if able. Occipital and shoulder padding may be applied while in the patient is in the supine position in order to maintain neutral cervical spine positioning. Removal should be performed with the help of the onsite athletic trainers.

Once the helmet is removed and a cervical collar is applied, padding that is part of the patient's uniform should also be removed. The helmet and pads should be considered one unit.

**Facial/Dental Trauma**

EMS providers should approach patients with facial and/or dental trauma by conducting **Routine Trauma Care** and prioritizing life-threatening injuries over the most apparently visible deformity. The primary assessment should focus on the patient's inability (or lack therefore) to keep their airway patent. Airway patency may be affected by an unstable midface (e.g. LeFort fracture), unstable mandible, or unstable dentition at risk of aspiration.

Providers should attempt to collect avulsed teeth or tissue, when able. Any lost teeth not recovered on scene may be in the patient's airway. Specific interventions include

- Avulsed tooth
  (1) Avoid touching the root of the avulsed tooth. Do not wipe off the tooth.
  (2) Pick up the crown end of tooth. If dirty, rinse off under cold water or saline for 10 seconds. Do not scrub the tooth.
  (3) Place tooth in milk or saline as the storage medium. Alternately, an alert and cooperative patient can hold tooth in their mouth using their own saliva as a storage medium

- Eye trauma
  (1) Place eye shield for any significant eye trauma
  (2) If globe is avulsed, do not put back into socket. Cover with moist saline dressings and place a cup over it.

- Mandible unstable
  (1) Expect patient cannot spit/swallow effectively and have suction readily available
  (2) Preferentially transport patient sitting up with emesis basin/suction available (at 30° if concern for spinal injury).

- Nose/ear avulsion
  (1) Recover tissue if it does not cause excessive scene time
  (2) Transport tissue wrapped in dry sterile gauze in a plastic bag. Place plastic bag on ice if available (do not put ice directly into the bag with the avulsed tissue!)

- Epistaxis – have patient squeeze nose for 10-15 minutes continuously

Persons with dental or facial trauma are also at risk of cervical spine and traumatic brain injury – patients should be fully examined and monitored closely for these complications. Special re-examination geared toward airway and ability to adequately ventilated should also be performed.

**Lightning Strike Injuries**[1]

Lightning strikes most commonly occur in outdoor environmental conditions that may also place EMS providers at risk of injury. Scene safety should always be the priority. Most frequently people are injured through ground currents created by a nearby stroke as opposed to a lightning bolt making direct contact with the victim. Repeat lightning strike has been known to occur, but victims do not carry or discharge a current – the patient is safe to touch and treat.

Lightning strikes cause a very high voltage of short duration; this can lead to dysrhythmias including ventricular fibrillation and asystole caused by the simultaneous depolarization of all myocardial cells. Additionally, the sudden electrical stun can temporarily paralyze the medulla's respiratory center, leading to prolonged apnea. Persons who experience cardiopulmonary arrest after lightning strike have a higher rate of successful resuscitation compared to the general population. In the event of multiple lightning strike victims, "reverse triage" is recommended where cardiac arrest patients are given highest priority.

Patients frequently have fixed and dilated pupils after a lightning strike due to overstimulation of the autonomic nervous system and subsequent autonomic dysfunction – this clinical finding should not be confused as a sign of death or impending death. Neurologic insult may also cause stroke-like findings, seizure, lower extremity paralysis and memory deficits. Patients may also have cardiovascular and respiratory symptoms, including respiratory paralysis, apnea, and cardiac arrest.

Lightning strike patients also frequently experience thermal burns – these should be managed as per the **Burn Care** guideline. Lichtenberg figures ("ferning" or "feathering" on the skin) are a unique finding on the skin that is pathognomonic for lightning injury – they generally appear within one hour and last less than 24 hours.

It is not always immediately apparent that a patient has been a victim of lightning strikes; providers should remember to look for the more subtle findings and injury patterns.

**Conducted Electrical Weapons (e.g. TASER) – aka Electronic Control Devices (ECDs)**

Conducted electrical weapons deliver an electric shock with the intent to cause pain and/or disrupt muscle function. A TASER device is the most commonly used ECD by law enforcement agencies to quickly stop a subject from resisting or fighting. TASERs may be used one of two ways: In the *probe* mode an officer maintains distance from the subject and launches two tiny probes (i.e. barbs) that attach to a person's clothing or skin. These barbs allow a circuit of electricity to deliver a shock that incapacitates

[1] https://www.emra.org/emresident/article/when-lightning-strikes/

neuromuscular groups. In *drive-stun* mode, the officer is in close contact with the subject and the TASER applies a direct shock, but no probe is fired – this mode causes pain but is not incapacitating.

Under certain circumstances EMS will be summoned to evaluate and treat TASER victims. These instances include:

1. if the person requests EMS
2. person was unconscious, even for a short period
3. person had a visible seizure outside of when Taser© was discharged
4. person has obvious significant injury from a fall or take-down
5. person volunteers that they are having chest pain or trouble breathing
6. person has persistent confusion or altered mental status for more than one minute after application of conducted electrical weapon
7. person is displaying signs concerning for excited delirium (see below)
8. victim of a TASER used by a member of the public (i.e. non-police use)
9. TASER probe is embedded in a sensitive area (head, neck, hands, feet, groin, or female breast)
10. if an officer has any doubt as to the health of the person based on:
    a. the officer's training
    b. the officer's previous use of a TASER
    c. the subject exhibits any of the conditions and/or symptoms above
    d. the subject exhibits any unusual behavior

Whenever possible, law enforcement officers should accompany patients under custody in the transporting unit to the hospital.

Patient Management after TASER Injury

THIS IS A COMPLEX PATIENT. During the evaluation of a TASER victim, one should question why the individual first required apprehension. Typically, it is not an ECD itself that leads to the need for transport to a hospital - it is rather the underlying pathology that led to the officer deploying the ECD. Excited delirium, toxic substance use, medical disease (ex. DKA, hypoglycemia), or mental illness are common examples.

Police officers should provide EMS personnel with as much information as possible about (a) the events leading up to TASER deployment, (b) specifics of the TASER deployment [mode(s) used, how many TASER cartridges were used, length of shock], and (c) changes in the victim's behavior after being shocked. Medical documentation should include the location of all barbs removed, regardless of whether removed by Police or EMS. Documentation should also include securing techniques used by both Police and EMS to restrain the patient. Patients should not be restrained in a prone, face-down, or hog-tied position – these increase the risk of respiratory compromise and compressional asphyxia.

- Trauma Care:
  - Patients who have received an ECD may have already been involved in a physical confrontation or sustained a fall during device discharge. Routine trauma care and thorough evaluation for polytrauma is necessary.
  - EMS may provide wound care (i.e. cleaning and bandaging the area) for barbs removed prior to their arrival.
  - TASER barb removal is an authorized EMS procedure as per the ROPE guideline included in this document. After EMS evaluation and removal, the patient MUST be transported to an appropriate ED unless law enforcement signs a guardian refusal and assumes responsibility for the patient. EMS providers should not perform a "medical clearance" assessment for law enforcement. Providers should always advocate for the patient's physical health and recommend hospital transport if they feel it is indicated.

- Medical Care:
  - All patients should receive cardiac monitoring and 12-lead EKG assessment. The voltage delivered by an ECD, in combination with toxins/drugs, patient's underlying disease(s), excessive physical exertion and trauma may precipitate arrhythmias.
  - Patient's neurologic status should be assessed and recorded frequently to recognize sudden changes and acute decompensation.
  - Monitoring of the patient must take place until the patient is released to a receiving facility.
  - Pay special attention to signs and symptoms that suggest excited delirium. Patients with excited delirium who are restrained by law enforcement have a heightened risk of mortality in the prehospital setting.

Excited Delirium

Excited delirium is a common, yet poorly understood condition. It has no universally accepted definition except that persons present with "delirium associated with agitation." Mentally, the patient is unable to focus his/her attention on any one thing and is often distracted by his surroundings. The subjects' inability to process rational thought often renders normal de-escalation procedures ineffective.

Common causes of excited delirium:

- drug overdose (ex. cocaine, methamphetamine, PCP)*
- drug withdrawal
- brain tumor
- dementia
- infection
- hypoxia or hypercarbia
- low or high blood sugar
- psychiatric patient off of meds
- mental illness or acute psychosis*
- hyperthyroidism/"thyroid storm"
- head trauma

* most common

Excited delirium is presumed to be due a combination of (1) an individual's underlying physical or mental illness, (2) excess catecholamine – either endogenous (ex. thyroid storm) or exogenous (ex. cocaine use),

and (3) overstimulation of dopamine receptors. Heart rate, respiration, and temperature control are also affected by dopamine levels with elevation resulting in tachycardia, tachypnea, and hyperthermia.

Common signs of excited delirium:

- bizarre & aggressive behavior
- dilated pupils
- fear and panic
- hyperthermia
- incoherent speech
- inconsistent breathing patterns
- insensitive to pain
- nakedness
- paranoia
- profuse sweating (may be absent with severe hyperthermia)
- shivering
- superhuman strength
- violence directed at objects

Hyperthermia is a key risk factor of imminent death in patients with excited delirium. Another alarming symptom to the onset of death is "instant tranquility" - this is when the suspect had been very violent or vocal then suddenly becomes quiet and docile while in the car or sitting at the scene.

Treatment of excited delirium involves four pillars. Care in the prehospital setting (as outlined in the ROPE guidelines) focuses on control of agitation. Further care includes correction of hyperthermia, avoidance of acidosis (secondary to muscle death), and investigation into the underlying etiology.

**Field Amputation**

If a field amputation is needed **contact the Trauma Center** as early as possible to allow for resource mobilization. This includes deployment of a clinician to the scene to perform this procedure.

## V. TRAUMA CENTER DESIGNATION[2]

Trauma centers are verified by the American College of Surgeons. The different levels refer to the types of resources available in the trauma center and the number of patients admitted yearly. Within Region 1, University Medical Center is a Level I Trauma Center; Children's Hospital New Orleans is Level II Trauma Center.

**Level I**

A Level I Trauma Center is capable of providing total care for every aspect of injury – from prevention through rehabilitation. Some of the required elements for Level I Trauma Center verification include:

- 24-hour in-house coverage by general surgeons, and prompt availability of care in specialties such as orthopedic surgery, neurosurgery, anesthesiology, emergency medicine, radiology, critical care, plastic surgery, oral and maxillofacial surgery, internal medicine, and pediatrics.
- Referral resource for communities in nearby regions

[2] https://www.amtrauma.org/page/traumalevels

**Level II**

A Level II Trauma Center is able to initiate definitive care for all injured patients. Some of the required elements for Level II Trauma Center verification include:

- 24-hour immediate coverage by general surgeons, as well as coverage by the specialties of orthopedic surgery, neurosurgery, anesthesiology, emergency medicine, radiology, and critical care.
- Tertiary care needs such as cardiac surgery, hemodialysis and microvascular surgery may be referred to a Level I Trauma Center.

**Level III**

A Level III Trauma Center has demonstrated ability to provide prompt assessment, resuscitation, surgery, critical care, and stabilization of injured patients. Some of the required elements for Level III Trauma Center verification include:

- 24-hour immediate coverage by emergency medicine physicians and the prompt availability of general surgeons and anesthesiologists.
- Transfer agreements for patients requiring more comprehensive care at a Level I or Level II Trauma Center.

**Level IV**

A Level IV Trauma Center has demonstrated an ability to provide advanced trauma life support (ATLS) prior to transfer of patients to a higher level trauma center. It provides evaluation, stabilization, and diagnostic capabilities for injured patients. Some of the required elements for Level IV Trauma Center verification include:

- Basic emergency department facilities to implement ATLS protocols and 24-hour laboratory coverage. Available trauma nurse(s) and physicians available upon patient arrival.
- May provide surgery and critical-care services if available.
- Has developed transfer agreements for patients requiring more comprehensive care at a Level I or Level II Trauma Center.

**Level V**

A Level V Trauma Center provides initial evaluation, stabilization and diagnostic capabilities and prepares patients for transfer to higher levels of care. Some of the required elements for Level V Trauma Center verification include:

- Basic emergency department facilities to implement ATLS protocols.
- Available trauma nurse(s) and physicians available upon patient arrival.
- After-hours activation protocols if facility is not open 24-hours a day.
- May provide surgery and critical-care services if available.
- Has developed transfer agreements for patients requiring more comprehensive care at a Level I through III Trauma Centers.

When uncertain, transport to the higher level of care is the safest and recommended approach. Medical Control may also be consulted for triage support.

THIS PAGE INTENTIONALLY LEFT BLANK

# Adult Trauma Triage

The recognition of major trauma and the decision to transport the patient to a designated trauma facility (as determined by this guideline & Medical Control) supersedes patient choice without consideration of patient finances.

**Step 1** **Measure Vital Signs (Physiologic Criteria)**

**Do Any of the Following Exist:**

- GCS < 14
- SBP < 90 mm/Hg ( <110 if >65 yo, <70 + 2 x age if < 11yo)
- Need for ventilatory support
- Respiratory Rate < 10 or > 29 min (<20/min if < 1yo)

**Yes** → **Transport to the highest level Trauma Center/Program regardless of age**

**No**

**Step 2** **Evaluate Injury (Anatomic Criteria)**

**Do any of the following exist?**

- Penetrating injuries: head, neck, torso extremities proximal to the elbow and knee
- Pelvic fracture(s)
- 2+ proximal long bone fractures
- Crushed, degloved, mangled, or pulseless extremity
- Amputation proximal to the wrist or ankle
- Flail chest
- Open or depressed skull fracture
- Paralysis
- Burn with associated trauma
- Blunt abdominal injury with firm or distended abdomen or with "seatbelt sign"

**Yes**

Trauma Medical Control **must** be called for every trauma activation and anytime it is unclear whether or not a patient meets trauma activation criteria

**No**

**Step 3** **Consider Mechanism (MOI Criteria)**

**Do any of the following exist?**

- Falls
  - Adult > 20 ft (two stories)
  - Child > 10 ft (one story) or >2x child's height
- High Risk Auto Crash
  - Passenger compartment
  - Intrusion > 12 inches at patient site, > 18 inches any site
  - Ejection (partial or complete)
  - Death in same passenger compartment
  - Vehicle telemetry data suggests high risk injury
- Auto vs. pedestrian/bicyclist/ATV
  - Thrown
  - Run over
  - Significant impact (> 20 mph)
- Motorcycle crash > 20 mph
  - High-energy electrical
- Blast or explosion injury
- Hanging
- Head trauma on anticoagulant (excluding ASA) or history of bleeding disorder with evidence of high-energy impact
- EMS provider judgement

**Yes** → **Transport to the closest Adult Trauma Center/Program**

**Contact Medical Control if an adult patient has an associated pediatric patient for which transport to CHNOLA is being considered**

**No** → **Transport to a specific resource hospital (need not be a Trauma Center)**

If the patient meets trauma criteria and has one of the below or online **Medical Control** feels it is in the patient's best interest, Medical Control may direct EMS to stop at the closest Emergency Department for patient stabilization.

- Traumatic arrest not meeting criteria for DNR (as per TCA/Withholding of Resuscitation guideline)
- Non-patent airway that cannot be corrected by OPA, BVM, and oxygen
- Tension Pneumothorax
- Transport time > 50 minutes to trauma center

After stabilization at the closest ED, the provider should proceed expeditiously to the highest level Trauma Center/Program, if indicated. This stopover does not qualify as a hospital to hospital transfer.

# Pediatric Trauma Triage

**If patient meets triage criteria, providers should consider transport to a Level 2 Trauma Center/Program when it requires no more than 20 additional minutes of transport**

Trauma **Medical Control** must be called for every trauma activation and questions regarding patient criteria

Level 1 | Adult Medical Control – University Medical Center

Level 2 | Pediatric Medical Control - Children's Hospital New Orleans

## Step 1: Measure Vital Signs (Physiologic Criteria)

### Level 1 Trauma – UMC

- GCS < 9
- SBP < 90 mmHg if ≥ 12 yo, <(70 + 2 x age) if ≤ 11yo
- Respiratory Rate < 10 or > 29/min, <20/min if < 12 months
- Need for ventilatory support

### Level 2 Trauma CHNOLA

- GCS 9-13

**Transport to the highest level trauma facility based on criteria**

If multiple patients are transported by one clinician, choose a Trauma facility based upon the sickest patient.

Use discretion when deciding whether to transport to one versus multiple facilities

## Step 2: Evaluate Injury (Anatomic Criteria)

### Level 1 Trauma – UMC

- Penetrating injuries: head, neck, torso, or extremities proximal to elbow and knee
- Amputation proximal to the wrist or ankle
- 2+ proximal long bone fractures
- Pelvic fracture(s)
- Crushed, degloved, mangled or pulseless extremity
- Flail chest
- Open or depressed skull fracture
- Paralysis
- Combination of trauma and burns
- Blunt abdominal injury with firm or distended abdomen or with positive "seatbelt sign"

## Step 3: Evaluate Mechanism (MOI Criteria)

### Level 1 Trauma – UMC

- High-energy electrical injury
- Blast or explosion injury
- EMS provider judgment

### Level 2 Trauma – CHNOLA

- Motorcycle crash > 20 mph
- High Risk Auto Crash
  - Passenger compartment intrusion (including roof) > 12 inches at patient site, > 18 inches any site
  - Ejection (partial or complete)
  - Death in same passenger compartment
  - Vehicle telemetry data suggests high risk injury
- Auto vs. pedestrian/bicyclist/ATV
  - Significant impact (> 20 mph)
  - Thrown
  - Run over
- Falls
  - Adult > 20 ft (two stories)
  - Child > 10 ft (one story) or >2x child's height
- History of bleeding disorder with evidence of high-energy impact
- Hanging

If the patient meets trauma criteria and has one of the below or online **Medical Control** feels it is in the patient's best interest, Medical Control may direct EMS to stop at the closest Emergency Department for patient stabilization.

- Traumatic arrest not meeting criteria for DNR (as per TCA/Withholding of Resuscitation guideline)
- Non-patent airway that cannot be corrected by OPA, BVM, and oxygen
- Tension Pneumothorax
- Transport time > 50 minutes to trauma center

After stabilization at the closest ED, the provider should proceed expeditiously to the highest level Trauma Center/Program, if indicated. This stopover does not qualify as a hospital to hospital transfer.

# Routine Trauma Care

The following procedures will be utilized on all trauma emergencies requiring Prehospital Trauma Life Support (PHTLS)

- Ensure scene safety and BSI/PPE precautions[1]
- Determine number of patients and need for additional resources
- Determine mechanism of injury

**Trauma Center Absolutes**

- GCS <14
- SBP <90 mmHg (<110 if > 65yo)
- RR <10 or >29 bpm (<20 if < 1 yo)
- Flail chest
- Penetrating injuries: head, neck, torso, extremities proximal to elbow/knee
- Pelvic fracture
- 2+ proximal long bone fractures
- Crushed, degloved, mangled, or pulseless extremity
- Amputation proximal to wrist or ankle
- Open or depressed skull fracture
- Head trauma with increased risk of bleeding
- Paralysis
- High-energy electrical injury
- Traumatic burns
- Blast or explosion injury
- Hanging
- Falls
  - Adult >20 feet (two stories)
  - Child >10 feet (one story) or >2x child's height
- Motorcycle crash > 20mph
- Motor vehicle collision:
  - Passenger compartment intrusion >12 inches at patient site, >18 inches any site
  - Ejection (partial or complete)
  - Death in same passenger compartment
  - Vehicle telemetry data suggests high risk injury
- Auto v. pedestrian/bicyclist/ATV:
  - Thrown
  - Run over
  - Significant impact (>20mph)

Perform primary survey[2] upon patient contact:

Vital Signs

EKG Monitor (12-Lead as needed)

**MARCH** if obvious external hemorrhage

| MARCH |
|---|
| Massive hemorrhage |
| Airway |
| Respirations |
| Circulation |
| Hypothermia |

Control exsanguinating hemorrhage

- Assess airway patency
- Evaluate mental status for ability to protect airway
- Provide supplemental oxygen as clinically indicated

- Listen bilaterally on lateral chest wall for breath sounds
- Place semi-occlusive dressing on open chest wounds
- Perform needle decompression for tension pneumothorax

**Vital Signs (perform q5min)**

Blood Pressure
Heart Rate
Respiratory Rate
SpO2
etCO2
GCS score
Temperature
Pain Scale

- Establish IV/IO Access with 2 large bore IVs[3]
- Saline Lock, Crystalloid, or Whole blood as indicated
- Place pelvic binder if hypotensive and pelvis is unstable
- Consider using **Traumatic Shock** guideline

**Consider Spinal Motion Restriction and Pain Management[4] then**

**Continue treatment under appropriate Trauma guideline**

[1] Body substance isolation (BSI) and personal protective equipment (PPE): eye protection, face mask, gloves etc.
[2] See Trauma preambles for additional primary survey PEARLS
[3] IO access can replace one large bore IV in unstable patients where peripheral IV access cannot be obtained
[4] According to **Spinal Motion Restriction** and **Traumatic Pain Management** guidelines

# Hemorrhage Control

Routine Trauma / Medical Care

**Apply direct pressure[1] to the bleeding site**

- Minimize/limit release of pressure while examining the wound
- If a discrete bleeding vessel can be identified, point pressure is more effective than diffuse pressure

[1]If life threatening hemorrhage exists, any provider may bypass pressure/dressing and use tourniquet or hemostatic agent immediately

**Amputation?**

- Gently rinse severed part with sterile saline
- Wrap severed part in moist, saline soaked gauze then place in a sealed plastic bag
- Place bag with severed part on ice in a second bag during transport

*Do not freeze severed part*

**Apply pressure bandage or dressing[1]**

Hemorrhage controlled?

**Yes** → Transport

**No**

**Head, Neck, Torso, or Junctional Injury:**

**Apply topical hemostatic agent**
with direct pressure
(following manufacturer's instructions)

Consider junctional tourniquet or junctional hemostatic device if available

**Extremity Injury**

**Apply tourniquet(s)**
**+/- deep wound packing**

- Cut away clothing prior to application
- Apply "high & tight" in the most accessible proximal position on limb
- Mark "TK" and time of application on tape applied to the tourniquet
- Apply a second tourniquet if bleeding not controlled with one – do not overlap!

- Transport to a Trauma Center and notify receiving ED staff of tourniquet use
- Do not release tourniquet(s) while in route to hospital
- Treat pain as per **Traumatic Pain Management** guideline
- Identify shock early
- Consider TXA and/or blood products (if available) as per **Traumatic Shock** guideline

Contact **Medical Control** for additional orders or consultation

# Traumatic Shock

**Shock** is defined as impaired tissue perfusion and may be manifested by any of the following:

- Altered mental status
- Tachycardia
- Poor skin perfusion
- Low blood pressure

Maintain a high index of suspicion. Traditional signs of shock may be absent early in the process.

Routine Trauma Care

Is patient hypotensive for age or showing other signs of shock?

| Hypotension for Age | |
|---|---|
| Age | Systolic Blood Pressure |
| > 10 years | < 90 mmHg |
| 1-10 years | < 70 + (2 x age in years) |
| < 1 year | < 70 mmgHg |

**Treat reversible causes of shock (if not done already)**:

- Control hemorrhage, if not done already
- Perform needle decompression for tension ptx
- Place pelvic binder for suspected unstable fracture

| Tachycardia for Age | |
|---|---|
| Age | Heart Rate |
| > 12 years | > 100 bpm |
| 5-12 years | > 120 bpm |
| 2-5 years | > 140 bpm |
| 1-2 years | > 150 bpm |
| < 1 year | > 160 bpm |

If patient is still in shock:

Does patient meet criteria for transfusion of Whole Blood?

**Yes**

Transfuse Blood Product:

**Low Titer O+ Whole Blood (LTOWB)**
500 ml (2 units) IV/IO
- or -
**Packed Red Blood Cells (pRBCs)**
500 ml (2 units) IV/IO
- or -
**Fresh Frozen Plasma (FFP)**
500 ml (2 units) IV/IO

- **Calcium Chloride** 2g IV/IO
- **Tranexamic Acid (TXA)** 2g IV/IO given via slow IVP, if available

**Blood Transfusion should occur while in route to the hospital and should not delay transport**

**Contact Trauma Center Medical Control for consultation or additional orders**

**No**

- **Crystalloid Fluid** bolus of NS/LR (500 ml for adults, 20ml/kg for peds)
- **Calcium Chloride** 2g IV/IO
- **Tranexamic Acid (TXA)** 2g IV/IO given via slow IVP, if available

- If patient is still in shock, continue small Crystalloid Fluid boluses of 250 ml (20ml/kg for peds) until the return of peripheral (radial) pulses
- Once pulses are maintained, lock IV and repeat boluses only as needed for SBP <90 mmHg

**Blood Product Transfusion Criteria**

(1) Blood product is available
(2) Shock is believed to be due to hemorrhage
(3) Age ≥ 12 years old
(4) Patient has no religious objection to blood products
(5) Patient has one of the following criteria:
- SBP < 70 mmHg
- SBP < 90 mmHg with HR ≥ 110 bpm
- Age ≥ 65 yo with SBP < 100 and HR ≥ 100

# Traumatic Cardiac Arrest (TCA) | Withholding of Resuscitation

**Are patient's injuries incompatible with life (any of the following):**

- Decapitation
- Incineration
- Body decomposition
- Rigor mortis

(EKG unnecessary)

Yes

No

**Does patient meet ALL of following criteria:**

- Victim of blunt or penetrating trauma
- No spontaneous movement
- No pupillary response
- Apneic and pulseless
- EKG showing asystole or PEA <40 bpm

Yes

**Contact Trauma Center Medical Control for DNAR**

No

Consider transport of the following even if all DNAR criteria are met:

- Pregnancy > 20 weeks gestation
- Lightning strike/electric shock
- Associated hypothermia < 86°F
- Concern for scene safety/support

Loss of vital signs > 10 min?

Yes

**Consider obtaining DNAR from Medical Control**

No

Once resuscitation is initiated, patient should be immediately transported to the Trauma Center

**resuscitative efforts should not prolong scene time for TCA**

Is there a medical cause for patient's arrest?

Yes

Routine Medical Care & Medical or Pediatric Cardiac Arrest Protocol

No

**Address Reversible Traumatic Pathologies[1]:**

| | |
|---|---|
| **H**ypovolemia | • control external hemorrhage<br>• splint pelvis/long bone fractures<br>• IV/IO fluid/blood bolus |
| **O**xygenation | • airway management (BVM, SGA, ETT)<br>• EtCO2 and SpO2 monitoring |
| **T**ension ptx | • bilateral needle decompression |

[1]Chest compressions should be ideally be performed simultaneously while addressing reversible pathologies; however, if necessary they may be delayed or paused during HOT treatment(s)

# Traumatic Pain Management

- Any patient treated under this protocol must be transported to an appropriate emergency department
- Remember that a pain score > 5 could be distracting other injuries
- Head trauma is not a contraindication to pain management
- Hypotension is not a contraindication to pain management – use smaller doses and titrate to effect

Routine Medical Care / Trauma Care

- Evaluate mechanism of injury (MOI)[1]
- Assess the need for spinal precautions per **Spinal Motion Restriction** guideline

Attempt comfort therapies first:
- Place patient in position of comfort
- Splint/support painful areas
- Consider ice and/or compresion

Record level of pain by either asking patient to rate on scale 1-10 or using FACES scale


[1]Wong-Baker FACES of pain rating scale.
** Score is based on patient's (not provider's) assessment of their pain**

Have **Naloxone** readily available to treat narcotic-induced respiratory depression.

Administer **one** of the following for moderate to severe (6-10) pain[1]:

(1) **Fentanyl** 25-50mcg IM or slow IV push q2min prn (max 150mcg) or

(2) **Morphine Sulfate** 2-4mg IV/IM q2min prn (max 10mg) or

(3) **Ketamine**[2,3] 25mg IV/IO or 50mg IN/IM q15min prn (max 50mg IV/IO, 100 mg IN/IM)

[3]Consider giving Ketamine as first-line therapy for persons who refuse opiates or have a history of opiate use disorder

If nausea/vomiting due to analgesia:
**Ondansetron** 4mg IV/IM/IO q15 min to max of 8mg

If additional analgesia is needed for persistently severe pain (8-10) believed to be due to a surgical pathology
**or**
If benzodiazepines are needed for a ketamine-induced emergence reaction[2], contact **Medical Control**

[1] See **Adult Trauma Center Triage** guideline to determine which MOI(s) is most severe and may be distracting.

[2] Ketamine may be given via slow IV push over 1min or via IV infusion over 10 min. See **Medical Preambles** for infusion instructions.

[3] Tonic-clonic movements are common after ketamine administration. They should not be confused with an emergence reaction which usually includes hallucinations, flashbacks, or irrational behavior mixed with periods of lethargy.

# Head Injury

**Signs of Herniation**[1]

- Decreasing mental status
- Abnormal respiratory pattern
- Asymmetric/unreactive pupils
- Cushing's reflex (elevated BP, bradycardia, & irregular breathing/apnea)
- Decorticate posturing (abnormal flexion)
- Decerebrate posturing (extension)

- Routine Trauma Care – including $SpO_2$, $EtCO_2$, CBG, and neurologic assessment
- Administer **Oxygen** 15L via NRB

Is patient GCS < 8 and/or $SpO_2$ <90% after 15L of oxygen?

**Yes**

- Reposition airway via jaw thrust; insert OPA/NPA
- Assist ventilations via BVM
- Limit neck/spine movement as much as possible

**No**

Does patient have signs of shock or SBP <90?

**Yes**

- Give **Crystalloid Fluid** bolus 1L IV/IO once
- Proceed to **Traumatic Shock** guideline

**No**

Perform ETT or insert SGA if $SpO_2$ remains <90% or GCS<8 persists (see **Airway Management** guideline)

Elevate head of bed to 30° to decrease ICP (this can be done with spinal motion restriction!)

**Promote cerebral perfusion**

(a) Maintain $EtCO_2$ 35-45 mmHg – avoid even mild hyperventilation!

(b) Avoid and treat hypotension – monitor for a dropping SBP

(c) Restrict IVF if SBP ≥ 140 mmHg

Contact Trauma Center **Medical Control** for consultation or additional orders

- Trend and document neurologic status during transport to hospital
- Monitor for signs of deterioration or herniation[1]
  - Consider potential for seizures
  - Initiate hyperventllation if s/s of herniation (target $EtCO_2$ 30-35); do not hyperventilate for "impending herniation"

**Glasgow Coma Scale**

Any aspect of the score that cannot be tested should be noted as *NT* - e.g. GCS = E2, VNT, M4

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **Best Eye Opening** | None | To Pain/Pressure | To Sound | Spontaneous | ----- | ----- |
| **Best Verbal Response** | None | Incomprehensible Sounds | Inappropriate Words | Confused | Oriented | ----- |
| **Best Motor Response** | None | Extension | Abnormal Flexion | Withdraws to Pain | Localizes to Pain | Obeys Commands |

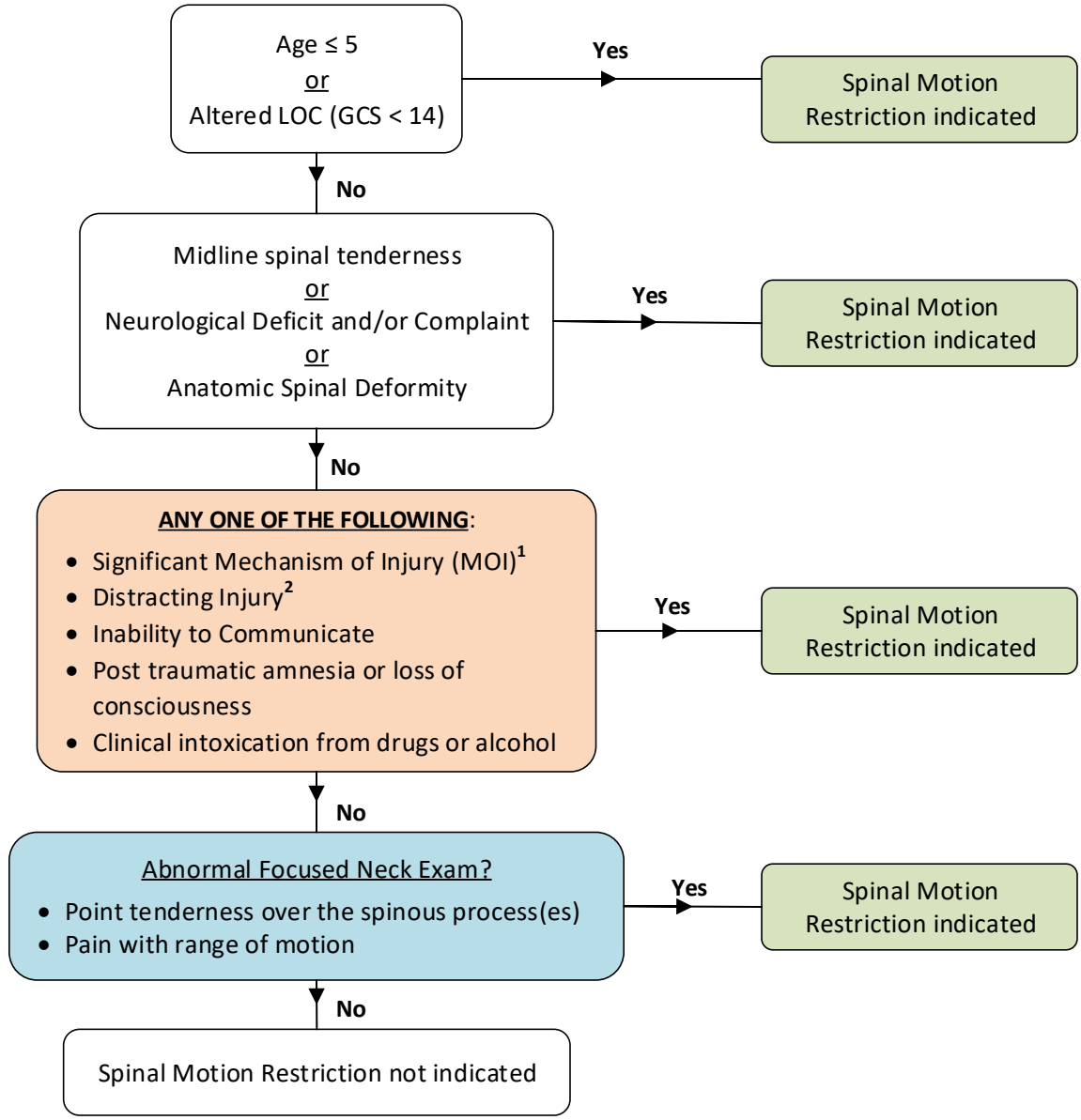
# Spinal Motion Restriction (SMR)

**This guideline is for blunt trauma only. Penetrating trauma with no evidence of spinal injury does not requires SMR.**
**Always perform Routine Trauma Care first.**

The critical component of Spinal Motion Restriction is use of a cervical collar.

The remainder of the head/neck/torso should be kept in alignment with a long spine board, scoop stretcher, Reeves© stretcher, vacuum splint, ambulance cot, or other similar device.

**If unsure whether SMR is indicated, always make the determination to protect the patient**




- **A long spinal board should be used for extrication only (not transport) unless the clinical situation warrants it.** Examples include an unconscious patient, immobilization of multiple extremity injuries, or providing a firm surface for chest compressions. In these situations, long boards should ideally be padded to minimize patient discomfort and secondary injury from ischemic pressure to the skin. Remove patient from the long board as soon at it is practical.
- **Patients that are ambulatory upon arrival do NOT require full immobilization for transport. They may be secured on the stretcher with cervical collar and straps.**
- **The preferred position for patients with spinal motion restriction is flat and supine; however, providers may place patient in reverse Trendelenburg or elevate HOB up to 30° if necessary.** Indications for this include but are not limited to (1) respiratory distress, (2) suspected head trauma, and (3) promotion of patient compliance.

[1] Significant MOI: determined by provider's clinical judgement. Examples include, but are not limited to, (a) fall >10ft, (b) high speed MVC/rollover/ejection, (c) bicycle/ATV/motorcycle collision, and (d) axial load injury (ex. diving, helmet-to-helmet contact).

[2] Distracting Injury – "a condition thought by the clinician to be producing pain sufficient to distract a second (neck) injury" or "injuries […] so severely painful that the neck exam is unreliable." Remember, if you are using the **Traumatic Pain Management** guideline, the patient may have a distracting injury.

# Open Wound / Fracture / Dislocation

Routine Trauma Care

This guideline is intended for use on **stable** patients with an isolated fracture or dislocation

**Evaluate mechanism of injury**

- Consider polytrauma – complete primary survey first!
- Consider spinal motion restriction – this is likely a distracting injury

Locate, expose and provide manual stabilization of injury

**Control bleeding and assess distal perfusion**

- Are distal pulses present?
- Is there capillary refill?
- Is extremity cyanotic (cold & blue)?

**Consider, recognize, and treat hemorrhagic shock –** especially if pelvis/femur fractures are present

Do not reintroduce exposed bone (i.e. open fractures) back into the skin unless distal circulation is absent

Clean, bandage, and dress any open wound using an aseptic technique

**Treat pain**

- Follow **Traumatic Pain Management** guideline
- Consider applying cold packs to fracture locations

**[1]Immobilize pelvis fractures using sheet wrap/papoose method or pelvic sling**

**Immobilize femur fracture/ dislocations using sheet wrap and/or long leg splint (i.e. traction device)**

***pelvic slings are not intended for femur fractures***

**Immobilize <u>bones</u> by splinting the joints above and below**

**Immobilize <u>joints</u> by splinting the bones above and below**

<u>If distal circulation is absent:</u>

- **Reposition/Reduce the fracture/dislocation** <u>ONCE</u> to attempt to restore circulation
- Repositioning should attempt to achieve normal anatomic position

**Immobilize/splint fracture/dislocation[1]**

Reassess and record distal circulation after immobilization

# Crush Injury / Syndrome (> 2 Hours)

Crush Injury

- Compression of extremities or other major muscle groups causing muscle swelling and/or neurological impairment.
- Physical findings are similar to the six Ps of compartment syndrome[1]
- Patients may initially present with very few signs & symptoms. Have a high index of suspicion based on MOI.

Crush Syndrome

- Systemic manifestations of crush injury due to traumatic rhabdomyolysis and the release of potentially toxic cell components (ex. myoglobin) and electrolytes (ex. potassium) into the circulation. Early treatment improves survival.
- May lead to altered mental status, hypotension, lethal dysrhythmias, hyperkalemia, hypocalcemia, renal failure, or death.
- More likely with multiple crushed limbs.

[1]Compartment Syndrome Signs & Symptoms:

- Pain
- Paresthesia
- Pallor
- Paralysis
- Pulselessness
- Poikilothermia (cool skin)

Routine Trauma Care
including
- Apply cardiac monitor
- Give high flow oxygen

- Provide **Hemorrhage Control** as per guideline
- Consider polytrauma – look for other potential injuries

Remove rings, bracelets, or constricting items

- Obtain EKG
- Establish 2 large bore IVs (may insert IO in unaffected limbs)
- Give **NaCl bolus** 1L IV/IO with 50mEq of **Sodium Bicarbonate** added per liter of NaCl[1]
- Following bolus, give **NaCl infusion** IV/IO at a rate of 1L/hour
- Provide **Traumatic Pain Management** as per guideline

Monitor for hyperkalemia:

- peaked T waves
- flattened P waves
- prolonged PR interval (>0.2 sec)
- widened QRS (>0.12 sec)
- sine wave
- ventricular fibrillation

If signs of hyperkalemia are present on EKG:

- **Calcium Chloride** 1gm IV/IO over 10 minutes (do not exceed 1ml/min)
- Bolus **Sodium Bicarbonate** 100mEq IV/IO
- **Albuterol Sulfate** 20mg nebulized

[1]**Avoid Lactated Ringers** - it contains potassium!

Contact **Medical Control** for further orders or consultation

[1] Monitor the patient closely during extrication. Administer IV fluid before releasing the crushed part. Start with NaCl bolus without sodium bicarbonate if preparing the solution will delay initiation of treatment.

- Patients frequently develop hyperkalemia and shock soon after the external pressure is released. Rapid clinical deterioration is expected. Repeat EKGs frequently.
- Monitor the air quality for confined space rescue.

# Burn Care

**SCENE SAFETY & PROVIDER SAFETY SHOULD ALWAYS BE THE PRIORITY**

- Only life saving interventions should be performed prior to decontamination and should always be done after applying PPE
- Decontamination can include (a) removing clothing from the patient, (b) brushing off powder/crystal residue, (c) flushing the burn(s) with normal saline or lukewarm tap or bottled water. **Do NOT flush patients in the ambulance.**
- Involve local fire department to assist with on-site patient irrigation/decontamination as necessary prior to patient transport

[1] **Signs of 2nd/3rd Degree Burns:**

- Blisters, bullae
- Sloughing skin
- Skin with brown/white leathery appearance (aka eschar)

**Measuring Burned BSA:**

- Palmar surface of patient's hand = 1% BSA
- Assume BSA > 20% if burn is large and you're unsure

Routine Trauma Care
including IV/IO access
(place through burned skin as last resort)

**Obtain 12-lead EKG if suspicion of electrical burn**

**Is there concern for upper airway injury?**

- Stridor, hoarseness, cough
- Soot-tinged sputum, singed hairs
- Extensive facial/mouth burns
- Circumferential neck burns
- Respiratory distress

**Yes**

- 100% $O^2$ via NRB
- Elevate head of bed >30°
- Prepare for aggressive airway management

**No**

Greater than 20% BSA with 2nd/3rd degree burns?[1]

**No**

- Cover with dry, clean sheet/blanket or sterile dressing
- Give **Crystalloid Fluid** IV infusion at 125ml/hr (LR is preferred over NS)

**Yes**

- Give **Crystalloid Fluid** IV/IO infusion based on age:
  - 14+ years: 500 ml/hr
  - 6-13 years: 250 ml/hr
  - 0-5 years: 125ml/hr

  (LR is preferred over NS)
- Cover with dry, clean sheet/ blanket or sterile dressing

If patient is altered:

**Consider causes of neurologic impairment**

- Hypoxemia
- CO or CN inhalation (see **HAZMAT** guideline)
- Opiate overdose
- Pre-existing condition (ex. MI, DM)

- Provide **Traumatic Pain Management** as per guideline
- Remove restrictive clothing and jewelry (remove contact lenses if possible ocular injury is present)
- Check/document distal pulses below circumferential or electrical burns – compartment syndrome may develop
- Determine if transport to an ED with decontamination setup is needed – alert hospital in advance; do not enter the hospital until you are sure it is safe

Contact **Medical Control** for additional orders or consultation

# Burn Center Triage

**Transport the following critical injuries to the closest Burn Center:**

- 2nd/3rd degree burns involving >10% body surface area (BSA)
- All 3rd degree burns
- Burns involving face, hands, feet, genitalia, perineum, or major joints
- Circumferential burns
- Chemical burns
- Electrical burns, including lightning injury
- Inhalation injury
- Burns associated with trauma

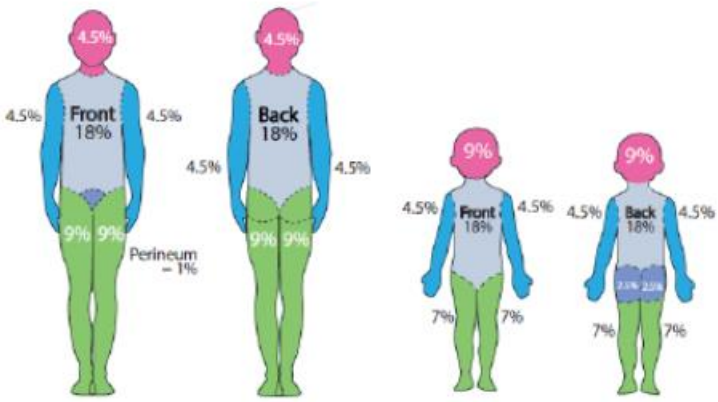
**Divert to the nearest ED for stabilization if:**

- Unable to obtain definitive airway in patient with imminent airway compromise
- Unable to obtain IV/IO access in patient with 2nd/3rd degree burns > 40% BSA

**If diversion is necessary, the provider should proceed to the Burn Center as soon as the patient is stabilized. This stopover does not qualify as a hospital to hospital transfer.**

**Trauma Center Medical Control should be contacted for every major burn patient and when it is not clear whether patient is a Burn Center candidate**

**Do NOT include first degree areas in this calculation (superficial burns without blister formation, eg. sunburn)**




**The size of the patient's hand – including the fingers – represents one percent of his/her total BSA**

## Calculating % of Total Body Surface Area (BSA)

### Electrical Burns (including Lightning Injuries)

- Maintain distance and safety until you are sure that current is not flowing – arc flashes can pass through the air!
- Look for associated trauma (eg. fractures, dislocations) due to falls or muscle spasms/contractions.
- Always apply a cardiac monitor and obtain a 12-lead EKG – electric current may induce fatal dysrhythmias (ex. VT, VF, sustained PVCs)
- Expose patient and look for electrical contact points (blackened, dry, holes in the skin). Even apparent thermal injuries may actually be due to conduction.
- Determine characteristics of source if possible (AC/DC, voltage, amperage)

### Chemical Burns

- Occur most commonly in industrial settings but also at home (self-harm, abuse, pediatric overdose, meth lab)
- When safe, carefully brush off dry powder agents prior to flushing the site to prevent a chemical reaction
- Irrigate burns copiously with water regardless of how minor they look – their initial appearance is often deceptive and progresses rapidly
- Do not try to "neutralize" the burn
- If the chemical is hydrofluoric acid (HF) refer to the HAZMAT guideline
- Ask for/obtain an MSDS (materials safety data sheet), if possible. Do not delay therapy while trying to identify the causative agent.

### Radiation Burns

- Occur most commonly in a healthcare facility, research lab, or power plant; can also be part of a "dirty bomb"
- If stable, decontaminate and irrigate on-scene until a radiation detector indicates minimal residual radiation
- See Radiation Exposure guideline

### Blast Injuries

- Patients may sustain multi-system injuries due to burns, flying objects, and barotrauma to internal organs
- Assess and reassess patient for blast lung injury and pneumothorax – support oxygenation and ventilation early and aggressively
- Patients may have difficult following commands due to perforated eardrums

# TASER Barb Injury

**If you are using this guideline you should also evaluate for Excited Delirium (see corresponding guideline as well as Trauma Preambles)**

Ensure scene safety
Confirm barb cartridge is disconnected from device (do not cut wire unless authorized by Law Enforcement)

Consider polytrauma from physical confrontation or from a fall after the TASER shock

Routine Medical Care / Routine Trauma Care including
- VS (BP, HR, RR, SpO2, Temp, GCS)
- Cardiac monitoring & 12 lead EKG
- Capillary Blood Glucose

**Documentation on ALL patients should include:**

(1) History of incident
- why TASER was used
- type of shock delivered (probe vs. direct stun, # of cartridges, duration of shock)
- patient's mental status before and after to TASER use

(2) Restraining positions used by Police and/or EMS

(3) Location of all barbs and who removed them (Police or EMS)

Altered mental status or agitation present?

**Yes** → Treat according to **Altered Mental Status** or **Excited Delirium** guideline

**No**

Arrhythmia, chest pain, palpitations, or dyspnea present?

**Yes** → Treat according to appropriate **Cardiac** or **Medical** guideline

**No**

**Does patient require transport?**
**(If any of the following are yes)**
- Persistently abnormal vital signs
- Hyperthermia >104°F
- Altered mental status or excited delirium
- Complaints of chest pain, shortness of breath, palpitations or headache
- History of coronary artery disease
- History or exam findings to suggest recent amphetamine or hallucinogenic drug use
- TASER barb located in sensitive area (head, neck, hands, feet, groin, female breast)
- Patient requests transport to the hospital

**Yes**

Leave TASER barb(s) in place

- Transport patient on cardiac monitor
- Perform frequent cardiac, vascular, and neurologic reassessments during transport
- Document initial and repeat assessments performed

**No**

- Remove TASER barb(s) according to policy/ procedure
- Handle probe as a contaminated sharp unless required to return to Law Enforcement for evidence
- Provide first aid and local wound care

**Does patient still refuse transport or is patient being taken into custody?**

**Yes**
- Advise patient to monitor for signs of infection (fever, redness, swelling, discharge, localized pain or warmth)
- Advise patient to obtain tetanus vaccination within 72 hours if they have not in the last five years
- Obtain AMA

**No**
- Transport patient on cardiac monitor
- Perform frequent cardiac, vascular, and neurologic reassessments during transport
- Document initial and repeat assessments performed

EMS providers responding to a TASER'ed patient should not perform a "medical clearance" exam for Law Enforcement

# Region One Protocol Effort

## Pediatric Guidelines

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Pediatric Preambles

The American Heart Association's recommended age group classifications for pediatrics will be adopted for use within these guidelines.

- an infant is less than one year of age
- a child is one year of age to an adolescent (known by secondary sex characteristics; ~12-14 years of age)

Approximately half of the EMS responses to calls for pediatric patients are for injury. Calls for medical complaints outnumber traumatic calls in patients under 5 years. Seizures and respiratory distress are common pediatric medical complaints. Most pediatric cardiac arrests are triggered by respiratory failure. Early recognition and aggressive treatment of respiratory distress, as well as shock, is priority in the treatment of pediatric patients.

**I. SHOCK**

Heart rate, initially and on repeated assessments, is the key parameter for recognition of compensated shock. Tachycardia without fever, anxiety, or hypoxia requires immediate intervention. Heart rate varies with age, and knowledge of normal vital signs needed (see table below).

Many clinicians equate shock with hypotension, which may be useful for adults, but this presents problems when caring for children. Normal blood pressure varies with age (see table below) and obtaining an accurate blood pressure in a child can be difficult. Due to children's unique physiology, when hypotension is present, the body's compensatory mechanisms have already failed, and clinicians should recognize that the child is in critical condition and at significant risk of death. While compensated shock may persist for hours, once the patient is hypotensive, cardiopulmonary failure may occur within only minutes.

A change in the level of consciousness demonstrates the effects of shock on the brain. Although this may be subtle, in children as young as 2 months, irritability or failure to recognize one's parents is a sign of cerebral hypoperfusion. A decreasing level of consciousness is an ominous sign. Other parameters to assess shock include muscle tone and pupillary responses.

Common Signs of Shock:

- cool extremities
- pale or mottled skin
- diaphoresis
- altered mental status
- weak peripheral pulses
- prolonged/delayed capillary refill

Treatment goals of shock include maintaining/restoring adequate oxygenation and perfusion to organs and tissues. Oxygen should be placed empirically, with knowledge of the patient's baseline oxygen saturations. Restoring adequate intravascular volume by the administration of 20 mL/kg of a crystalloid (Lactated Ringers is preferred) should be initiated quickly (over 5-20 minutes). A resuscitation weight-estimation tool should be used for fluids, drug dosing, and equipment size. Patients in shock may require up to 60 mL/kg of crystalloid fluid resuscitation. If cardiogenic shock is suspected, smaller fluid boluses of 5-10 mL/kg should be used (see Cardiogenic Shock below). In diabetic ketoacidosis with compensated shock, a bolus of 10-20 mL/kg should be administered over one hour. If the patient's condition worsens during fluid resuscitation, such as signs of

pulmonary edema, worsening tissue perfusion or development of hepatomegaly, parenteral fluids should be stopped, and an epinephrine drip should be started.

Additional interventions for treatment of shock include cardiac monitoring, pulse oximetry, and end-tidal $CO_2$ monitoring, as well as a blood glucose check. Once adequate fluid resuscitation has occurred, if shock is still present, vasopressors, such as norepinephrine or epinephrine, should be considered.

A major difficulty with pediatric patients in shock may be the ability to establish intravenous access. Limiting the number of attempts or time allowed for intravenous access before intraosseous cannulation (in the appropriate patient) is recommended when treating shock. For septic shock, placement of intraosseous device after two failed intravenous catheter attempts is recommended.

In children with a cardiac lesion that causes mixing of the pulmonary and systemic circulations, careful attention must be directed to the child's clinical response to interventions. While oxygen is considered empiric therapy for patients in shock, supplemental oxygen relaxes pulmonary vascular resistance and can lead to increased left-to-right shunting. This shunting decreases systemic blood flow and worsens metabolic acidosis. Clinicians must ascertain from caregivers what the patient's baseline oxygen saturations are; they should not provide supplemental oxygen that raises saturations above the patient's baseline.

In assessing vital signs, capillary refill – in conjunction with another assessment tool – is an adequate indicator of perfusion. The formula used to approximate blood pressure remains the same, 70 +( 2 x age in years), and should be used for recognizing hypotension. When fluid is needed, 20 ml/kg should be administered (10ml/kg for patients with cardiogenic shock -see below). This can be repeated two more times for a total of 60 ml/kg (30 mg/kg for cardiogenic shock); isotonic fluids only. When treating patients for shock, a fluid bolus of 20 ml/kg (10 ml/kg for neonate) should be given even if the patient has a normal blood pressure.

Pediatric patients are able to compensate prior to showing signs of poor perfusion. Children in shock may initially present with only tachycardia.

## Types of Shock

Septic shock: This is the most common cause of shock and is due to systemic infection. Patients in septic shock generally present with fever and tachycardia. Signs of poor perfusion are not always present. Patients with septic shock require 20/kg of isotonic fluids and can receive up to 3 fluid boluses in the field. Rapid administration of IV fluids is imperative in the treatment of septic shock. Early antibiotic administration is important - notifying the receiving hospital early will help them prepare the antibiotics in advance of the patients' arrival. Patients with underlying medical conditions are at much higher risk of developing septic shock; therefore, anyone with the following medical conditions who has fever and tachycardia should be treated for septic shock with fluids:

- Severe Developmental Delay
- Sickle Cell Disease or Asplenia
- Cancer
- History of Transplant
- Indwelling Line or Catheter
- Immune Deficiency/compromise/suppression

PALS Adjusted Vital Signs for Septic Shock

| Age | Heart Rate | Resp Rate | Systolic BP | Temp (°F) |
|---|---|---|---|---|
| 0d - 1m | > 205 | > 60 | < 60 | <96.8 or >100.4 |
| > 1m - 3m | > 205 | > 60 | < 70 | <96.8 or >100.4 |
| > 3m - 1y | > 190 | > 60 | < 70 | <96.8 or >101.3 |
| > 1y - 2y | > 190 | > 40 | < 70 + (age in yr x 2) | <96.8 or >101.3 |
| > 2y - 4y | > 140 | > 40 | < 70 + (age in yr x 2) | <96.8 or >101.3 |
| > 4y - 6y | > 140 | > 34 | < 70 + (age in yr x 2) | <96.8 or >101.3 |
| > 6y - 10y | > 140 | > 30 | < 70 + (age in yr x 2) | <96.8 or >101.3 |
| > 10y - 13y | > 100 | > 30 | < 90 | <96.8 or >101.3 |
| > 13y | > 100 | > 16 | < 90 | <96.8 or >101.3 |

Anaphylactic shock: this is a distributive shock caused by histamine release and is a life-threatening allergic reaction. All of the blood vessels dilate which causes decreased perfusion and hypotension. This is treated with epinephrine 1:1000 IM every 5 minutes and isotonic fluid boluses of 20 ml/kg up to 3 times (max 60 ml/kg).

Cardiogenic shock: This is primarily a pump problem. The heart is weak and cannot pump blood to all of the organs - this results in increased heart rate and eventually poor perfusion and fluid overload. Signs of cardiogenic shock include weak pulses, hepatomegaly, and crackles on lung exam. Cardiogenic shock still requires fluid but should be treated with 5-10 ml/kg isotonic fluid boluses (max 30 ml/kg) instead of 20 ml/kg isotonic fluid boluses. Patients with cardiogenic shock will get worse if they receive too much fluid too quickly. If there are any signs of fluid overload, consider starting an epinephrine drip. Signs of cardiogenic shock are similar to signs of septic shock and sometimes it is difficult to differentiate between the two. Any patient with signs of shock who gets worse after fluids should receive an epinephrine drip. Call Medical Control if needed to ask for help with managing patients with cardiogenic shock and notify the hospital well in advance of the patient's arrival.

## II. AIRWAY/VENTILATION

Proficiency in pediatric bag-valve-mask ventilation is mandatory for all prehospital clinicians. Model EMS clinical guidelines recommend escalating from the least to most invasive intervention. When supplemental oxygen via nasal cannula, simple mask or non-rebreather mask do not maintain adequate oxygenation, assisted ventilation and airway management then become necessary. Complete airway occlusion with foreign body removal does require visualization with direct laryngoscopy and removal with Magill forceps.

The method of airway support used in the system should be based on the skill level of the clinicians, equipment and medications available, ongoing training and experience, and transport times. The 2019 American Heart Association/International Liaison Committee on Resuscitation update included that bag-valve-mask is reasonable compared with advanced airway interventions in the management of children during cardiac arrest in the prehospital setting. Given the very low frequency of occurrence, the high rates of complications, the increased mortality, no demonstrable benefit to good neurological outcomes in cardiac arrest and trauma, along with the questionable necessity in seizures, the risks of an advance airway may outweigh the benefits for non-critical care trained paramedic pediatric intubation.

When selecting oral airways make certain the correct size is being used. Oral airways that are too small will not keep the tongue from occluding the airway; if they are too large it can obstruct the airway.

There is a much higher rate of missed pediatric intubations than adult intubations in the prehospital setting. As a general rule, consider continuing with BVM if you are able to ventilate effectively. There are a variety of pediatric supraglottic airways available in pediatric and neonatal sizes. Compared to endotracheal intubation, supraglottic airways have higher first pass success rates and are much quicker to place in the prehospital environment for both pediatric and adult populations. Current prehospital literature does not show improved cardiac arrest outcomes with pediatric supraglottic airway use, and in fact bag-valve-mask was associated with a higher survival to hospital discharge compared to endotracheal intubation and supraglottic airway. Strict quality improvement programs and research are needed with pediatric supraglottic airway use to monitor for efficacy and safety in the prehospital setting.

If pediatric ET intubation is attempted, the size of the ETT is determined by the patient's (age in years / 4) + 4 = ETT (uncuffed) size in mm; [(age in years / 4) +4)] -1/2 size if cuffed. It is very important that the ETT is properly sized to ensure minimal air leaking and maximal airway protection; therefore, if the tube is too small you should consider using a larger one provided it is a prudent choice to do so using sound clinical judgment. Cuffed endotracheal tubes are preferred in pediatric patients.

Confirmation of ETT placement is accomplished using the same methods in adult ETT confirmation. Capnography (electronic $EtCO_2$ monitoring) is the "gold standard" of airway placement confirmation, monitoring, & documentation. If unable to confirm tube placement by continuous $EtCO_2$ measurements, or if at **ANY TIME** it is thought that the ET tube is misplaced, it should be **immediately removed and alternate means should be used to control the airway** (i.e. BVM). If you believe that the tube is in the trachea but are unable to ventilate, consider suctioning the tube briefly to remove any obstruction and then attempting to give a few breaths before making the decision to remove the ETT. $EtCO_2$ monitors may give low readings for the first few minutes in a cardiac arrest, but as CPR increases circulation and cellular perfusion, $EtCO_2$ values should increase in a patient with a viable downtime. The presence of any $EtCO_2$ value and/or waveform gives evidence of airway confirmation. **NOTE: $EtCO_2$ also often gives the first indicator of ROSC, as evidenced by an abrupt and sustained rise in $EtCO_2$.** The ideal placement of the tip of the ETT is above the carina and below the clavicle. This space is very small in infants and children. A useful formula for ETT depth = 3 x the size of the ETT in the child (i.e. tape a 4.0 ETT at around 12 cm depth). The ETT can easily become displaced. Please be mindful of this and check the position of the tube frequently.

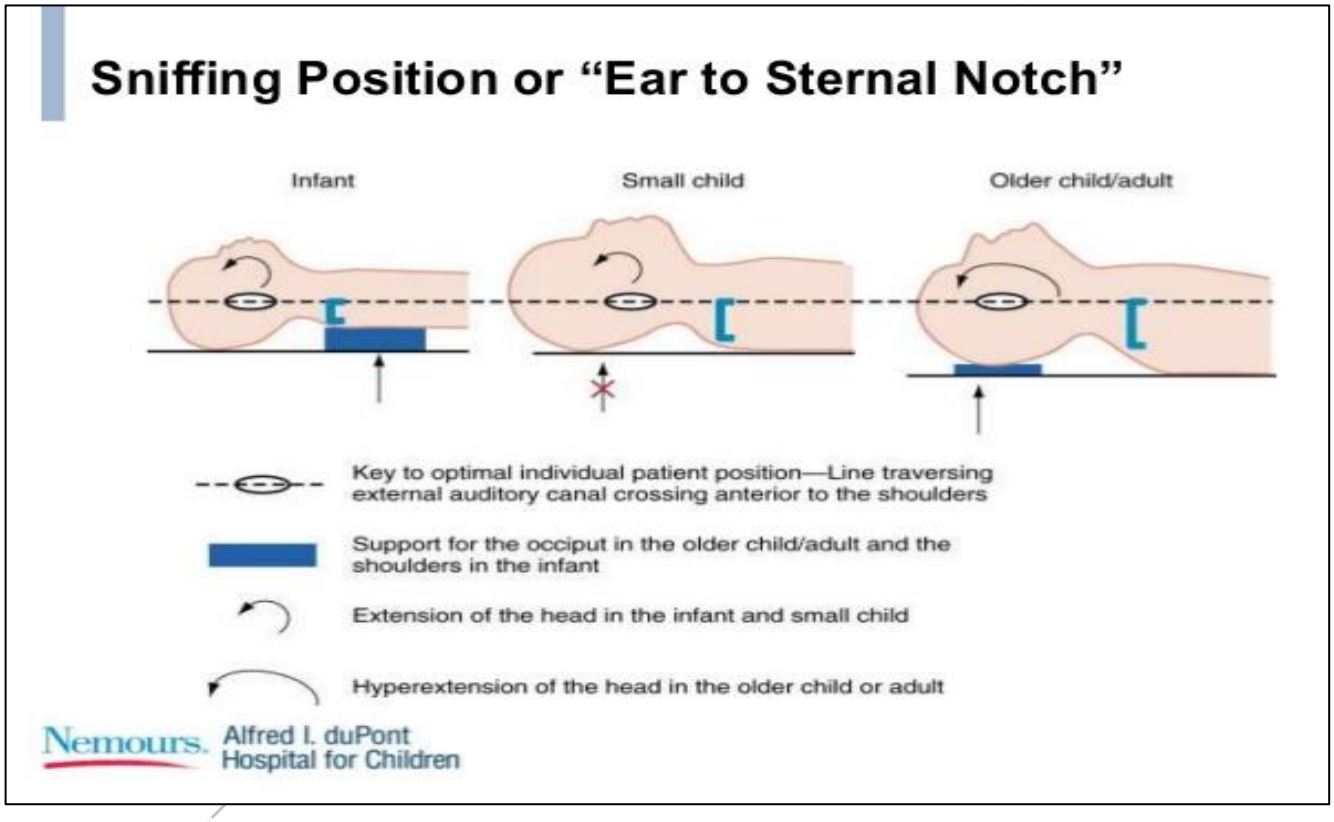
For post intubation hypoxia: Troubleshoot the ETT with the **DOPE** mnemonic.

> **D**isplacement: Check to see if the tube has been pushed in too far or if it has come out. Look with the laryngoscope to check that the tube is in the trachea.
> **O**bstruction: Suction the ETT.
> **P**neumothorax: Listen for breath sounds
> **E**quipment: Check the equipment to make sure that everything is connected properly. Check the oxygen to make sure that the oxygen is on and the tubing is connected properly.

In cardiac arrest, patients tend to be over ventilated which can have paradoxical effects. Ventilating with excessive tidal volume increases intrathoracic pressure and reduces venous return, which reduces cardiac

output, and can also cause barotrauma. Excessive minute volume or ventilatory rate will also decrease cerebral blood flow and coronary perfusion, thereby working against resuscitative efforts. Proper ventilation with controlled peak inspiratory pressure will also keep GI distension to a minimum, which will also reduce the risk of aspiration. Pediatric assessment tape (e.g. Broselow) is recommended to assist with proper tidal volumes & ventilatory rates. Continuous pulse-oximetry and capnography to ensure oxygenation and ventilation are key.

Children have larger occiputs which can cause neck flexion and airway occlusion. Proper sniffing position, with the sternal angle aligning with the external auditory meatus, can be obtained with a chin lift and, when supine, a towel roll beneath the shoulders (see image below. The proportionately larger tongue and adenoids can cause airway obstruction, especially in the supine apneic child. Lateral recumbent positioning, chin lift and jaw thrust, and adjunct (nasopharyngeal or oral) airway devices are potential solutions to this problem. Because children under 6 months of age are obligate nose breathers, nasal suctioning is key to a patent airway in patients who have occluded nares.




Suctioning is a necessary skill in airway protection, but keep in mind that it works against oxygenation efforts and can cause damage if the catheter comes in contact with tissue. Therefore, if suctioning is needed, the duration of suction efforts should be limited, and a max suction force should be between 80 and 100 mm Hg.

All children with respiratory distress should have pulse oximetry and capnometry/capnography used as adjuncts to other forms of respiratory monitoring. Supplemental oxygen should be provided, escalating from nasal cannula to simple face mask to a non-rebreather mask as needed, with the cardiac patient being a special caveat. Known cardiac patients should be kept at their baseline oxygen saturation level. Suctioning can be a very effective intervention to relieve distress.

Signs for upper airway respiratory distress include:

- stridor
- suprasternal retractions
- nasal flaring
- neck muscle use
- respiratory rate greater than normal for age

Signs for lower airway respiratory distress include:

- wheezing
- intercostal, subcostal, supraclavicular retractions
- head bobbing, grunting
- abdominal muscle use
- respiratory rate greater than normal for age
- sleepy, intermittently combative, or agitated

Signs of respiratory failure include:

- central cyanosis / poor peripheral perfusion
- decreased muscle tone
- increased respiratory effort visible at sternal notch
- marked use of accessory muscles
- marked tachycardia

Respiratory failure involves the findings of respiratory failure with any one of the following:

- absent breath sounds
- absent or shallow chest wall motion
- respiratory rate < 10 breaths per minute
- apnea
- limp muscle tone
- unresponsive to voice or touch
- bradycardia
- weak or absent pulses / asystole

Evaluation of children and interventions delivered may be accomplished more easily with the parent's assistance. Moving a child from a position of comfort might worsen the respiratory distress; however, during transport, a child in respiratory distress should be safely restrained in an upright position, unless specific treatments require the supine position.

## III. BRIEF RESOLVED UNEXPLAINED EVENTS (BRUE)

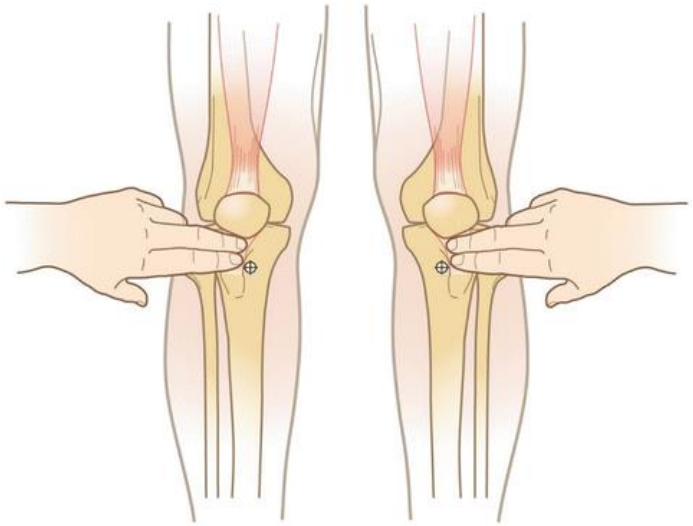
Any patient less than 1 year who has a brief resolved event that resulted in any period of apnea, altered or inadequate breathing, cyanosis, marked change in tone or mental status, or any episode that required bystander CPR should be transported even if they are well appearing on the scene. If another process is identified on exam, follow that guideline. If the parents refuse transport, please call Medical Control to discuss patient refusal against medical advice.

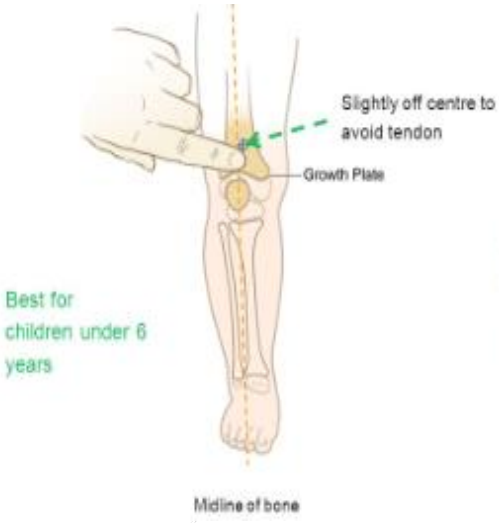
## IV. VASCULAR ACCESS

Intraosseous access is just as effective as IV access in pediatrics. IO access should be obtained early for unstable and/or symptomatic children. Therefore, it is unacceptable to take multiple IV attempts in a critical pediatric patient. In cardiac arrests, the intraosseous (IO) access is preferred. The preferred IO site for an unconscious pediatric patient or for a pediatric arrest is the distal femur. Only the 25mm (blue) or 45mm (yellow) needles may be used in the distal femur. For the conscious

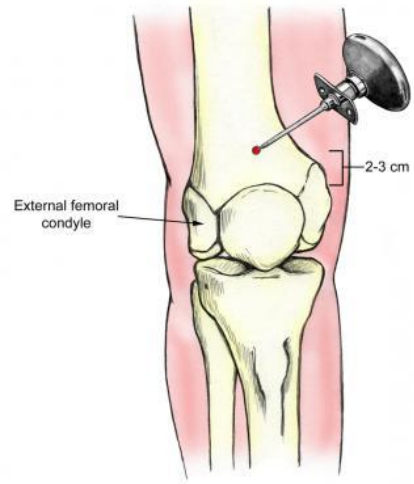
infant or child, a proximal tibial IO may be placed. The smallest IO needle (15 mm – pink) should only be used in those weighing less than 3 kg for a tibial IO. The 25 mm (blue) needle should be used for those requiring a tibial IO who weigh more than 3 kg.

Proximal Tibia IO Placement








## V. PEDIATRIC CARDIAC ARREST

The focus is to be placed on immediate, effective, continuous, and minimally interrupted chest compressions in both adult and pediatric cardiac arrest. Even with the likelihood of a respiratory origin of arrest in the pediatric patient, compressions are to be started immediately as there is virtually no set-up time - even basic airway equipment requires some set-up time for sizing and deployment. Therefore, the first cycle of chest compressions should be initiated without delay, while allowing time (approx. 18 sec. for first cycle) for basic airway equipment set-up/sizing.

Chest compressions should be performed at a rate of 100-120 per minute. To achieve effective chest compressions, compress at least one third of the anteroposterior diameter of the chest. This corresponds to approximately 1½ inches (about 4 cm) in most infants and about 2 inches (5 cm) in most children. Once children have reached puberty (adolescents), the recommended adult compression depth of at least 2 inches (5 cm) but no greater than 2.4 inches (6 cm) is used. Before the next compression is delivered the chest must fully recoil from the previous compression.

Continue chest compressions while the defibrillator is charging. Pause compressions just before the shock is delivered to ensure the best chance of conversion. **NOTE: The chest compression/ventilation ratio for the neonate is 3:1 to increase focus on ventilation rate, unless there is evidence of a cardiac origin where the ratio reverts back to 15:2. If an advanced airway is present, the chest compressions should be continuous and a breath should be given every 2-3 seconds.**

In symptomatic (unstable) bradycardia for children eight years of age or younger, chest compressions should start when the heart rate is less than 60 beats per minute.

## Post Cardiac Arrest Care

After return of spontaneous circulation (ROSC) continue cardiac monitoring, pulse oximetry, and quantitative capnometry; also obtain a blood pressure, electrocardiogram, and blood glucose. Outcomes are worse when hypotension or hypoglycemia are present post cardiac arrest – both should be treated rapidly or avoided.

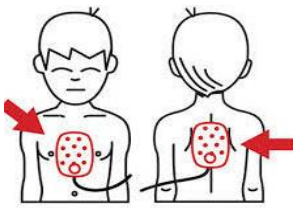
Oxygenation and ventilation should be optimized. Patients should have a goal oxygen of 94-99% (or as appropriate for patient's underlying condition), with avoidance of hypoxia and weaning of oxygen when oxygen saturations are 100%. Clinicians should target $CO_2$ appropriate to patient's condition with avoidance of hyper- and hypocapnia.

The 2019 guidelines for post-arrest shock include identifying and treating the "H's and T's" that may be contributing to persistent shock, considering a 20 ml/kg intravenous or intraosseous bolus of isotonic crystalloid (10 ml/kg if poor cardiac function is suspected), and considering the need for inotropic and/or vasopressor support for fluid refractory shock. Cardiac arrhythmias may occur post-cardiac arrest and patients should be closely monitored with any arrhythmias promptly treated.

## Defibrillator / Cardioversion Settings

Adult defib pads are generally used on all pediatric patients > 10 kg. However, refer to your device's guidelines.

Defibrillator pad placement – The proper location to attach pads on a child is the anterior-posterior (or "front-and-back") position – one electrode pad is placed in the center of the child's chest and the other pad is placed in the center of their back. Ensure that the pads are not touching or overlapping.



Energy Settings

- In V-Fib / Pulseless V-Tach, the first defibrillation should be given with 2 J/kg; the second shock should be given at 4 J/kg, escalating to a maximum of 10J/kg in refractory V-fib. Stacked shocks should not be given.
- After the 2nd shock, Epi 1:10,000 0.01mg/kg q 3-5 min
- For refractory VF/VT, give Amiodarone 5 mg/kg after the 3rd shock

Transcutaneous Pacing (this is rarely needed in pediatric patients)

- Use pediatric pacing pads for those patients less than 15 kg
- Start at a rate of 80-100 for pediatric patients
- Start at 50 mAmps and titrate up until you obtain capture (usual range 50-100 mAmps, some patients may need higher)

## VI. PEDIATRIC TERMINATION OF RESUSCITATION

Pediatric out of hospital cardiac arrest (OHCA) is rare and is associated with poor outcomes. Since the recent advancements in pediatric emergency medicine the survival rate has increased from 2-6% to 17-40%. Of those that survive, only 1-4% have good neurologic outcomes at this point. Pediatric OHCA are harder on families and on paramedics than OHCA in other patients. Because of this, there are different termination of resuscitation guidelines for children than for adults. Our guiding principal is to "first do no harm". While it is recommended to attempt resuscitation for all pediatric patients, there are times that resuscitation of a child that has no hope of survival can be more traumatic for the family and EMS providers. Below are some cases when providers may consider termination of resuscitation for a pediatric patient, however resuscitation may continue at the provider's discretion. For termination of resuscitation of a pediatric patient (<18 years old), providers must call Medical Control to discuss the case and request withholding of resuscitative efforts or termination of resuscitation. When in doubt, it is always better to resuscitate the pediatric patient.

1. The withholding of resuscitative efforts should be considered in pediatric victims of penetrating or blunt trauma with injuries obviously incompatible with life, such as decapitation.

2. The withholding of resuscitative efforts should be considered in pediatric victims of penetrating or blunt trauma with evidence of a significant time lapse following pulselessness, including dependent lividity, rigor mortis, and decomposition.

3. The withholding of resuscitative efforts should be considered in newly born patients less than 20 weeks gestation. All efforts should be made to resuscitate infants born at 20 weeks gestation or later – these patients should be transported to a level 3 or 4 NICU. If there is any doubt about the gestational age, continue resuscitative efforts and transport to a hospital with a level 3 or 4 NICU. Providers may call Medical Control to request termination of resuscitative efforts after they have started resuscitating a newly born patient and then determined that the fetus was less than 20-week gestation. If the mother did not have prenatal care or is not able to give a history, continue resuscitative efforts and transport the patient.

For reference, a 20-week fetus is about 10 inches, weighs about 10 ounces (or 300 g), and is about the size of a banana. The eyes are fused closed. This is for reference only. When in doubt, resuscitate.

4. Standard resuscitation should be initiated for all cardiopulmonary arrest patients in whom the mechanism of injury does not correlate with a traumatic cause of arrest unless (1) or (2) above applies.

5. Standard resuscitation should be initiated for cardiopulmonary arrest victims of lightning strike or drowning in whom there is significant hypothermia unless (1) or (2) applies.

6. Immediate transportation to the ED should be initiated for children who exhibit witnessed signs of life before traumatic cardiopulmonary resuscitation and have CPR ongoing or initiated within 5 minutes in the field, with resuscitation maneuvers including airway management and intravenous or intraosseous line placement planned during transport.

7. Following blunt and penetrating trauma in victims in whom there is an unwitnessed traumatic cardiopulmonary arrest, a longer period of hypoxia may be presumed to have occurred. High quality CPR with an advanced airway should continue for at least 30 minutes prior to considering termination of resuscitation.

8. If there is any doubt as to the circumstances or timing of the traumatic cardiopulmonary arrest, resuscitation should be initiated and continued until arrival to the appropriate facility.

9. Providers should talk to the family prior to termination or resuscitation and explain that the injuries are not compatible with life and that the child has already died. If the family insists that providers continue resuscitative efforts, continue CPR and transport to the closest appropriate facility where there will be more resources to support the family.

## Death Notification: The GRIEV  ING Mnemonic

Death notification is an action that no EMS provider should take lightly. It is an event that is a common albeit unfortunate occurrence in the prehospital setting and EMS providers should seek proper coaching and instruction prior to performing.

G-GATHER

Gather the patient's family and friends who are at the scene.

R-RESOURCES

Utilize resources that are available to you, including police. Families respond to unexpected news of death of a loved one in unpredictable ways. This can sometimes manifest as violence towards the care provider. It is not always necessary to have police at the scene, but It is important to always have an available exit if things turn violent. If the scene is unsafe, please leave.

I-IDENTIFY

Identify yourself as the paramedic provider. Identify the deceased patient by name. Have family/friends present identify their relation to the deceased (Ask "How is everyone related to _"). Identify what the family knows about the situation ("What do you know about what has happened?").

E-EDUCATE

Educate the family on the events leading up to the patient's death. This includes events that happened with EMS. Remember to avoid medical jargon and use simple language.

V-VERIFY

Verify that the family member has died. Use the words "dead" or "died." Avoid euphemisms like "passed away" or "no longer with us."

_ GIVE SPACE
Allow the loved ones time and space to absorb the information. There will be a lot of silence and it may be uncomfortable, however there needs to be time for the family to process the information.

I-INQUIRE
Inquire if there are any questions. Answer them to the best of your knowledge. If you do not know, be honest and open.

N-NUTS AND BOLTS
Start planting the seeds about logistical tasks. This includes coroner and police. This all does not have to be discussed immediately and is variable depending on patient situation. Offer to have the family see the patient if they desire.

G-GIVE
Give the family your name, condolences, and sympathies. Use the name of the person who has died. Offer to answer any questions.

## VII. NOTATIONS AND REFERENCE

### Medications

| | | |
|---|---|---|
| Adenosine | 0.1mg/kg (max 6mg) IV/IO | repeat 0.2 mg/kg (max 12mg) |
| Amiodarone | 5 mg/kg IV/IO (max 300 mg) | repeat 15 mg/kg (max 300 mg) |
| Atropine | 0.02 mg/kg IV/IO (minimum dose = 0.1mg)<br>max single dose child = 0.5mg, max single dose adolescent = 1mg | repeat x 1 |
| Calcium Chloride | 20 mg/kg IV/IO | slow IVP (not proven helpful in cardiac arrest) |
| Epinephrine | 0.01 mg/kg (1:10,000) IV/IO | repeat q3-5 minutes |
| Dexamethasone | 0.6 mg/kg IV/IO (max 10 mg) | once |
| Glucose | 0.5-1 g/kg IV/IO | D25: 2 ml/kg<br>D50: 1ml/kg |
| Magnesium | 50mg/kg IV/IO (max 2g) | give over 10-20 min, faster in torsades |
| Naloxone | 0.1 mg/kg IV/IO | if cardiac arrest, 1-2 mg IV/IO |
| Sodium Bicarbonate | 1 mEq/kg IV/IO of 8.4% solution | |

### APGAR
An APGAR score is required at 1 and 5 minutes postpartum. Perform life-saving interventions immediately after birth as necessary. The APGARs are calculated after the patient is stabilized based on how the patient appeared at 1 and 5 minutes of life.

| Clinical Sign | 0 (zero) | 1 point | 2 points |
|---|---|---|---|
| **A**ppearance | Blue or pale | Pink body with blue extremities | Completely pink |
| **P**ulse | Absent | Below 100 | Over 100 |
| **G**rimace | No response | Grimaces | cries |
| **A**ctivity | Limp | Some flexion | Active motion |
| **R**espiratory | Absent | Slow; irregular | Good, strong cry |

**A score of 7 – 10** is associated with coughing and crying within seconds of delivery. Newborns with this score typically do not require any further resuscitation.

**A score of 4 – 6** are moderately depressed. They will typically appear pale or cyanotic and have respiratory complications and flaccid muscle tone. These newborns will require some type of resuscitation efforts.

**Pediatric Glasgow Coma Scale**

| | Child | Infant | Score |
|---|---|---|---|
| Eye Opening | Spontaneous | Spontaneous | 4 |
| | To Speech | To speech | 3 |
| | To pain only | To pain only | 2 |
| | No response | No response | 1 |
| Best Verbal Response | Oriented appropriate | Coos & babbles | 5 |
| | Confused | Irritable cries | 4 |
| | Inappropriate words | Cries to pain | 3 |
| | Incomprehensible sounds | Moans to pain | 2 |
| | No response | No response | 1 |
| Best Motor Response | Obeys commands | Moves spontaneously & purposefully | 6 |
| | Localizes commands | Withdraws to touch | 5 |
| | Withdraws in response to pain | Withdraws in response to pain | 4 |
| | Flexion in response to pain | Abnormal flexion posture to pain | 3 |
| | Extension in response to pain | Abnormal extension posture to pain | 2 |
| | No response | No response | 1 |

**Term Newborn Vital Signs**

Heart rate 120 – 160
Respiratory rate 30 – 60
SBP 56 – 90 mm/Hg
DBP 26 – 56 mm/Hg
Glucose ≥ 40 mg/dL

Portions include excerpts from:
Gross T, Donofrio-Odmann J. Pediatric Medical Priorities. In: Brice J, Cone D, Delbridge T, Myers B eds. *Emergency Medical Services: Clinical Practice and Systems Oversight.* New Jersey: John Wiley & Sons, Inc.; in press.

# Pediatric Cardiac Arrest

If no advanced airway present:
Give compressions & ventilations 15:2 ratio

If advanced airway present:
Provide continuous compressions and give one breath every 2-3 sec

Confirm patient is pulseless or HR <60 if <8yo
Begin **CPR** @ 100-120 compressions/min with ventilation via BVM started ASAP

[1]AHA 2020 guidelines recommend administering Epinephrine ASAP after initiating CPR (i.e. do not wait 5 min)

- Apply cardiac monitor and defibrillator pads
- Assess cardiac rhythm

## Ventricular Fibrillation/ Pulseless VT

**Defibrillate** at 2J/kg once (max = adult dose)
Resume **CPR** immediately

- Establish IV/IO access
- **Epinephrine 0.1mg/ml (1:10,000)**[1] 0.01mg/kg IV/IO q3-5min (max = 1mg/dose)
- Insert advanced airway (ETT or SGA)
- Initiate continuous $EtCO_2$ monitoring
- Apply Impedance Threshold Device (ITD), if available, for patient ≥ 2 years old

If VF/pVT persists after 2 min:

**Defibrillate** at 4J/kg
Resume CPR immediately for an additional 2 minutes

If VF/pVT persists after an additional 2 min:

**Defibrillate** → **CPR** → Rhythm Check q2min until ROSC, asystole, or PEA

Defib dose = 4J/kg (consider escalating dose to 10J/kg)

After 3rd shock: **Amiodarone** 5mg/kg IV/IO may repeat bolus x2 prn (max 450 mg total)

If torsade de pointes: **Magnesium Sulfate** 50mg/kg IV/IO (max 2 g)

Search and treat reversible causes

## Asystole/PEA

- Establish IV/IO access
- **Epinephrine 0.1mg/ml (1:10,000)**[1] 0.01mg/kg IV/IO q3-5min (max = 1mg/dose)
- Insert advanced airway (ETT or SGA)
- Initiate continuous $EtCO_2$ monitoring
- Apply Impedance Threshold Device (ITD), if available, for patient ≥ 2 years old

Search and treat reversible causes

Continue **CPR** with rhythm/pulse check q2min until ROSC or Termination of Resucitation

Patients should be worked on-scene for a minimum of 30 minutes. CPR may be performed in back of ambulance to facilitate scene safety.

**Reversible Causes of Cardiac Arrest (Hs & Ts)**

**Hypovolemia** - 20mlg/kg NaCl bolus (max 60ml/kg)
**Hydrogen ion (acidosis)** – Sodium Bicarbonate (1 mEq/kg)
**Hypoglycemia** – Dextrose 10%/25%/50%
**Hyperkalemia** – Calcium Chloride 20mg/kg IV/IO (max 1g)
**Hypokalemia –** (*treat in hospital)*
**Hypothermia –** rewarming (ex. blankets, hot packs)
**Hypoxia –** supplemental Oxygen

**Toxins** – Naloxone 0.1mg/kg for opiates
**Tension pneumothorax** – 1.5 inch (not 2 in) 14/16G needle
**Trauma** - 20mlg/kg NaCl bolus (max 60ml/kg)
**Tamponade** (cardiac)
**Thrombosis, pulmonary** (i.e. PE)
**Thrombosis, coronary** (i.e. STEMI)

# Pediatric Upper Airway Obstruction: Croup/Stridor

Routine Medical Care

- Give 100% **Oxygen** via NRB mask
- Assist ventilations with BVM as needed
- Suction [bulb or mechanical] if excessive secretions are present

Attempt to keep child calm, avoid undue distress
Allow for position of comfort

Cardiac Monitor / Pulse ox / ETCO2

Stridor at Rest?

**No** → Continue to monitor and reassess frequently during transport

**Yes**

**Inhaled Epinephrine 1mg/ml (1:1000)**
3ml via NEBULIZER (no dilution needed)
May repeat prn if stridor at rest still present
*no max dose*

Respiratory Distress?

**No** → **Dexamethasone** (if available)
0.6 mg/kg PO/IV/IM/IO
(max 16mg)
** It is safe to give IV form orally, if tolerated**

**Yes**

**Assist Ventilations with BVM**
If unable to ventilate/oxygenate, place **Supraglottic Airway or Endotracheal Intubation**
(airway should be managed in least invasive way possible)

Assess for hypoperfusion and consider IV/IO access with NaCl 20ml/kg bolus

***The benefits of IV/IO access and fluid should outweigh the increased distress caused to the child***

Contact **Medical Control** for additional orders or consultation

Croup usually affects children under the age of 3 and is associated with cold symptoms, hoarse voice, and barking cough

**Serious signs / symptoms:**

- **Significant inspiratory stridor at rest (i.e. when child is not coughing or crying)**
- **Decreased responsiveness**
- **Apnea or cyanosis**
- **Inability to tolerate secretions**

Always also consider the possibility of foreign body aspiration

# Pediatric Lower Airway Obstruction: Wheezing due to Bronchiolitis

**Consider bronchiolits in patients under 2 yo, with recent URI, and with no history of asthma.**
**If patient has a hx of prematurity, asthma, prior albuterol use, or a family history of asthma, use the Lower Airway Obstruction: Asthma/Wheezing guideline instead.**

Routine Medical Care

- Suction the nose and/or mouth via bulb suction or properly sized suction catheter (wear PPE while suctioning)
- Administer **Oxygen** to obtain SpO2 > 90% (escalate from nasal cannula to face mask or non-rebreather mask as needed)

Cardiac Monitor/Pulse Ox/EtCO2

Is Response to Treatment Adequate?

**Yes**

- Transport in position of comfort
- Continue monitoring and reassessment during transport
- Be prepared to assist ventilations with BVM as needed

**No**

- Re-suction the nose and/or mouth
- Assist ventilations with BVM as needed for respiratory failure

Is Response to Treatment Adequate?

**Yes**

**No**

**Inhaled Epinephrine 1mg/ml (1:1000)**
3ml via NEBULIZER (no dilution needed)
Hold mask on the child's face

Contact **Medical Control** for additional orders or consultation

Signs of impending respiratory failure:

- Nasal Flaring
- Accessory Muscle Use
- "Silent Chest"
- "Silent Cry"
- Head Bobbing

Bronchiolitis is a viral illness characterized by fever, copious secretions, and respiratory distress It is typically seen November through April

**The most important interventions are to provide supplemental oxygen and suction secretions adequately and often**

**Age Appropriate Assisted Ventilation Rates**

**Neonates (<1 mo): 40 bpm**
**Infants (<1 yo): 30 bpm**
**Children (> 1yo): 20 bpm**

Consider IV/IO access with **Crystalloid Fluid** 20ml/kg bolus if signs of hypoperfusion/shock

# Pediatric Lower Airway Obstruction: Asthma/Wheezing > 2 yo

**Use this guideline for patients ≥ 2 years old with wheezing. Also consider this guideline for patients < 2 years old with a history of asthma, history of prematurity, family history of asthma, or who have responded to albuterol in the past.**

Routine Medical Care

- Suction the nose and/or mouth via bulb or suction catheter if excessive secretions are present
- Assist ventilations with BVM as needed for respiratory failure

Signs of impending respiratory failure:

- Nasal Flaring
- Accessory Muscle Use
- "Silent Chest"
- "Silent Cry"
- Head Bobbing

**Duo-Neb via Nebulizer**

**Albuterol Sulfate**
< 4 yo: 2.5mg
≥ 4 yo: 5mg

**Ipratropium Bromide**
500mcg (i.e 0.5mg)
(may repeat duoneb x 2 while administering other treatments)

***continue duonebs prn while en route***

Age Appropriate Assisted Ventilation Rates

Neonates (<1 mo): 40 bpm
Infants (<1 yo): 30 bpm
Children (≥ 1yo): 20 bpm

**If severe respiratory distress:**

**IM Epinephrine 1mg/ml (1:1000)**
(Thigh is preferred site)
< 25kg: 0.15 mg IM
≥ 25kg: 0.3 mg IM

Is Response to Treatment Adequate?

**Yes**

**Dexamethasone** 0.6mg/kg PO/IV/IM/IO (max 16mg)
** It is safe to give IV form orally, if tolerated **
or
**Methylprednisolone** 2 mg/kg IV/IM/IO (max 125mg)

- Continue monitoring and reassessment during transport
- Be prepared to assist ventilations as needed

**No**

- Start IV/IO
- **Dexamethasone** 0.6mg/kg PO/IV/IM/IO (max 16mg) or **Methylprednisolone** 2 mg/kg IV/IM/IO (max 125mg)
- **NaCl** 20ml/kg bolus if dehydration is suspected or patient is hypotensive
- Consider **Magnesium Sulfate** 50mg/kg IV over 10 min (max 2g) **may cause hypotension**

Is Response to Treatment Adequate?

**Yes**

**No**

- Assess for pneumothorax
- Assist ventilations with BVM as needed

Contact **Medical Control** for additional orders or consultation

# Pediatric Anaphylaxis / Allergic Reaction

(a) Evaluate for non-anaphylactic allergic reaction versus anaphylaxis
(b) Consider other specific protocols. e.g. airway management, breathing difficulty, shock

**Routine Medical Care**

**Determine Severity of Reaction**

**Non-Anaphylactic Allergic Reaction**

**Diphenhydramine**
1 mg/kg IV/IO/IM (max 50mg)

- Treat stridor as indicated in the **Upper Airway Obstruction** guideline.
- Treat wheezing and chest tightness as indicated in the **Lower Airway Obstruction** guideline.

**Anaphylaxis**

**IM Epinephrine 1 mg/ml (1:1000)**
(Thigh is preferred site)
If < 25kg, 0.15 mg IM
If ≥ 25kg, 0.3 mg IM
**May repeat x 1 after 5 min**

**Diphenhydramine**
1 mg/kg IV/IO/IM (max 50mg)

**Crystalloid Fluid** 20 mL/kg bolus IV/IO if hypotensive. Repeat x 1 prn

If prolonged transport:
**Methylprednisolone**[1] 2mg/kg (max 125mg) IV/IO/IM

**Medical Control for further orders**
Consider **Epinephrine** infusion
0.01-0.5 mcg/kg/min
if signs of anaphylaxis persist

**Non-anaphylactic allergic reaction:** symptoms involve only one organ system, generally considered a mild or moderate reaction

**Anaphylaxis:** more severe reaction that meets one of the following criteria:

A. Two or more body systems affected rapidly after exposure
- Skin involvement (rash, generalized itching)
- Mucosa involvement (angioedema, throat tightening sensation)
- Respiratory compromise (dyspnea, wheezing, stridor)
- Persistent GI involvement (vomiting, diarrhea, abdominal pain)
- Altered mental status, syncope, incontinence

or

B. Hypotension (for age) or respiratory compromise after known allergen exposure *(having two systems involved is not required)*

- **The mainstay of treatment for anaphylaxis is epinephrine.** Consider immediate IM epinephrine prior to IV/IO access in critically ill patients. Administration to the thigh is the fastest IM site. Use either the vastus lateralis or the rectus femoris.
- If patient has their own epinephrine via auto-injector you may assist them with using it.
- A dystonic reaction (to phenothiazines) is an adverse reaction **NOT** an allergic reaction. Patients may receive **Diphenhydramine** 1-2 mg/kg IV/IM.
- Reassess frequently for signs of deterioration, including impending airway obstruction

[1] Corticosteroids are not indicated as initial treatment for anaphylaxis in the place of epinephrine; they can be given as adjunctive therapy after the administration of epinephrine but should be considered optional.

# Pediatric Tachycardia

- Maintain airway
- Assist with BVM as needed
- Oxygen via NC, NRB, BVM
- 3 lead or 12 lead EKG

Routine Medial Care
12-lead EKG

- Pulse oximetry ($SpO_2$)
- End tidal capnometry ($EtCO_2$)
- IV/IO access
- Blood glucose

Evaluate QRS Duration

Narrow Complex Tachycardia (QRS ≤ 0.09 seconds)

Wide Complex Tachycardia (QRS > 0.09 seconds)

Evaluate EKG Rhythm

**Probable Supraventricular Tachycardia (SVT)**

- Vague, nonspecific history with abrupt rate changes
- P waves absent /abnormal
- Heart Rate not variable
- Infant rate usually over 220/min
- Child rate usually over 180/min
- Consider Valsalva Maneuver or ice to the face if there are no signs of shock, hypotension, poor perfusion, or altered mental status.
- Do not delay adenosine for valsalva.

Place pads on patient's chest prior to administering adenosine

**Adenosine** 0.1 mg/kg IV max 6mg (first dose). If second dose is needed, double the first dose (max 12mg)

**IF UNSTABLE**
**Synchronized cardioversion:**
0.5 – 1 J/kg (max 100J)
If repeat cardioversion is needed, 2 J/kg (max 200J)

**Probable Sinus Tachycardia**

- Compatible History with consistent known cause
- P waves present/normal
- Variable R-R
- Constant PR interval
- Infant rate usually under 220/min
- Child rate usually under 180/min

- Support ABC's
- $O_2$ as needed
- Consider sepsis and shock
- Observe
- Transport

**Possible Ventricular Tachycardia**

Cardiopulmonary Compromise Present?
- Hypotension?
- Acute Altered Mental Status?
- Signs of Shock?

**Yes**

**Synchronized cardioversion:**
0.5 – 1 J/kg (max 100J)
If repeat cardioversion is needed, 2 J/kg (max 200J)

If torsades de pointe (polymorphic VT)
**Magnesium Sulfate**
50 mg/kg IV/IO over 20 min (max 2g)

**No**

Place pads on patient's chest prior to administering adenosine

If rhythm is regular and monomorphic:
**Adenosine**
0.1 mg/kg IV
max 6mg (first dose).
If second dose is needed, double the first dose (max 12mg)

Contact **Medical Control** for additional orders or consultation

**Consider Contributing Factors (Hs & Ts)**

**Hypovolemia**
**Hydrogen ion (acidosis)**
**Hypoglycemia**
**Hyper-/Hypokalemia**
**Hypothermia**
**Hypoxia**
**Trauma**
**Tension Pneumothorax**
**Tamponade (cardiac)**
**Thrombosis, pulmonary**
**Thromobosis, coronary**

# Pediatric Bradycardia

**Pediatric patients become bradycardic just prior to arrest – Look at your patient not the monitor**

- Patients perfusing well and without respiratory compromise usually do not require emergency treatment for bradycardia
- [1]Chest compressions should not be delayed for an EKG and should continue while bradycardia is being treated.
- **The most common cause of pediatric bradycardia is hypoxemia – recognize it and treat it quickly**

**Cardiopulmonary Compromise Present?**
- Hypotension
- Acute Altered Mental Status?
- Signs of Shock?

**No**

- Support ABC's
- $O_2$ as needed
- Obtain 12 Lead EKG
- Observe
- Transport
- Identify and treat underlying causes

Use caution when intubating and suctioning patients <1 yo - excessive vagal stimulation can cause further bradycardia.

Contact **Medical Control** for additional orders or consultation

**Yes**

**If HR <60 and <8 yo**
**Start CPR immediately[1]**

- Ensure adequate oxygenation/ventilation
- Obtain 12 Lead EKG

Poor Perfusion and/or Compromise Persists?

**No**

**Yes**

**Push Dose Epinephrine 10mcg/ml (1:100,000)**
1 mL/min IV/IO
may repeat q5min x 2 (3 doses total)
titrate to maintain age-appropriate SBP
**Do NOT administer dose faster than 1ml/min**

**To Make Push Dose Epinephrine**

Using a 1ml syringe, draw 0.1ml of 0.1mg/ml (1:10,000) Epinephrine and 0.9 ml of NS (syringe = 10mcg/ml Epinephrine)

*contraindicated in traumatic shock*

If bradycardia or age-appropriate hypotension persists:
**Epinephrine 0.1mg/ml (1:10,000)**
0.01 mg/kg IV/IO q 5 min prn (max 1mg)

If the bradycardia is due to vagal stimulation or AV block:
**Atropine Sulfate** 0.02 mg/kg IV/IO
(min dose 0.1mg, max single dose 0.5mg)
repeat x 1 prn

**Pacing (TCP)** as needed to support cardiorespiratory function
- Initial rate of 80 beats per minute
- increase milliamps until capture is gained
- Increase the rate as needed until patient is hemodynamically stable

**Reversible Causes of Bradycardia (Hs & Ts)**

**Hypovolemia** - 20mlg/kg NaCl bolus (max 60ml/kg)
**Hydrogen ion (acidosis)** – Sodium Bicarbonate (1 mEq/kg)
**Hypoglycemia** – Dextrose 10% or Dextrose 25%
**Hyperkalemia** – Calcium Chloride 20mg/kg IV/IO (max 1g)
**Hypokalemia** – (*treat in hospital)*
**Hypothermia** – rewarming (ex. blankets, hot packs)
**Hypoxia** – supplemental Oxygen

**Toxins** – Naloxone 0.1mg/kg for opiates
**Tension pneumothorax** – 1.5 inch (not 2 in) 14/16G needle
**Trauma** - 20mlg/kg NaCl bolus (max 60ml/kg)
**Tamponade** (cardiac)
**Thrombosis, pulmonary** (i.e. PE)
**Thrombosis, coronary** (i.e. STEMI)

# Pediatric Shock

[1]Manage anaphylactic shock as per **Pediatric Anaphylaxis** guideline

[2] Alert the hospital if you have a sepsis patient!

**Risk Factors for Septic Shock**

Cancer
Sickle Cell disease
Catheters (PICC, Foley, etc)
Immune deficiency or compromise
History of transplant
Severe developmental delay

Routine Medical Care / Trauma Care

- Include temperature
- Look for associated injuries

Place 1 or 2 IVs of the largest size possible (consider IO after two unsuccessful attempts)

Consider etiology of shock state

**General Signs of Shock**

- Altered mental status
- Delayed/flash capillary refill
- Weak or decreased pulses
- Tachycardia*
- Elevated RR
- Hypoxemia
- Hypotension for age
- Decreased urine output

***sometimes tachycardia is the only symptom***

Normal SBP = 70 + (age in yrs x 2)

[1]Anaphylactic | [2]Septic | Hypovolemic | Neurogenic

**Crystalloid Fluid bolus**
20 mL/kg IV/IO (max 1L)
*deliver bolus as quickly as possible*
(infuse over <15 minutes)

Obstructive

- High flow $O_2$ via NRB
- Evaluate lung sounds
- Decompress tension pneumothorax (consult **Med Control** prn)

Cardiogenic

- Evaluate lung sounds
- **Crystalloid Fluid bolus** 10 mL/kg IV/IO (max 500 mL)

- Reassess vital signs and perfusion
- Look for signs of fluid overload (ex. JVD, crackles, hepatomegaly, hx of heart failure)

Are there signs of fluid overload?

**No** → Repeat prior **Crystalloid Fluid bolus** 20 ml/kg (if cardiogenic 10ml/kg)

**Yes** → Start **Epinephrine infusion**[3] 0.01-0.5 mcg/kg/min

[3]Consider Vasopressor Infusion:

**Epinephrine** 0.01–0.5 mcg/kg/min
or
**Norepinephrine** 0.01–0.5 mcg/kg/min

[3]While preparing infusion, consider

**Push Dose Epinephrine** 1ml IV/IO - may repeat q5min x 2 (3 doses total)
**Do NOT administer faster than 1ml/min**

To Make:
Using a 1ml syringe, draw 0.1ml of 0.1mg/ml (1:10,000) Epi and 0.9 ml of NS (syringe = 10mcg/ml Epinephrine)

* contraindicated in traumatic shock*

**Normal Vital Signs by Age**

| AGE | HEART RATE (beats/min) | BLOOD PRESSURE (mmHg) | AGE | HEART RATE (beats/min) | BLOOD PRESSURE (mmHg) |
|---|---|---|---|---|---|
| Premature | 120-170 | 55-75/35-45 | 1-3 yr | 70-110 | 90-105/55-70 |
| 0-3 mo | 100-150 | 65-85/45-55 | 3-6 yr | 65-110 | 95-110/60-75 |
| 3-6 mo | 90-120 | 70-90/50-65 | 6-12 yr | 60-95 | 100-120/60-75 |
| 6-12 mo | 80-120 | 80-100/55-65 | 12+ yr | 55-85 | 110-135/65-85 |

Contact **Medical Control** for additional orders or consultation

# Pediatric Altered Mental Status

**Differential Diagnosis**

- **A** Alcohol, Anemia, Anaphylaxis
- **E** Epilepsy, Electrolytes, Encephalopathy
- **I** Insulin, Inborn Errors, Intussusception
- **O** Oxygen, Opiates
- **U** Uremia
- **T** Trauma, Tumor, Temperature
- **I** Infection, Ingestion
- **P** Poison, psychiatric
- **S** Shock, Space occupying lesion

**How to make:**

**D25:** remove/discard 25ml of D50 from ampule & replace with 25ml of NaCl

**D10:** remove/discard 40ml of D50 and replace with 40ml of NaCl

**General Signs of Shock**[1]

- Altered mental status
- Delayed/flash capillary refill
- Weak or decreased pulses
- Tachycardia*
- Elevated RR
- Hypoxemia
- Hypotension for age
- Decreased urine output

***sometimes tachycardia is the only symptom***

Normal SBP = 70 + (age in yrs x 2)

Routine Medical Care (including $CO_2$ & temperature)

Upper airway or respiratory compromise? **Yes** → Give **Oxygen** via NRB mask or BVM; Go to appropriate **Pediatric Upper** or **Lower Airway Obstruction** guideline

**No**

Bradycardia if < 8 yo? **Yes** → **Pediatric Bradycardia guideline**

**No**

Suspicion of opiate/opioid ingestion? **Yes** → Give **Naloxone** 0.1mg/kg (max 2mg) q3min IV/IO/IN – titrate prn

**No**

Signs of shock?[1] **Yes** → **Pediatric Shock guideline**

**No**

Obvious signs of trauma? **Yes** → **Routine Trauma Care & appropriate Trauma guideline**

**No**

Capillary Blood Glucose (CBG) < 60 mg/dl? (<40 mg/dl if newborn) **Yes** → **Dextrose 25%** 2ml/kg age 1-7yo; **Dextrose 10%** 5ml/kg age <1 yo

**No**

Recent or current seizure activity? **Yes** → **Pediatric Seizure guideline**

**No**

Positive Cincinnati Prehospital Stroke Scale? **Yes** → **Adult Stroke guideline**

**No**

**Consider other causes of AMS:**
e.x. encephalopathy, CO poisoning, anaphylaxis, psychiatric

Contact **Medical Control** for additional orders or consultation

# Pediatric Seizure

**Consider febrile seizures in patients under the age of 5 who have no seizure history and have a fever**

Routine Medical Care

- Check pulse
- Reassess ABCs
- Give supplemental oxygen

**How to make:**

**D25:** remove/discard 25ml of D50 from syringe & replace with 25ml of NaCl

**D10:** remove/discard 40ml of D50 and replace with 40ml of NaCl

Is patient actively seizing upon EMS arrival?

**Yes** → Administer **Midazolam** 0.2mg/kg IM/IN (max 5mg) prior to obtaining IV access

**No** →

- Symptomatic care
- Look for signs of trauma and/or head injury

- Obtain IV access
- Check capillary blood glucose

If CBG <60 mg/dl, give **IV/IO Dextrose**

**Dextrose 25%** 2ml/kg age 1-7

**Dextrose 10%** 5ml/kg age < 1

Contact **Medical Control** for additional orders or consultation

After 5 min is patient still seizing?

**Yes** →

**Give Benzodiazepine (Midazolam is 1st choice if available):**

| | | |
|---|---|---|
| **Midazolam** | 0.1mg/kg IV/IO (max 2mg)<br>0.2mg/kg IM/IN (max 5mg) | **Repeat dose q5min x1 (two doses total)** |
| **Lorazepam** | 0.1mg/kg IV/IO/IM (max 4mg)<br>* do not give Lorazepam via IN route | |
| **Diazepam** | 0.2mg/kg IV/IO/IM (max 5mg if <5 yo, 10mg if <10 yo)<br>0.2mg/kg IN if 12yo-adult<br>0.3 mg/kg IN if 6-11yo<br>* do not give Diazepam via IN route if <6yo<br>0.5 mg/kg PR (max 20 mg) – use as last resort | |

**No** →

- Symptomatic care
- Look for signs of trauma and/or head injury
- Obtain IV access prior to transport

Generalized or complex partial seizure activity begins in the presence of EMS?

**Yes** →

- Universal seizure precautions: (a) ensure airway patency – do not force anything between teeth, (b) keep patient on side, (c) protect patient from injury, (d) suction as needed, (e) check pulse immediately after seizure stops
- Status epilepticus is defined as continuous seizure activity≥ 5 minutes without return of consciousness or 2 or more seizures without an intervening period of neurologic recovery. **Status epilepticus should be treated the same regardless of the type of seizure.**

# Pediatric Nausea / Vomiting & Dehydration

Routine Medical Care
(including temperature)

Intractable nausea/vomiting related to illness, intoxication or pre-hospital narcotic administration?

**YES**

**Give Ondansetron:**
2mg IV/IO/PO (8-15 kg)
4mg IV/IM/PO (> 15 kg)
* IV form may be given orally in the same dose *

- Consider **Crystalloid** fluid bolus 20 mL/kg (10mL/kg for neonates) if signs or symptoms of dehydration are present[1]
- Treat hypovolemic shock as per **Pediatric Shock** guideline – may repeat crystalloid bolus x 2 if needed

Contact **Medical Control** for additional orders or consultation

**Normal Vital Signs by Age**

| AGE | HEART RATE (beats/min) | BLOOD PRESSURE (mm Hg) |
|---|---|---|
| Premature | 120-170* | 55-75/35-45 |
| 0-3 mo | 100-150* | 65-85/45-55 |
| 3-6 mo | 90-120 | 70-90/50-65 |
| 6-12 mo | 80-120 | 80-100/55-65 |
| 1-3 yr | 70-110 | 90-105/55-70 |
| 3-6 yr | 65-110 | 95-110/60-75 |
| 6-12 yr | 60-95 | 100-120/60-75 |
| 12+yr | 55-85 | 110-135/65-85 |

*In sleep, infant heart rates may drop significantly lower but if perfusion is maintained no intervention is required

[1] Signs and Symptoms of Dehydration/Shock:

- Tachycardia
- Lethargy
- Pale, cool extremities
- Absent tears
- Sunken fontanelle
- Poor skin turgor
- Capillary refill > 2 seconds
- Weak peripheral pulses

**normal SBP = 70 + (age in yrs x2)**

# Pediatric Traumatic Pain Management

Routine Medical Care / Trauma Care

- Evaluate mechanism of injury
- Assess the need for spinal precautions per **Spinal Motion Restriction** guideline

Attempt comfort therapies first:
- Place patient in position of comfort
- Splint/support painful areas
- Consider ice and/or compresion

Record level of pain by either asking patient to rate on scale 1-10 or using FACES scale

Administer **one** of the following for moderate to severe (4-10) pain:

**Fentanyl IV** 1mcg/kg

or

**Fentanyl IN** 1 – 2mcg/kg

(max 100mcg)

or

**Morphine Sulfate**

0.05mg/kg IV (< 1 year od)

0.1mg/kg IV (≥ 1 year old)

Have **Naloxone** readily available to treat narcotic-induced respiratory depression.

Reassess pain level 5-10 min after treatment

If pain remains severe (score: 8-10)
**contact Medical Control**
for additional orders to

repeat **Fentanyl** or **Morphine** dose

or

give **Ketamine** 0.5mg/kg IN


[1]Wong-Baker FACES of pain rating scale.

# Neonatal Resuscitation

**[1]Preductal SpO2 Target**

**1 min 60-65%**
**2 min 65-70%**
**3 min 70-75%**
**4 min 75-80%**
**5 min 80-85%**
**10 min 85-95%**

**[1]Measure on patient's right hand**

[2] Initial HR assessment is most accurate using a stethoscope placed on the left side of the chest

**Term Newborn Vital Signs**

**Heart rate 120 – 160**
**Respiratory Rate 30 – 60**
**SBP 56 – 90 mm/Hg**
**DBP 26 – 56 mm/Hg**
**Glucose ≥ 40 mg/dL**

Birth

**Term Gestation? Good Tone? Breathing or Crying?**

**Yes** → No resuscitation is needed; dry the newborn and keep warm. Clear/suction secretions if needed.

**No**

1 minute

Keep the newborn warm. Position, dry to stimulate breathing, oxygenate prn, clear/suction secretions as needed

Inadequate breathing? [2]HR < 100/min?

**No** → Labored breathing or persistent cyanosis?

**Yes**

Positive Pressure Ventilation
EKG monitoring
$SpO_2$ monitoring[1]

**Yes**

Position and clear airway
$SpO_2$ monitoring
Supplemental O2 as needed
Positive pressure ventilation PRN

HR <100/min?

**No** → Post Resuscitation Care

**Yes**

Check chest rise/fall
Take ventilation corrective steps
ETT as needed (x1 attempt)

30 seconds

HR <60/min?

**No**

**Yes**

Chest compressions and ventilatory support to correct HR.
(Use a 3:1 ratio unless suspected cardiac etiology, then use a 15:2 ratio)
After 2 minutes of chest compressions and ventilatory support without a spontaneous return of HR > 60 administer
**Epinephrine 0.1mg/ml (1:10,000)** 0.01 to 0.03mg/kg IV/IO

HR <60/min after 60 seconds of CPR?

**Yes**

Consider hypovolemia
Consider pneumothorax

Contact **Medical Control** for additional orders or consultation

**APGAR SCORING SYSTEM**

| | 0 Points | 1 Point | 2 Points | Points totaled |
|---|---|---|---|---|
| Activity (muscle tone) | Absent | Arms and legs flexed | Active movement | |
| Pulse | Absent | Below 100 bpm | Over 100 bpm | |
| Grimace (reflex irritability) | Flaccid | Some flexion of Extremities | Active motion (sneeze, cough, pull away) | |
| Appearance (skin color) | Blue, pale | Body pink, Extremities blue | Completely pink | |
| Respiration | Absent | Slow, irregular | Vigorous cry | |

| | |
|---|---|
| Severely depressed | 0-3 |
| Moderately depressed | 4-6 |
| Excellent condition | 7-10 |

APGAR score at 1 and 5 minutes postpartum

Routine intubation for tracheal suction with presence of meconium-stained amniotic fluid is NOT recommended. It is only indicated if airway obstruction is suspected after providing positive pressure ventilation.

THIS PAGE INTENTIONALLY LEFT BLANK

# Region One Protocol Effort

# HAZMAT Guidelines

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Hazardous Materials Preambles

This introduction provides a framework for providers responding to an incident involving hazardous material (HAZMAT) release and chemical, biological, radiological, nuclear, and explosives (CBRNE) agents. All EMS providers are expected to have regular HAZMAT training at the awareness level – providers should be able to recognize a HAZMAT situation and not become part of the problem. Providers should begin their response with the following assumptions:

- There will not be advanced notification for most of these incidents.
- Information regarding the hazardous agent(s) may not be available immediately.
- There are a limited number of on-duty medical first responders and transport units available.
- Many patients will not necessarily have been decontaminated prior to departing the scene of the incident and will self-refer to nearby healthcare facilities.

**I. DEFINITIONS**

- **"Hazardous Materials":** substances, such as chemicals, that endanger a person's health or life when ingested, inhaled, absorbed (through the skin or mucous membranes), or injected under skin (ex. by abrasion, cut, or shot), or absorbed. These substances shall be considered a threat to the health and life of EMS personnel. A hazardous material can be identified by its location, its use, and labels, placards, and signs attached to it.

- **"Weapons of Mass Destruction (WMD)":** includes any chemical, nuclear or biological agent used in terrorist activities to threaten or inflict intentional harm or death to a given population.

- **"Nerve agents":** extremely toxic organophosphate-type chemicals, including GA (tabun), GB (sarin), GD (soman), GF (cyclosarin), and VX, which attack the nervous system and interfere with chemicals that control nerves, muscles, and glands. G-series nerve agents are odorless and invisible and can be inhaled, absorbed through the skin, or swallowed. Traditionally classified as WMDs.

- **"Decontamination":** the process by which hazardous materials are removed from an exposed person. This process may involve removal of the patient's clothing, rinsing the patient with a high-volume water bath, washing the patient's body with a neutralizing agent, and/or irrigation of the eyes. Persons who have been decontaminated shall be considered safe for evaluation and treatment by responding personnel.

**II. ROLES/RESPONSIBILITIES**

The HAZMAT Team or Hazardous Materials Unit (HMU), under direction of the Incident Commander, assumes responsibility for control of a HAZMAT incident. EMS personnel should coordinate treatment/transport efforts with the HAZMAT Team so as not to jeopardize scene integrity or cause unnecessary spread of contamination to the ambulance, hospital personnel, or bystanders.

(1) **HAZMAT Team** – the HAZMAT team or unit (frequently associated with the fire department) is primarily responsible for identification, rescue, and decontamination. The HAZMAT team is frequently, but not always, associated with the fire department. The responsibilities of the HAZMAT team include:

a. Identifying the hazard(s) and material(s),
b. Determining the appropriate PPE requirements,
c. Determining initial estimate of victims,
d. Determining the control zones
    i. Staging area
    ii. Hot, Warm, Cold
    iii. Gross decontamination

The HAZMAT team/unit frequently is equipped to provide temporary disposable garments to decontaminated patients to prevent hypothermia and secondary contamination.

The HAZMAT team is often not first to a scene or hazardous incident; they should be requested as an additional resource via dispatch as soon as the need is identified.

(2) **Law Enforcement Officers (LEOs)** – LEOs are responsible for managing initial area isolation and extended evacuation, and egress control for EMS. LEOs will also identify additional explosive hazards associated with explosive events and determine the control zones and staging area to prevent injuries from secondary devices.

(3) **EMS** - the responding EMS personnel assume responsibility for patient care and transportation after decontamination and release by the HAZMAT team. Roles of EMS providers include:
    a. Patient triage
    b. Patient treatment
    c. Patient transport
    d. Provision of HAZMAT-specific medical care, including,
        i. Identifying intoxicating agent
        ii. Identifying antidote or mitigating agent
        iii. Treating signs and symptoms in effort to stabilize patient
        iv. Assessing for risk of organ impairment
    e. Communications with local healthcare facilities

Any EMS personnel not trained to the technician level of HAZMAT education and equipped with Level A or B PPE should not enter a potentially hazardous scene until the HAZMAT team arrives with further instruction. HAZMAT technician level EMS providers should consider the available and needed resources prior to entering a hazardous scene to ensure they have adequately trained back-up if needed.

**III. SCENE SAFETY & SIZE-UP**

When responding to a possible HAZMAT event the safety and security of first responders is a priority. It is important to stay upwind and uphill of all hazards when approaching the area and during staging prior to

entering the cold zone established by Hazmat Team. Safe distances for specific chemical may be determined from the Department of Transportation's *North American Emergency Response Guidebook.*

**Initial Notification**

Providers should communicate with Dispatch prior to arrival to identify a safe route to the scene and staging location. Necessary information to facilitate safe entry includes:

a. Estimated number of victims or potential victims

b. Urgency of the incident

c. Approach to the incident (i.e. Ingress and egress)

d. Location of the staging area

e. Identification (radio designation) of the Incident Commander

f. Hazardous substance involved

g. Request for specialized equipment needed

**Scene Arrival**

Initial evaluation includes (1) establishment and activation of an incident command/management system, (2) confirmation of scene security via perimeter and crowd control, and (3) activation of the appropriate guidelines for treatment, including a possible MCI or terrorist response.

Responders First On-Scene

The first arriving paramedic on scene should act as EMS Incident Commander (IC) until relieved by a higher ranking personnel capable of assuming command. The EMS Incident Commander is expected to:

a. Confirm the location of the staging area with the Fire Department on scene and notify dispatch.

b. Confirm the following information from the HAZMAT Team IC:
   - Specific chemical involved
   - Chemical state (liquid, gas, solid) and amount
   - Type/level of PPE required
   - Number of victims involved - if there are > 5-10 Red (Immediate) and/or $10^{+}$ (Yellow) or Green (Minor) patients, providers should activate the Mass Casualty Incident (MCI) plan if they anticipate rapidly exhausting available EMS resources.

c. Notify EMS Dispatch of:
   - Description of hazard
   - Number of patients
   - Risks to providers en route (e.g. necessary PPE, concern for nerve agent exposure)
   - Any other pertinent information relative to hospital needs (e.g. concomitant trauma or burns, decontamination capability of receiving facility)

All Other Responders

If the scene has not been secured and a staging area has not been established, the ambulance unit should make radio contact with the Incident Commander for staging instructions. Once the scene has been secured, the first-in ambulance unit should enter the staging area and report to the Incident Commander for further instructions.

In addition to providing patient care, qualified EMS personnel may be asked to assume any of the following roles: Safety Officer, EMS Section Officer (e.g. Triage, Treatment, Transportation, Communications), Rehabilitation Officer, or Public Information Officer.

In the absence of an Incident Commander and/or a staging area, EMS personnel should avoid entering the contaminated area.

**Levels of PPE**[1]

Personal protective equipment is divided into four categories based on the degree of protection afforded. Level B protection is the minimum level recommended on initial site entries until the hazards have been further identified and defined. Most EMS providers without additional Hazmat/Rescue training are equipped with Level C or Level D protection.

- **Level A protection should be worn when the highest level of respiratory, skin, eye and mucous membrane protection is needed**. A typical Level A ensemble includes:
    - Positive pressure (pressure demand), self-contained breathing apparatus (SCBA) (NIOSH approved), or positive-pressure supplied air respirator with escape SCBA.
    - Fully encapsulating chemical protective suit.
    - Gloves, inner, chemical resistant.
    - Gloves, outer, chemical resistant.
    - Boots, chemical resistant, steel toe and shank; (depending on suit boot construction, worn over or under suit boot.)

- **Level B protection should be selected when the highest level of respiratory protection is needed, but a lesser level of skin and eye protection is needed.** A typical Level B ensemble includes:
    - Positive-pressure (pressure-demand), self-contained breathing apparatus (NIOSH approved), or positive-pressure supplied air respirator with escape SCBA.
    - Chemical resistant clothing (overalls and long-sleeved jacket, coveralls, hooded two-piece chemical splash suit, disposable chemical resistant coveralls.)
    - Gloves, outer, chemical resistant.
    - Gloves, inner, chemical resistant.
    - Boots, outer, chemical resistant, steel toe and shank.

- **Level C protection should be selected when the type of airborne substance is known, concentration measured, criteria for using air-purifying respirators met, and skin and eye exposure is unlikely.** Level C provides the same skin protection as Level B but a lower level of respiratory protection. A typical Level C ensemble includes:
    - Full-face or half-mask, air-purifying respirator (NIOSH approved).
    - Chemical resistant clothing (one-piece coverall, hooded two-piece chemical splash suit, chemical resistant hood and apron, disposable chemical resistant coveralls.)
    - Gloves, outer, chemical resistant.

[1] US Department of Health & Human Services. https://chemm.nlm.nih.gov/ppe.htm#levels

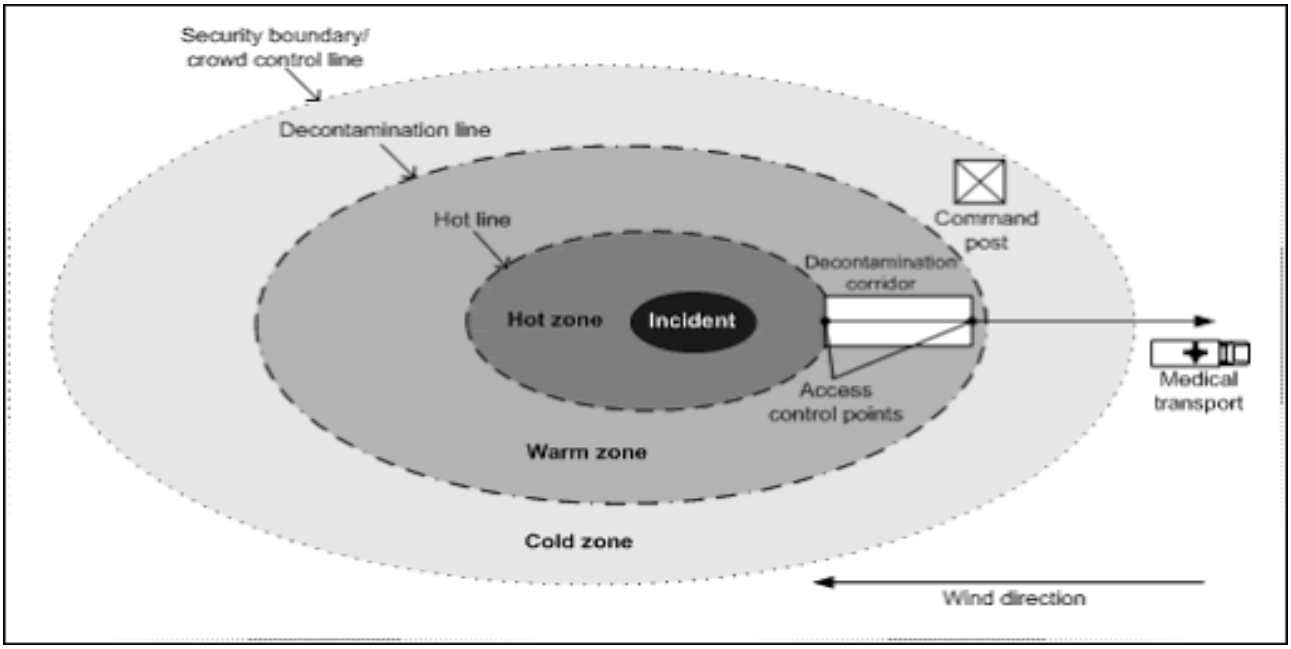
- Gloves, inner, chemical resistant.
- Boots, steel toe and shank, chemical resistant.

- **Level D protection is primarily a work uniform and is used for nuisance contamination only**. It requires only coveralls and safety shoes/boots. Level D provides no respiratory protection and minimal skin protection. Other PPE is based upon the situation (types of gloves, etc.). It should not be worn on any site where respiratory or skin hazards exist.

The EMS Incident Commander should confirm with the Hazmat IC what level of PPE is needed within each zone of care; this will vary based upon the situation and agent.

**IV. ZONES OF CARE**[23]

Zones of care delineate locations that require different levels of care and/or safety. Operationally, these zones help define the personnel and equipment that can and should be used depending on the type of incident. EMS zones are dynamic and fluid. Safety is paramount and the goal is to effectively transition the patients from the location of potential harm to definitive care.




*Source: www.averagejakefirefighter.com*

Hot (Exclusion) Zone: The area of the EMS scene considered to be contaminated (actually or potentially) and having the highest potential for exposure. No responder should enter the hot zone without adequate PPE. The hot zone is maintained by a perimeter (aka "hot line") and should encompass all known or suspected hazardous materials.

Warm (Contamination Reduction) Zone: The area of the EMS scene that transitions between the hot and cold zone. This is the area where decontamination occurs, including decontamination of first responders entering

[2] StatPearls [Internet]. www.ncbi.nlm.nih.gov/books/NBK436017/
[3] EMRA EMS Essentials. www.emra.org/books/emra-ems-essentials/chapter-7-haz-mat/

and exiting the hot zone. Initial triage also takes place in the warm zone. This intermediate zone of protection is determined by the length of the decontamination corridor which contains all of the needed decontamination stations.

Cold (Support) Zone: The area of the EMS scene determined to be free of all hazardous materials and contamination, including discarded protective clothing and respiratory equipment. The command post, planning, and staging areas should be located in the cold zone, upwind and uphill of the red zone.

**Ensure that personnel assigned to operate within each zone have the proper level of PPE and training.**

**V. PATIENT DECONTAMINATION**

Victims contaminated by a hazardous substance or radiation must be appropriately decontaminated by the HAZMAT Team prior to being moved to the triage area for transportation. Decontamination consist of two phases[4]:

(1) The Gross Decontamination phase occurs in the "hot" zone and includes the medical provider's primary assessment of ABCs, as well as the cutting away of clothing and jewelry once immediately life-threatening emergencies such as respiratory failure and hemorrhage are addressed. Open wounds should be cleaned and then covered with a water repellant dressing. The patient should then be rinsed with tepid water from head to toe.

(2) The Definitive Decontamination phase occurs in the "warm" zone and involves making the patient as clean as possible before transferring to the support zone and receiving facilities. Guidelines on duration of decontamination vary, but generally fall between 3-5 minutes, if not longer. If resources or time constraints do not allow for thorough cleansing, the patient should be cocooned in a blanket or sheet prior to transfer.

Transfer of the patient from the Hot Zone to the Cold Zone must be carefully coordinated to prevent the spread of contamination. The urgency of the situation should not change the handling of the contaminated personnel or equipment.

The removal of clothing and shoes will reduce external contamination by 70-90%. Thorough washing with soap and water will provide over 95% decontamination. Contaminated clothing and personal articles should be properly prepared for disposal by the HAZMAT Team. Double bagging removed clothing is ideal.

**Decontamination Procedure**

1. HAZMAT Team IC will establish hot, warm, and cold zones of operation.
2. HAZMAT and EMS Incident Commanders will ensure that personnel assigned to operate within each zone have proper PPE and training.
3. In coordination with other public safety personnel, EMS providers will ensure that each patient from the hot zone undergoes appropriate initial decontamination specific to the exposure. Only immediate life threats (i.e. ABCs) should be addressed by hot/warm zone providers at the same time as the initial (i.e. gross, high volume rinse) decontamination is occurring.

[4] EMRA EMS Essentials. www.emra.org/books/emra-ems-essentials/chapter-7-haz-mat/

4. Further/repeat triage for treatment and transport may occur in the cold zone after secondary decontamination (i.e. thorough washing). In the event of an MCI, providers should place triage identification tags on each patient.
5. If patient personal belongings removed during decontamination are not disposed of by the Hazmat Team, providers should attempt to match patient belongings with the tag/triage information. Personal belongs should then be preserved for law enforcement. This should include all jewelry, cellular phones, clothing, etc.
6. EMS providers should ensure patient is grossly/initially decontaminated prior to being placed in an EMS unit for evaluation or transport.
7. EMS providers should monitor all patients for environmental illness (e.g. hypo- or hyperthermia)
8. Transport patients per ROPE guideline – consider MCI activation for major incidents.
9. Notify receiving facility as early as possible to allow for emergency department preparations.

**VI. PATIENT CARE**[5,6]

**General Care**

EMS treatment of the Hazmat patient is no different from standard patients, with the exception of the provider protecting oneself from contamination. Some hazardous agents persist despite decontamination and require EMS providers to continue wearing PPE after patient decontamination and during patient transport. This should be clarified with the Hazmat IC prior to patient evaluation. Providers also should prepare for the potential of secondary contamination through body fluids, emesis, and/or belching in patients with a history of toxic ingestion.

As previously stated, life threats should be addressed during the primary survey concurrent to the initial decontamination process. The secondary survey occurs when time allows. Unless required by life threatening conditions, invasive procedures (e.g. IV injection, intubation) should be performed only in fully decontaminated areas because they may create a direct route for introducing hazardous material into the patient. Providers should remember to reassess the patient frequently because many chemicals have latent physiological effects.

Most contaminated patient can be handled with symptomatic care. However, antidote specific treatment is outlined in the following Hazmat guidelines.

**Toxidromes**

Occasionally patients will display a constellation of signs and symptoms that aid in the identification of a hazardous agent. More common toxidromes are opioids, sedatives hypnotics, and the sympathomimetic syndrome seen after stimulant use. Other toxidromes that should be recognized and potentially treated in the prehospital setting include (1) Calcium channel and Beta blocker overdose, (2) Na-channel blockade and (3) Acetylcholinesterase inhibition.

[5] EMRA EMS Essentials. www.emra.org/books/emra-ems-essentials/chapter-7-haz-mat/
[6] Centers for Disease Control and Prevention: Managing Hazardous Materials Incidents. https://www.atsdr.cdc.gov/mhmi-v1-3.pdf

Beta & Calcium-Channel Blocker Toxicity

Beta blockers and cardioselective calcium-channel blockers both block the heart's AV node and reduce the effects of adrenaline. Severe overdose can result in cardiovascular collapse. A single pill of either of these drugs can kill a toddler.

In therapeutic doses, beta and calcium-channel blocker reduce heart rate and blood pressure. Not surprisingly, early signs of their toxicity include bradycardia, AV heart block, and hypotension. Multiple drugs are frequently required for stabilization of these patients. Providers should give Crystalloid fluid boluses initially for hypotension. Atropine may be required if the patient is hypotensive and bradycardic, though it is likely to be less helpful in severe overdoses. In the case of calcium channel blocker overdose, the administration of IV Calcium can be used to treat fluid-resistant hypotension. Medical Control should be contacted for these orders. Glucagon use is controversial; its use for either overdose should be discussed in consultation with Medical Control.[7]

The presence of hyperglycemia (in a non-diabetic patient) can help differentiate calcium channel versus beta blocker toxicity. Calcium channel exist in the pancreas and become ineffective during overdose. There may be a relationship between the severity of the ingestion and the extent of the hyperglycemia. Seizures and coma are rare and usually signify the presence of a co-ingestant.

Propranolol is a unique beta-blocker whose toxicity presents more like a sodium channel blocker overdose and should be treated as such.

Sodium Channel Blocker Toxicity

Na-channel blockade may be seen with several prescription drugs (e.g. carbamazepine, lamotrigine, citalopram, flecainide) but is most attributed to tricyclic antidepressants. Cocaine also has Na-channel blocking effects. The **SALT** syndrome[8] is used to describe the common clinical features seen with Na-channel blockade:

**S**hock
**A**ltered Mental Status
**L**ong QRS (wide complex > 100ms)
**T**erminal R wave in lead aVR is prominent (other EKG findings include AV conduction blocks, VT, and VF)

If Na-channel blockade is suspected, EMS providers should anticipate the need for early airway management and treatment of shock, referring to those respective medical guidelines. Sodium bicarbonate is the mainstay of treatment for severe Na-channel blockade toxicity. Sodium bicarbonate should be given if a wide QRS, ventricular arrythmia, or shock is present - Medical Control should be contacted for this order. Sodium Bicarbonate is ineffective for managing agitation or seizures; benzodiazepines may also be needed.

[7] Life in the Fast Line. https://litfl.com/glucagon-as-an-antidote/
[8] Tarascon Adult Emergency Pocketbook, 4th Ed.

Cholinergic Crisis (Acetylcholinesterase Inhibitor – AChEi - Exposure)[9]

Organophosphate and carbamate insecticides inhibit acetylcholinesterase enzymes and increase acetylcholine concentration, leading to cholinergic crisis. **DUMBELS** is a common mnemonic used to describe the signs and symptoms of cholinergic crisis.

Patients can manifest any or all of the signs and symptoms based on the route of exposure, agent involved, and concentration of the agent:

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

The ultimate cause of death with AChEi exposure is due to hypoxia/anoxia from pulmonary edema caused by profound bronchial secretions. The primary antidote for cholinergic crisis is atropine. Atropine should be administered liberally and repeatedly until the patient's secretions resolve and respiratory effort improves; ongoing treatment should not be based upon heart rate or pupillary response. Atropine doses over 20mg are sometimes necessary; the stock available to a single provider is usually not sufficient to fully treat the victim but it should be initiated and continued during transport.

Pralidoxime chloride (aka 2-PAM) is a secondary antidote that augments the effect of atropine. Pralidoxime should be used concurrently with atropine when available; generally, no more than 2-3 doses of pralidoxime is administered to an adult patient. Several commercially available antidote kits have autoinjectors that contain both atropine and pralidoxime. If using a dual antidote autoinjector, providers must calculate the amount pralidoxime administered each time to prevent pralidoxime overdoses while giving multiple rounds of atropine. Further guidance on treatment is outlined in the corresponding HAZMAT guideline.

**Nerve Agents**

Nerve agents also inhibit acetylcholinesterase enzymes and cause cholinergic crisis. However, unlike organophosphates and carbamates, nerve agents are not readily accessible to the general public, can be rapidly be fatal with any route of exposure, and are traditionally classified as weapons of mass destruction.

EMS providers should consider the confirmed or potential release of a nerve agent when responding to an unspecified incident or scene involving:

1. An unknown illness involving a potentially large number of patients
2. An explosion from an unknown source at an event where a large number of people are in attendance
3. An incident where the initial EMS responders on scene suddenly become symptomatic

[9] NAEMT. Nerve Agent Information for EMS and Hospitals. https://www.naemt.org/docs/default-source/ems-preparedness/nerve-agent-info-for-ems-hospitals_08-21-2018_final.pdf?sfvrsn=9710c892_0

A person potentially exposed to a nerve agent should be decontaminated whether they develop signs of acute illness or not. Nerve agents can persist in the environment and remain chemically toxic for a prolonged period.

In the event of a nerve agent release, mass medication distribution may be necessary for the treatment of illness. CHEMPACK is a federally owned cache of nerve agent antidotes managed by the Centers for Disease Control and Prevention (CDC) and reserved for larger events (where the nerve agent exposure will deplete the regional supply of antidotes). CHEMPACKS are placed in centralized locations for rapid deployment and usage[10] and contain enough antidote to treat over 500 patients. The use of CHEMPACK materials is for a life-saving measures only and should not be used prophylactically.

EMS providers should contact their IC and/or higher rank immediately if they suspect that a nerve agent is being used as a terrorist attack or for chemical warfare. Special operations and the FBI Field Office WMD Coordinator will be notified by the IC or Rank Command.

**Asphyxia Agents[11]**

Asphyxiants are any gas capable of causing death due to oxygen displacement. Asphyxiants are designated as either simple or chemical.

Simple Asphyxiants

Simple asphyxiants are gases that displace oxygen from the inspired air. Common simple asphyxiants are carbon dioxide ($CO_2$), nitrogen, helium, methane, ethane, and natural gas (e.g. propane, heptane). Simple asphyxiants are encountered when the environmental atmosphere becomes abnormally loaded with one of these gases at such high concentrations that they significantly or completely push the normal oxygen out. Simple asphyxiants have no inherent toxic or metabolic effects on the body's cells, other than causing hypoxia due to lack of oxygen.

The signs and symptoms of exposure to a simple asphyxiant depend on the specific agent involved and the relative concentration of the agent in the atmosphere (i.e., how severe the lack of atmospheric oxygen is). Patients will exhibit such classic signs of hypoxia as agitation, which may rapidly progress to unconsciousness and then cardiac arrest. If the simple asphyxiant is $CO_2$, patients may experience a narcotic-like sleepiness as the initial effect of exposure.

A key consideration concerning the effects of simple asphyxiants is water solubility. Materials with high water solubility react quickly with the moist membranes of the eyes and upper respiratory tract, causing irritation and burning in addition to coughing, wheezing and bronchospasm. Unless the patient has a pre-existing pulmonary condition (asthma, COPD), symptoms seen in mild to moderate exposure tend to improve with fresh air and good ventilation. Examples of highly water soluble asphyxiants include ammonia, hydrogen chloride, and formaldehyde.

Materials with low water solubility do not react readily with moist membranes of the upper respiratory tract and are able to pass more deeply into the lungs, causing direct lung injury. Patients exposed to low solubility asphyxiants often have mild or no upper respiratory symptoms for the first severe hours but slowly experience

[10] Medical Response to Terrorism. www.naemsp.org/medicalresponse/
[11] JEMS. https://www.jems.com/operations/ems-responds-toxic-inhalation/

lower respiratory complaints like dyspnea, wheezing, and hypoxia. In cases of severe exposure, non-cardiogenic pulmonary edema may develop up to 24 hours after the time of exposure. A patient may seem relatively stable then decompensate with respiratory failure due to acute lung injury. Examples of low water soluble asphyxiants are phosgene and fluorine.

Chlorine is a unique asphyxiant in that it has intermediate water solubility. Patents exposed to chlorine may have immediate irritation of the upper respiratory tract while also displaying signs and symptoms of respiratory distress, bronchial irritation, and pulmonary edema within 6-24 hours of higher exposures. In its gaseous form, chlorine is known as hydrogen chloride. When chlorine dissolves into water, hydrochloric acid is made. Liquified chlorine (aka hydrochloric acid) is a commonly used corrosive solution that can cause injuries similar to frostbite and severe burns with deep ulcerations. Providers exposed only to chlorine gas generally are not at great risk of secondary contamination; however, providers most recognize the significant risk involved in exposure to liquified chlorine.

The mainstay of simple asphyxiant management is gaining safe access to the patient, followed by high-concentration oxygen administration and cardiopulmonary support as indicated. Any significant exposure to a respiratory irritant needs to be evaluated at a medical facility.

Chemical Asphyxiants

Chemical asphyxiants are gases that interfere with oxygen delivery to the tissues or utilization of oxygen to produce energy. These include Carbon Monoxide (CO), Cyanide (HCN), and Hydrogen Sulfide ($H_2S$). Signs and symptoms of inhaled chemical asphyxiant exposure depend on which specific agent the patient has been exposed to. Symptoms can have a sudden or gradual, more insidious onset depending on the concentration and material to which a patient is exposed. HCN and H2S exposure tend to have a more rapid onset and progression of symptoms than CO.

Carbon monoxide affects oxygen delivery by displacing oxygen molecules bound to hemoglobin. The affinity of CO for hemoglobin is over 200x oxygen's affinity; the more CO binds to hemoglobin, the easier it becomes for more CO to bind. Bound carboxyhemoglobin not only blocks unbound oxygen from binding but also inhibits the release of bound oxygen meant to be delivered to tissues. Patients exposed to CO may present with a spectrum of symptoms ranging from nausea and confusion with mild intoxication to seizures and cardiac arrest with severe poisoning. When available, providers should affix a CO detector on their equipment bag prior to entering a scene to assist with detection of occult toxicity.

Cyanide interferes with oxygen utilization by blocking an enzyme necessary for the aerobic metabolism and production of ATP. This leads to lactate accumulation as a by-product anaerobic metabolism and the development of metabolic acidosis. The seriously poisoned HCN patient classically presents with unresponsiveness, hyperventilation, and hypotension without evidence of cyanosis.

Hydrogen sulfide is a direct neurotoxin rapidly absorbed by the lungs that produces rapid systemic effects. Patients will often report a distinctive rotten egg odor, followed by eye and upper airway irritation progressing quickly to altered mentation with shortness of breath, hemoptysis, and ultimately pulmonary edema. $H_2S$ can

cause death after just a few breaths. It is commonly referred to as the "knock down" gas because it causes near immediate loss of consciousness with high concentrations.

Clinical guidelines for treatment of CO and CN poisoning are outlined in subsequent pages. Treatment for $H_2S$ includes supportive care with high-concentration oxygen and endotracheal intubation, if indicated.

Off-gassing of exhaled HCN and $H_2S$ from the patient's lungs may be significant enough to cause some level of toxicity to EMS providers. Proper PPE in addition to following the procedures outlined in Section VII: Patient Transportation will help prevent secondary contamination.

**Riot Control Agents**[12]

Riot control agents (sometimes referred to as "tear gas") are chemical compounds that temporarily make people unable to function by causing irritation to the eyes, mouth, throat, lungs, and skin. Symptoms begin within seconds of exposure, are self-limited and are best treated by removing the patient from ongoing exposure. Symptoms frequently decrease over time (15-45 minutes) after the exposure ends.

Persons exposed to riot control agents may experience some or all of the following symptoms:

- Eyes: excessive tearing, burning, blurred vision, redness
- Nose: runny nose, burning, swelling
- Mouth: burning, irritation, difficulty swallowing, drooling
- Lungs: chest tightness, coughing, choking sensation, wheezing, shortness of breath
- Skins: burns, rash
- GI: nausea, vomiting

Toxicity from riot control agents is related to is related to concentration of the agent used and the duration of exposure (especially in a non-ventilated space). EMS providers should move affected individuals from the contaminated environment and into fresh air as early as possible. Additional prehospital care should be symptom-specific: the most pertinent clinical guidelines for treatment will usually be (a) **Routine HAZMAT Care**, (b) **Wheezing/Bronchospasm**, and (c) **Burn Care**.

Patients with pre-existing pulmonary conditions (e.g. asthma, COPD) may be prone to more severe respiratory effects. Providers should also look for traumatic injury if exposed individuals were in proximity to the device used to disperse the riot control agent (e.g. host/stream under pressure, grenade).

**VII. PATIENT TRANSPORTATION**

No contaminated personnel, patient or equipment will depart the scene without first going through decontamination. EMS has limited staffing, equipment, and ambulance resources and they must be protected.

[12] https://emergency.cdc.gov/agent/riotcontrol/factsheet.asp#:~:text=Riot%20control%20agents%20(sometimes%20referred,throat%2C%20lungs%2C%20and%20skin.

Patient handling should be limited to personnel required in treatment and patient movement. When able, the driver of the ambulance should not be involved in patient treatment or handling to prevent contamination of the driver compartment of the ambulance. No PPE should be worn within the driver compartment.

The Routine HAZMAT Care guideline should be followed to prevent secondary contamination of EMS providers. This includes (a) wrapping the patient in a sheet, (b) sealing the window between the patient and driver compartment of the ambulance, and (c) ventilating the patient compartment of the ambulance.

Units found to have been exposed and contaminated by a hazardous substance or material should be promptly decontaminated.

As early as possible (ideally, prior to transportation of patients), the EMS provider should notify the receiving hospital of the following and ask for instructions for entering the hospital with a contaminated patient.

a. Number of victims
b. Materials causing contamination
c. Extent of contamination and whether field decontamination occurred
d. Extent of injuries
e. ETA
f. Any other pertinent information

**VIII. ARRIVAL AT THE EMERGENCY DEPARTMENT**

Upon arrival at the hospital, emergency room personnel should meet the patient at the ambulance in order to determine if further decontamination is needed prior to delivery of patient(s) into the emergency room. All hospitals are expected to have a plan for receiving contaminated patients and mass contaminated casualties.

**IX. EMERGENCY PERSONNEL DECONTAMINATION**

All EMS providers who contact and care for a contaminated patient(s) or contaminated material(s) must take immediate measures to ensure proper decontamination after patient handoff is complete. Recommended secondary decontamination of EMS providers includes taking a shower and changing clothes. Follow-up monitoring of all personnel shall be conducted as deemed necessary by the ED Physician / Medical Director.

THIS PAGE INTENTIONALLY LEFT BLANK

# Routine Hazmat Care

**Only trained and department approved personnel should enter into warm zones**

Possible Hazmat Threat Identified

When possible, notify dispatch of:

1. Location of Incident
2. Chemical(s) involved
3. Amount & state of chemical(s)
4. Number of victims
5. Wind direction and speed

**Use binoculars to maintain a safe distance**

**Ensure Scene Safety**

- Stay/Move upwind and uphill of all hazards
- Communicate with dispatch to notify Hazmat Team, if not already on scene
- Identify a safe route to the scene and staging area

Consider contacting **Poison Control** for additional information: 1-800-222-1222

Confirm with Hazmat Team the level of PPE required for EMS once the chemical(s) involved has been confirmed

Any patient that has made contact with a hazardous material and/or showing signs or symptoms of exposure must be immediately decontaminated by the local Hazmat Team prior to EMS evaluation

**After Patient Has Been Decontaminated:**

- Utilize START triage and place patient into appropriate priority group
- Treat (based on ROPE guidelines) according to hazard, level of exposure and signs and symptoms

**Prior to Securing Patient on the Stretcher:**

- Wrap patient in a sheet to prevent secondary contamination and hypothermia
- Leave patient's head exposed to maintain airway, breathing and circulation

**Prior to Loading Patient:**

- Consider taping plastic to seal the window between the patient and driving compartments
- Ventilate the patient compartment and set temperature to prevent hypothermia

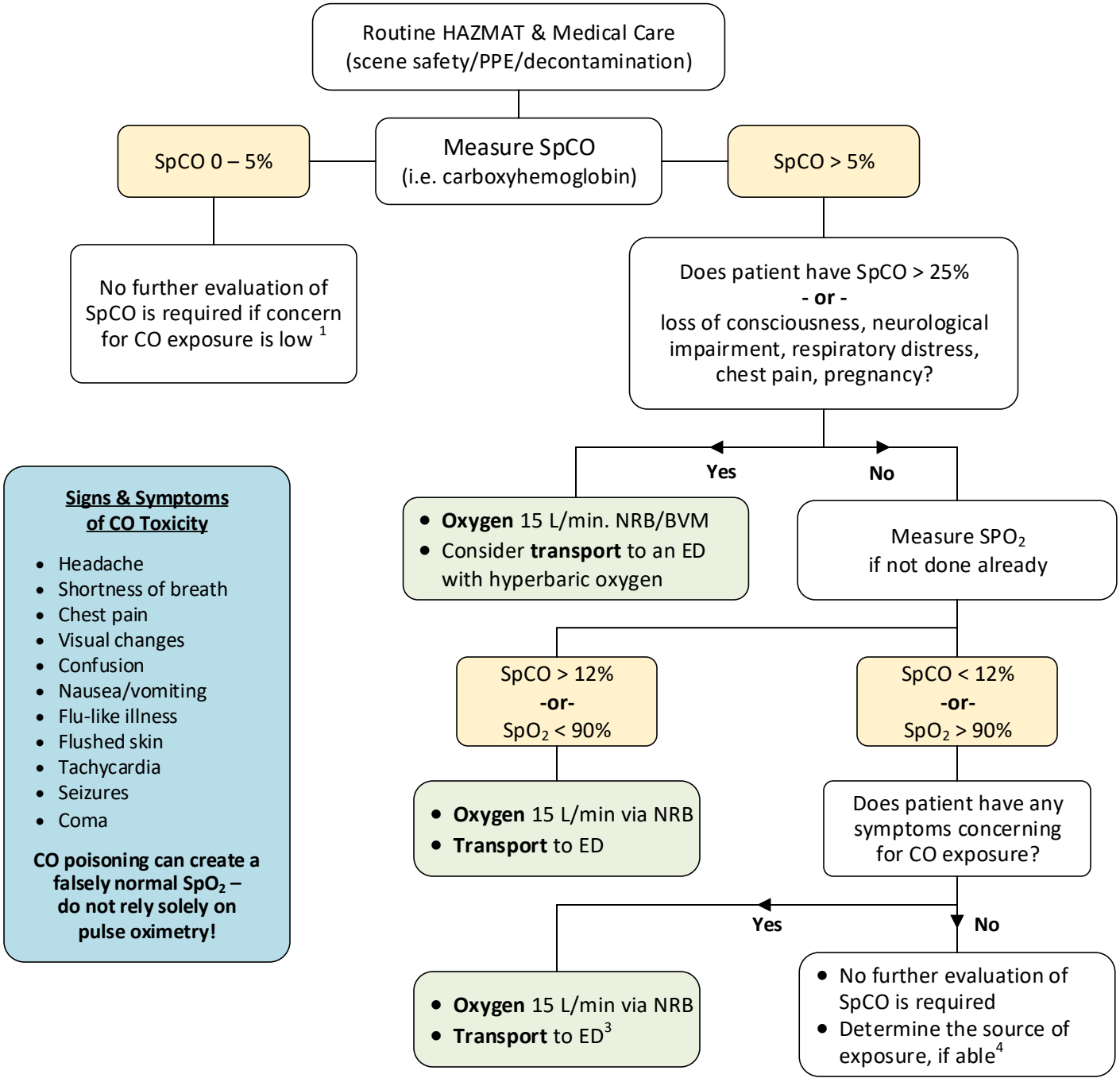
**Prior to Transport:**

Contact hospital(s) to determine decontamination capabilities and ability to receive patients

**The primary role of EMS is medical triage, treatment and transport of patients and rehabilitation of first responders**

- Assume all patients are potentially contaminated - use appropriate PPE and patient packaging techniques to prevent the transmission of contaminants.
- As soon as safe, remove the patient from the source and limit exposure – treatment and antidotes will not be effective while the patient remains exposed to the hazard.
- By removing all patient clothing (including undergarments) and grossly decontaminating a patient with water, 80% of the contaminants will be removed. Most of the remaining contaminants are found in the patient's hair.
- Patient belongings/clothing should not be transported by EMS. Contaminated items should be left on scene and evaluated for proper decontamination by the Hazmat Team.

# Carbon Monoxide (CO) Exposure




- Chronic CO exposure is just as significant as acute poisoning but may have a gradual onset. Tobacco smokers have a higher baseline concentrations of carboxyhemoglobin and will reach toxic concentration earlier in any exposure. Recommend smoking cessation treatment for smokers.

[1] Absent or lower levels of COHb are not reliable, especially when your clinical suspicion for CO poisoning is high (e.g. firefighters, obvious inhalation of fire byproducts). Treat CO poisoning while also considering/treating other diagnoses.

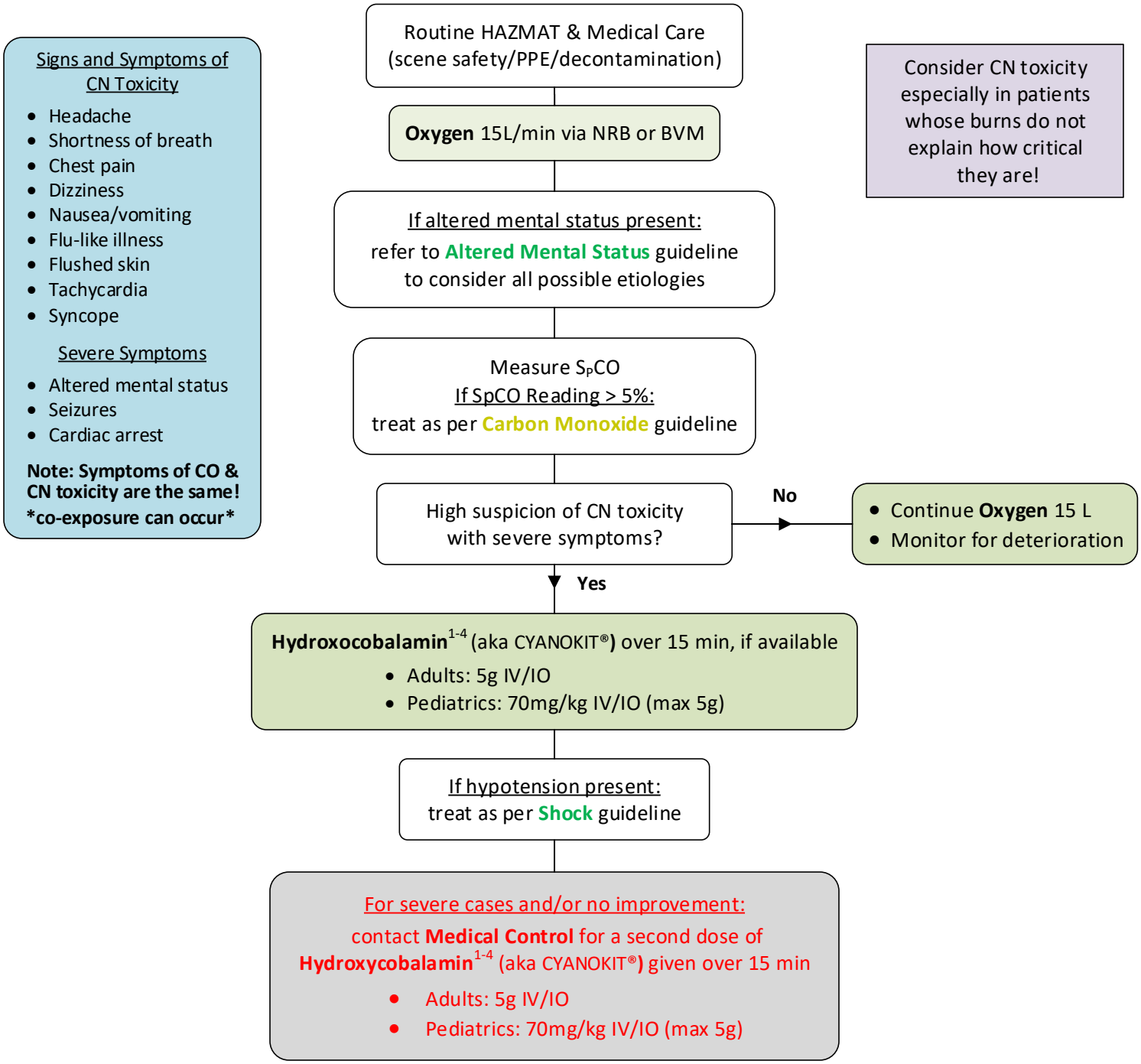
[2] Fetal hemoglobin has a much higher affinity for CO than maternal hemoglobin. All females with known or suspected pregnancy should be advised that EMS-measured SpCO levels only detect adult COHb and their fetal COHb could be much higher. Recommend ED evaluation for any CO-exposed pregnant female.

[3] Subtle neurological findings may rapidly improve on Oxygen 15 L/min via NRB. The patient still requires an ED evaluation.

[4] CO poisoning is caused by inhaling combustion fumes. Common sources includes fire, gasoline, heating appliances in the home, and cigarettes. Always consider this diagnosis when multiple persons in the home present with the same suspicious symptoms.

# Cyanide (CN) Exposure

Consider treatment for any patient with altered mental status or unresponsive after smoke inhalation, fire, combustion, or after known exposure to cyanide compound




**Cyanide poisoning can occur in spite of an oxygen rich environment – do not use $SpO_2$ to determine CN or CO toxicity.**

[1] Hydroxcobalamin 5g vial is reconstituted with 200mL of 0.9% sodium chloride using the supplied transfer spike. The vial should be rocked, not shaken, for at least 60 seconds prior to infusion.

[2] Hydroxocobalamin must be administered independently of any other resuscitative medicines as it is incompatible with most standard ACLS medications. Establish a secondary means of vascular access.

[3] Begin CPR immediately if the patient is in cardiac arrest. Hydroxycobalamin can be administered during resuscitation.

[4] The dark red color of hydroxycobalamin causes discoloration of skin, mucous membranes, and bodily fluids. The pigment also may interfere with pulse oximetry. $SpO_2$ levels should not be relied upon after hydroxycobalamin is administered.

# Nerve Agent | Organophosphate Poisoning

**DUMBELS**

**D**iarrhea
**U**rination
**M**iosis/**M**uscle Weakness
**B**ronchospasm/**B**ronchorrhea
**E**mesis & **B**radycardia
**L**acrimation
**S**alivation/**S**weating

(miosis = pinpoint pupils)

Routine HAZMAT & Medical Care
(scene safety/PPE/decontamination)

Obtain history of AChEi exposure
and observe for toxidromic symptoms
(**DUMBELS** or **SLUDGE**)
* see HAZMAT preambles *

**SLUDGE**

**S**alivation
**L**acrimation
**U**rination
**D**efecation
**G**astrointestinal
**E**mesis

Evaluate severity of symptoms

**Mild/Moderate Symptoms**

- Visual disturbance
- Mild wheezing
- Chest tightness
- Salivation
- Lacrimation
- Sweating

**Atropine Sulfate**
q5min prn until secretions resolve – no max dose
Adults: 2mg IV/IO
Pediatric: 0.02mg/kg IV/IO

If available, **Pralidoxime Chloride (aka 2-PAM)**
Adults: 1g IV/IO
Pediatric: 15mg/kg IV/IO (max 1g)

- Monitor for development of major symptoms
- Notify receiving hospital of possible AChEi exposure as early as possible

**Major Symptoms**

- Bradycardia
- Vomiting
- Respiratory distress/arrest
- Headache
- Seizures
- Altered mental status

If available, **DuoDote® Auto Injector (or Mark I® Kit)**[1,2,3]
x 3 doses (RAPID)

Treat seizure activity
as per **Seizure** guideline[4]

**Atropine Sulfate**
q5min prn until secretions resolve – no max dose
Adults: 2mg IV/IO
Pediatric: 0.02mg/kg IV/IO

- Be prepared to assist patient ventilations
- Initiate cardiac monitoring, if available
- Document treatment on triage tag if MCI

[1] Each **DuoDote® autoinjector** contains **Atropine** 2.1mg + **Pralidoxime Chloride** 600mg. The Mark I Kit contains an atropine and pralidoxime autoinjector linked together with a plastic clip – the atropine should be administered first followed by the pralidoxime.

[2] Duodote autoinjectors should not be used for additional dosing of atropine beyond the recommended administered dose of pralidoxime.

[3] In the event of a large scale MCI, begin with 1 **DuoDote** if pt < 7 y/o, 2 **DuoDotes** if pt is 8-14 y/o and 3 **DuoDotes** if pt ≥ 15 y/o.

- If available for use, Pediatric AtroPens® can be used in place atropine vials:
  - Age 0-2 yo (<13kg): Mild/moderate symptoms: 0.05 mg/kg, Severe symptoms: 0.1mg/kg
  - Age 3-7 yo (13-25kg): Mild/moderate symptoms: 1mg, Severe symptoms: 2mg
  - Age 8-14 yo (26-50kg): Mild/moderate symptoms: 2mg, Severe symptoms: 4mg
- A pralidoxime 600mg autoinjector may be administered to an infant weighing greater than 12 kg.

[4] In the event of a large scale MCI, utilize **Diazepam autoinjector** 10mg for seizure activity as needed.

# Hydrofluoric (HF) Acid Exposure

**HF Signs & Symptoms**

- Irritation/chemical burns (pain may be out of proportion to the apparent skin involvement)
- Chemical conjunctivitis
- Throat burning
- Stridor
- Wheezing
- Dyspnea
- Nausea/vomiting
- Abdominal pain
- Altered mental status
- Seizures
- Dysrhythmias
- Hypotension

Routine HAZMAT[1] & Medical Care including 12 lead EKG (scene safety/PPE/decontamination)

Obtain History of HF Exposure[2]

- Concentration of product
- Time of exposure
- Route of exposure (skin, ocular, inhalation, ingestion)

Give **Oxygen 15L** via NRB/BVM

If altered mental status present:

refer to **Altered Mental Status** guideline to consider all possible etiologies

**To Make Calcium Gluconate Gel:**

Mix 10mL of 10% Calcium Chloride into 5oz (150ml) of water soluble jelly (e.g. KY Jelly, Surgilube)

Commercially manufactured gel may also be utilized

Ocular Exposure

**Irrigate eyes with 1L NaCl or $H_20$** (use Morgan lens, if available)

Inhalation Exposure[3]

- If bronchospasm present, treat as per **Wheezing/Bronchospasm** guideline
- If available, give 4ml of **nebulized Calcium Gluconate 2.5-5%**
- Anticipate the need for more aggressive airway management

Skin Exposure

- Copiously **Irrigate with NaCl or $H_20$** for a minimum of 15 minutes
- Apply **Calcium Gluconate gel 2.5%** transdermal to affected area[4]

- Apply cardiac monitor[5]
- Consider transport to a Burn Center based on size and location of injury – see **Burn Center Triage** guideline

[1] Assume that all patients are potentially contaminated and use appropriate PPE. **Responders must wear rubber (neoprene or polyvinyl chloride) gloves when treating HF to avoid hand burns from secondary contamination.**

[2] Hydrofluoric acid (HF) is primarily used for automotive cleaning products, rust removal, etching glass, or cleaning cement or brick. Injuries due to dilute or low concentration HF solutions may not present until days after the exposure.

[3] Given HF's high propensity for evaporation, inhalation injury should be considered in any dermal exposure involving the face or neck or if the patient's clothing is soaked in the product.

[4] Leave the gel in place for at least 20 minutes then reassess and repeat as needed if pain persist. In smaller burns, Calcium Gluconate gel can be massaged into the skin while flushing with water or saline. If fingers are involved, apply the gel to the hand, squirt additional gel into a surgical glove, and then insert the affected hand into the glove to keep the gel in place.

[5] Oral or large dermal HF exposure frequently result in significant hypocalcemia and cardiovascular collapse. If cardiac arrest develops, patients should be given IV Calcium Chloride to reverse hypocalcemia.

# Irritant Gas | Simple Asphyxiant Exposure

Generally supportive therapy and respiratory support is the focus of care in these exposures as there are no specific antidotes.

**Signs & Symptoms**

- Irritation/chemical burns
- Chemical conjunctivitis
- Lacrimation, rhinorrhea
- Throat burning/irritation
- Coughing, choking
- Stridor
- Wheezing
- Dyspnea
- Pulmonary edema
- Nausea/vomiting
- Abdominal pain
- Headache
- Dizziness
- Altered mental status
- Seizures
- Dysrhythmias
- Syncope
- Hypotension
- Cardiac arrest

Severe respiratory distress may resemble cholinergic crisis due to profound secretions from pulmonary edema.

Remember, patients exposed to an irritant gas will have normal or dilated pupils, whereas nerve agent or organophosphate-exposed patients will have pinpoint pupils.

Routine HAZMAT Care
(scene safety/PPE/decontamination)

Routine Medical Care
including $SpO_2$, $EtCO_2$,
cardiac monitor, 12 Lead EKG

Obtain history of exposure, identify specific agent if able

For symptomatic patients:
Give **Oxygen 15L** via NRB/BVM

If altered mental status present:
refer to **Altered Mental Status** guideline
to consider all possible etiologies

If respiratory symptoms present:

- Give Albuterol/Atrovent as per **Wheezing** guideline
- If patient was exposed to chlorine, give nebulized **Sodium Bicarbonate 2.5ml** mixed in 2.5ml of sterile water
- Consider early CPAP with 5-10 cm $H_20$
- Prepare for aggressive airway management

- If hypotension present: treat as per **Shock** guideline
- If seizures present: treat as per **Seizure** guideline
- If dermal burns present: treat as per **Burn** guideline
- If severe pain present: treat as per **Traumatic Pain** guideline

If ocular injury present:
**Irrigate eyes with 1L NaCl or $H_20$** (use Morgan lens, if available)

**If there is any sort of suicide signage, hoses, or buckets of substance visible as you arrive – do not enter!**

Immediately retreat to a well ventilated area and contact Dispatch for a HAZMAT Team

A supraglottic airway should be considered as a last resort due to the irritant's potential to cause laryngeal edema

- Many irritant gases are heavier than air and will build up in low lying areas. Constantly reassess scene safety as the time of exposure increases. Assume that all patients are contaminated - use appropriate PPE and patient packaging techniques to prevent secondary contamination.
- A variety of gases may cause injury to multiple organ systems – the most significant of these is injuries to the upper and lower respiratory tract. Many airway/respiratory irritants have "warning properties" such as identifiable or unpleasant smells or irritation to eyes or airways.
- The most common exposures vary in their effect(s) based on their water solubility. Read more in the HAZMAT Preambles.
  - Ammonia is known for causing significant irritation to the eyes upper respiratory tract with minimal lower respiratory tract involvement.
  - Phosgene causes mild – if any – upper respiratory symptoms but patients may develop severe lower respiratory tract symptoms several hours after exposure due deep alveolar injury.
  - Chlorine gas (aka hydrogen chloride) can cause irritation and injury to be the upper and lower respiratory tracts. Liquefied chlorine (aka hydrochloric acid) can cause severe burns and dermal and ocular injuries similar to frostbite.

# Radiation Exposure

The underlying principle of care involves management of injuries to skin and supportive care for additional injuries.
Treatment of life-threatening injuries or illness takes priority over assessment for contamination or initiation of decontamination.

Identify type/source of radioactive material[1]
Don PPE & limit exposure while waiting[2]

Treat life-threatening injuries
as per appropriate **Medical** or **Trauma** guideline

Routine Hazmat Care
if stable, decontaminate on-scene until a radiation detector indicates minimal residual radiation

Routine Medical and/or Trauma Care

Treat localized radiation injury
as per **Burn** guideline[3,4]

- Transport to a burn center that also has capability to treat radiation injuries
- Notify receiving ED staff as early as possible

Providers should suspect potential radioactivity on any scene they see the trefoil (the international radiation symbol)

A radiological survey conducted with specialized equipment is the only way to confirm exposure to radiation.

Consult with Dispatch and/or HAZMAT Team to determine if this has occurred.

[1] Common sources of radiation include industrial plants, nuclear power plants, healthcare facilities, WMD's, and "dirty bombs" - conventional explosives that contain radioactive material.

[2] Standard PPE including surgical facemask (N95 if available), outer garment protection, and gloves should be worn by first responders if available. Standard PPE protects the provider from secondary contamination but does not prevent direct exposure. Providers should limit the time they are exposed to a radiation source, maximize a distance from the source, and create a shield using physical barriers.

- It is important to differentiate irradiation from contamination. Irradiation (exposure) occurs when a person is near a radiation source. One does not have to come into contact with radiation materials to be exposed. Contamination occurs when radioactive material is physically present on or in the body. External contamination occurs when radioactive material is deposited on surfaces like skin or clothing. Internal contamination occurs when radioactive material is inhaled, ingested, or lodged in an open wound.
- Patients that have been exposed to radiation but are not contaminated with radioactive material do not need to be decontaminated. Irradiated patients pose no threat to medical providers. Contaminated patients pose little threat to providers who use appropriate PPE.

[3] Local Radiation injury (LRI)/burns can manifest as erythema, epilation (hair loss), ulceration, desquamation (scaling skin), or necrosis. LRI burns generally take longer to develop – sometimes days to weeks. Acute burns on a patient should be suspected to have a thermal or chemical component in addition to LRI and be treated as per the **Burn** guideline.

[4] Any patient with a local radiation injury is at risk of developing Acute Radiation Syndrome (ARS). ARS is caused by high doses of radiation. Symptoms (acute or delayed) may include nausea, vomiting, dizziness, loss of consciousness, hypotension/shock. Patients with this condition are not contagious.

- Providers should measure the length time between radiation exposure and onset of emesis. This time is a reliable indicator of the received dose of ionizing radiation. The more rapid the onset, the higher the whole body dose of radiation.

THIS PAGE INTENTIONALLY LEFT BLANK

# Region One Protocol Effort

## Advanced Practice Guidelines

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Delayed & Rapid Sequence Intubation

**Paramedics MUST have written approval from their respective EMS Medical Director before using this protocol**

**DSI/RSI Indications**
- Patient unable to oxygenate or ventilate
- Patient unable to protect airway
- Impending airway compromise

- Obtain IV access (preferably two sites)
- Prepare for continuous VS monitoring ($SpO_2$, $EtCO_2$, BP, HR, EKG) and ensure visibility of all monitoring devices

**DSI/RSI Contraindications**
- Only one ALS provider on-scene
- EMS provider doubts they will be able to successfully secure the patient's airway

[1]**Signs of Difficult Airway**
**D**entition **D**isproportion
**D**istortion **D**ysmobility
(see **Medical Preambles**)

**Only if performing Delayed Sequence Intubation**

Administer **Ketamine**[1] 2mg/kg IV/IO via slow push

[1]Ketamine/DSI is ideal when patients are too agitated/anxious to tolerate preoxygenation.

**Choose RSI instead if preoxygenation can be achieved without sedation.**

Ketamine may cause myocardial depression and cardiac arrest in severely shocked patients. Consider RSI or administer hypotensive doses of Ketamine if using DSI.

- Preoxygenate with 100% **Oxygen** (see **Medical Preambles**)
- Treat hypotension with **Crystalloid Fluid** bolus and/or **Vasopressor Infusion** or **Push Dose Epinephrine**
- **Ondansetron** 4mg IV/IO if time permits

- Initiate apneic oxygenation @ 15L via NC (see **Medical Preambles**)
- Assess airway[1] with 4 D's – don't forget dentures!
- Position patient so their ear aligns with their sternal notch
- Assemble airway equipment, including backup tools (e.g. SGA, Bougie, cricothyrotomy kit)
- Verbalize "failed airway plan" to team

**Only if performing Rapid Sequence Intubation**

Administer sedative agent:

**Etomidate** 0.3mg/kg IV/IO
or
**Ketamine**[1] 2mg/kg IV/IO

**Hypotensive Doses:**
**Etomidate** 0.15mg/kg
**Ketamine** 0.5mg/kg
**Succinylcholine** 2mg/kg
**Rocuronium** 1.6mg/kg

**Succinylcholine Contraindications**
- CVA or spinal cord injury within the last 6 months
- Chronic renal failure on dialysis
- Suspicion of hyperkalemia
- Known or suspected muscular disease (e.g ALS, muscular dystrophy, myasthenia gravis, Guillain-Barre syndrome)
- History of malignant hyperthermia

**Rocuronium Contraindications**
- Known hypersensitivity to the drug

Administer paralytic agent:

**Succinylcholine** 2mg/kg IV/IO
or
**Rocuronium** 1.2mg/kg IV/IO

Trachea successfully intubated?

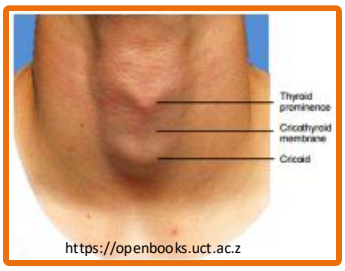
**No**
- Optimize $SpO_2$ via BVM
- Reattempt intubation x 1
- Utilize failed airway plan & proceed to guideline **Airway Management 3 of 3: Can't Ventilate & Can't Intubate**

**Yes**
- Secure ETT with commercial ETT restraint device and document depth of ETT at level of patient's incisors
- Reconfirm ETT placement by using continuous $ETCO_2$ capnography
- Measure and apply cervical collar to patient
- Proceed to guideline **Airway Management 3 of 3: Post-Intubation Airway Management**

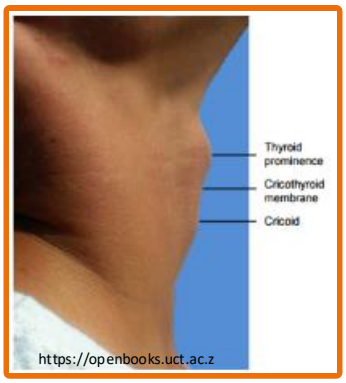
# Cricothyrotomy

**Paramedics MUST have written approval from their EMS Medical Director before using this guideline**

**When able, cricothryotomy should be formed by the qualified ALS provider that did NOT last attempt to intubate**




- Team Leader says out loud to the team **"This is a Can't Oxygenate|Can't Intubate patient"** to ensure team moves toward SGA and preparation for cricothyroidotomy
- Team Leader confirms that ventilation is inadequate despite BVM and SGA (or SGA insertion is not possible due to upper airway obstruction)




- Remove pillows/blankets from under patient's head and neck
- Hyperextend patient's neck
- Palpate landmarks and identify cricothyroid membrane[1,2]

Perform surgical or large bore needle cricothyrotomy[3,4]

The agency Medical Director should be notified immediately upon completion of patient care whenever cricothyrotomy is performed

Trachea successfully intubated?

**No** → If needle cricothyrotomy was originally performed, provider may consider attempting surgical cricothyrotomy if previously trained and approved by their agency's Medical Director

**Yes**

- Secure ETT or cannula with neck tape
- Reconfirm placement by using continuous $ETCO_2$ capnography
- Proceed to guideline **Airway Management 3 of 3: Post-Intubation Airway Management**

[1] The thyroid prominence (aka Adam's apple) is more evident and easily palpated on some individuals than others. When one cannot easily find this landmark, the provider should use the "laryngeal handshake" method to palpate the entire laryngeal framework (thyroid + cricoid cartilage) instead of palpating with just the tips of their index fingers. With the laryngeal handshake method, the provider uses their whole hand to move the thyroid and cricoid cartilages side to side.

[2] If unable to palpate landmarks, providers performing a surgical cric should consider first making a vertical incision through the skin and dissecting with fingers on both hands to identify and stabilize the larynx prior to puncturing the cricothyroid membrane.

[3] Choice of needle versus surgical cricothyrotomy use should be determined in advance by the agency's Medical Director. Narrow bore or small cannula needle cricothryotomy (e.g. 12 or 14 g catheters with jet insufflation) is not recommended; however, large bore needles and catheters (4mm diameter or greater) allow for sufficient emergency oxygenation and ventilation. **Providers should not perform surgical cricothyrotomy on children less than 12 years of age.**

[4] Providers performing surgical cricothyrotomy should consider inserting a Bougie (similar to endotracheal intubation) to assist with proper tube placement.

# Region One Protocol Effort

# Appendix

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# Appendix I: Prehospital Radio/Phone Report

- "This Is [EMS Department / Service Name]"
- Unit # _____
- Skill level treating the patient
- Parish or Origin
- ETA
- Patient's Age
- History of present illness (CC) and duration of illness

  Relay major pertinent injuries
- Patient's LOC and GCS
- Vital Signs
  - Blood pressure
  - Pulse
  - Respiratory Rate, Quality & Breath Sounds
  - $SpO_2$ (Including $O_2$ device and rate)
- Pertinent medical history _____
- Treatment rendered and impact of treatment (response to treatment)

# Appendix II: Trauma Radio/Phone Report

"This Is" (Service Name) _____ (Unit #)_____ Service Level_____ Parish_____

Age_____

Mechanism of Injury / M.O.I _____

Meets Trauma Center Criteria (Anatomic, Physiologic, Mechanism) by _____

GCS _____

Vitals: Airway Status / $O_2$ Device_____ B/P_____ HR_____ Resp. Rate_____ $SpO_2$_____

Treatment rendered and Impact of treatment (physical exam improvement)_____

Scene Delays due to extrication, traffic, Etc._____ E.T.A._____

## Region One Trauma Center Criteria

### Physiological:

- Glasgow Coma Scale <14
- SBP <90 mm/Hg (<60 in peds.)
- Respiratory Rate <10 or>29/min or need for ventilatory support
- Respiratory Rate <20 in infant less than 1 year or need for ventilatory support
- Revised Trauma Score < 11
- Pediatric Trauma Score < 9

### Anatomic:

- Penetrating injuries to the head, neck torso or extremities proximal to the elbow and knee.
- Flail chest
- Two or more proximal long bone fractures
- Crushed, degloved or mangled extremity
- Amputation proximal to the wrist or ankle
- Pelvic fractures
- Open or depressed skull fracture
- Paralysis
- Combination of mechanism of trauma associated with burns
- Blunt abdominal injury with firm or distended abdomen or with "seatbelt sign"

### Special Considerations:

- SBP <110 in adult >65 y/o
- EMS provider judgment

### Mechanism of Injury Criteria:

- Fall:
  - Adults → > 20 feet (one story is equal to 10 feet)
  - Pediatric → > 10 feet or 2-3 times the height of the child

- High Risk Auto Crash:
  - Intrusion (including roof) → > 12 inches into occupant site; > 18 inches any site
  - Ejection (partial or complete) from automobile
  - Death in same passenger compartment
  - Vehicle telemetry data consistent with high risk injury
- Auto vs pedestrian/bicyclist/ATV thrown, run over or with significant (> 20 mph) impact
- Motorcycle crash > 20 mph
- Head trauma on anticoagulant (exclude ASA) or history of bleeding disorder
- Blast or explosion
- High – energy electrical injury
- Hanging

# Appendix III: VAN LVO Stroke Screening Tool

**Table 1** Vision, aphasia, neglect emergent large vessel occlusion screening tool

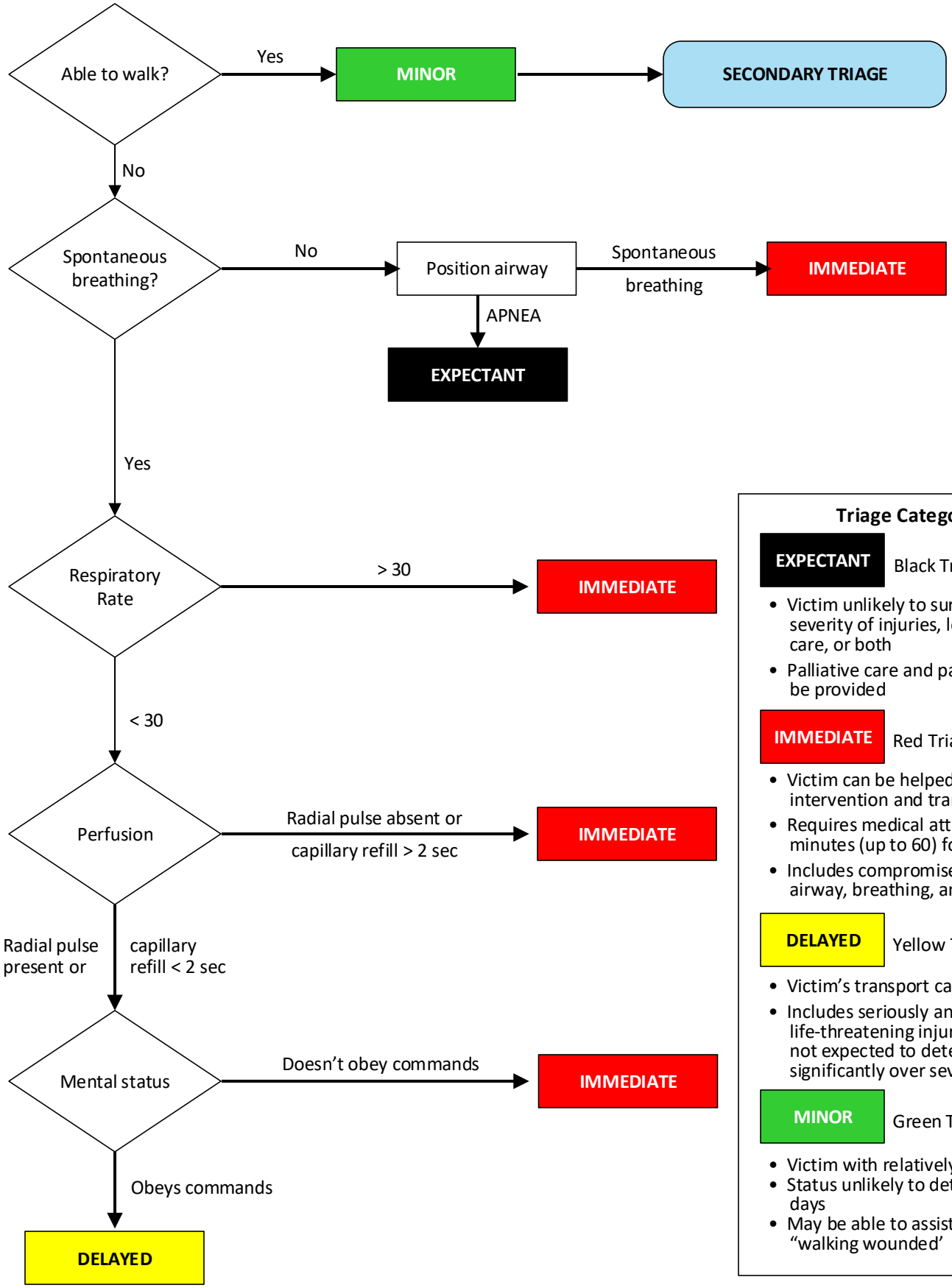
| **Stroke VAN** | |
|---|---|
| How weak is the patient? Raise both arms up | ☐ Mild (minor drift)<br>☐ Moderate (severe drift—touches or nearly touches ground)<br>☐ Severe (flaccid or no antigravity)<br>☐ Patient shows no weakness. Patient is VAN negative |
| (exceptions are confused or comatose patients with dizziness, focal findings, or no reason for their altered mental status then basilar artery thrombus must be considered; CTA is warranted) | |
| Visual disturbance | ☐ Field cut (which side) (4 quadrants)<br>☐ Double vision (ask patient to look to right then left; evaluate for uneven eyes)<br>☐ Blind new onset<br>☐ None |
| Aphasia | ☐ Expressive (inability to speak or paraphasic errors); do not count slurring of words (repeat and name 2 objects)<br>☐ Receptive (not understanding or following commands) (close eyes, make fist)<br>☐ Mixed<br>☐ None |
| Neglect | ☐ Forced gaze or inability to track to one side<br>☐ Unable to feel both sides at the same time, or unable to identify own arm<br>☐ Ignoring one side<br>☐ None |

Patient must have weakness plus one or all of the V, A, or N to be VAN positive. VAN positive patients had 100% sensitivity, 90% specificity, positive predictive value 74%, and negative predictive value 100% for detecting large vessel occlusion.
CTA, CT angiography; VAN, vision, aphasia, and neglect.

Source: Teleb MS, Ver Hage A, Carter J, et al. J NeruoIntervent Surg

# Appendix IV: START Adult Triage

**S.T.A.R.T. = Simple Triage and Rapid Treatment**
**Remember RPM: Resiprations, Pulse, Mentation**




**Triage Categories**

**EXPECTANT** Black Triage Tag Color

- Victim unlikely to survive given severity of injuries, level of available care, or both
- Palliative care and pain relief should be provided

**IMMEDIATE** Red Triage Tag Color

- Victim can be helped by immediate intervention and transport
- Requires medical attention within minutes (up to 60) for survival
- Includes compromises to patient's airway, breathing, and circulation

**DELAYED** Yellow Triage Tag Color

- Victim's transport can be delayed
- Includes seriously and potentially life-threatening injuries, but status not expected to deteriorate significantly over several hours

**MINOR** Green Triage Tag Color

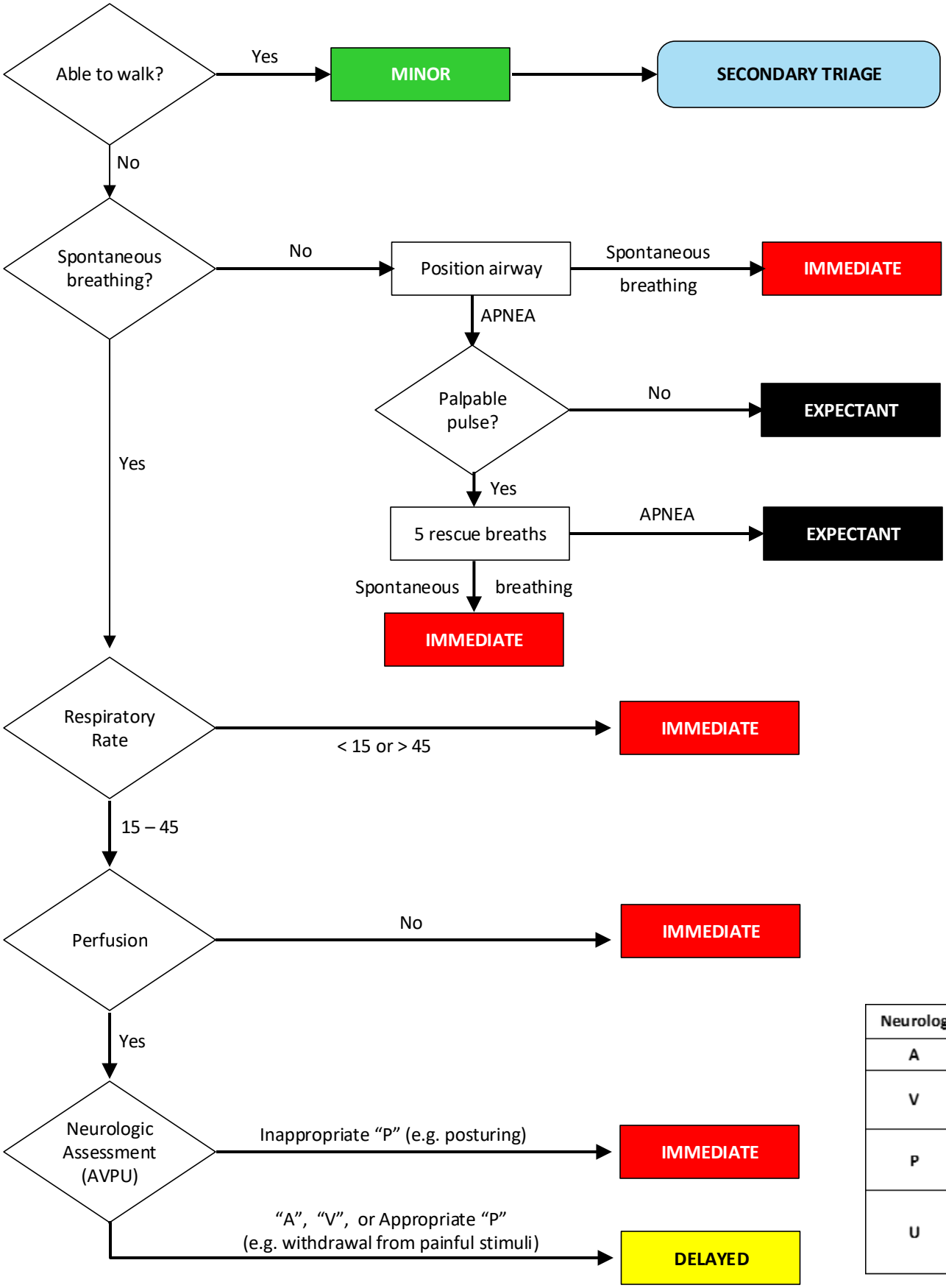
- Victim with relatively minor injuries
- Status unlikely to deteriorate over days
- May be able to assist in own care: "walking wounded'

Adopted from https://chemm.nlm.nih.gov/startadult.htm

# Appendix V: JumpSTART Pediatric Triage

**The primary difference between JumpSTART & START is in Step 2 – using rescue breaths to make triage decisions**

**If a victim appears to be a child, use JumpSTART**
**If a victim appears to be a young adult, use START**




| Neurological Assessment | |
|---|---|
| A | Alert |
| V | Responds to Verbal Stimuli |
| P | Responds to Painful Stimuli |
| U | Unresponsive to Noxious Stimuli |

Adopted from https://chemm.nlm.nih.gov/startadult.htm

# Appendix VI: Helicopter Response Guidelines

**Purpose**

The helicopter is an air ambulance and an essential part of an EMS system. While Air Medical Services (AMS) are valuable, they are also a limited resource. It is important that Emergency Medical Service personnel utilize consistent and appropriate criteria when requesting AMS for patient care and transport.

This document does not require EMS activation of air medical services – it solely serves as a guide when requesting air medical support. Helicopter EMS must be fully integrated into the regional emergency healthcare systems in order to be both safe and effective.

**Decision to Utilize Helicopter Response**

The highest-skilled level EMS provider on-scene should determine the need for helicopter evacuation and follow his/her service's operational guidelines and protocols for making this request. A helicopter may be considered in situations where:

- Helicopter use will meaningfully shorten to time to delivery of definitive care (compared to ground EMS) to patients with time-sensitive conditions;
- Helicopter use will provide necessary specialized medical expertise or equipment to patients before and/or during transport; or
- Helicopter use will provide transport to patients inaccessible by other means of transport

Air medical services should not be deployed for the sole purpose of expediting care. Additionally, providers should consider the likelihood of whether a patient has a reasonable chance of survival when determining the appropriateness of flight transport.

Air Medical Services may be considered for the following criteria:

Operational Indications

- Extended ground transport time
- Prolonged extrication
- Remote areas or areas inaccessible by ground ambulance
- Mass casualty incidents or incidents involving multiple critical patients (i.e. the use of the existing ground transport services threatens to overwhelm the local EMS system)
- The nature of the emergency is such that the local hospital is not appropriate and transport by ground EMS to an appropriate facility is greater than 20-30 minutes.

Medical Indications (patient must be < 350 lbs.)

- Critically ill trauma, burn, stroke or STEMI patient(s)
- Patient(s) has respiratory compromise or requires rapid sequence intubation
- Patient(s) has a high-risk medical emergency after consultation with Medical Control

**Emergent Request for Helicopter Response**

The key to effectively utilizing AMS is to request helicopter response as early in the incident as possible. The responder on-scene should communicate the situation and the location to the air ambulance service; additionally, on-scene providers should offer recommendations for safe landing zones or intercept sites (see below). Agencies should ensure that on-scene personnel have access to the appropriate radio frequencies to communicate with air medical units.

# Appendix VI: Helicopter Response Guidelines

**Landing Zone Officer**

On-scene EMS providers must designate a Landing Zone Officer (LZO) who has been appropriately trained and passed an air medical landing zone course. The LZO will advise the 911 dispatch center of their LZO designation as early as possible. The responsibility of the LZO is to act at the coordinator and primary communicator with 911 dispatch and the helicopter crew. Duties of the LZO include, but are not limited to, the following:

1) Identify a safe landing zone (LZ)
2) Provide the exact location of the desired LZ to the aircraft pilot (using GPS coordinates)
3) Verify correct marking of the landing zone
4) Advise 911 dispatch of the arrival and departure of the responding aircraft
5) Delegate other necessary duties within the landing zone (including a safety officer)

**Safe Landing Zone**

While the helicopter is en route, a landing zone must be selected and prepared. The helicopter crew will usually provide instructions outlining what they need for a safe landing zone. The landing zone should be as close to the scene as possible without jeopardizing the safety of the personnel on the ground. The landing zone should be free of debris such as gravel, litter, or any materials that may become deadly airborne projectiles if they are caught in the helicopter's main rotor. The landing zone should also allow the helicopter to approach and depart along a path that is free from obstructions such as trees, power lines, and light poles.

Landing Zones Requirements

- Area ideally measuring 100 ft x 300 ft (100x100 is needed for landing + 200x100 for safe approach and departure)
- Flat, firm ground with no more than a 3 inch slope for every 100 feet
- Clear of wire, debris, obstructions, unstable sheds, loose rooftops, people, and livestock
- Properly marked and free of moving vehicles or bystanders
- At least 1 mile upwind to any hazardous materials incidents

1st LZ choice: as close as safely possible to the incident
2nd LZ choice: between the incident and the specialized receiving hospital
3rd LZ choice: at a predesignated landing area in the community (e.g. football field, local hospital helipad)

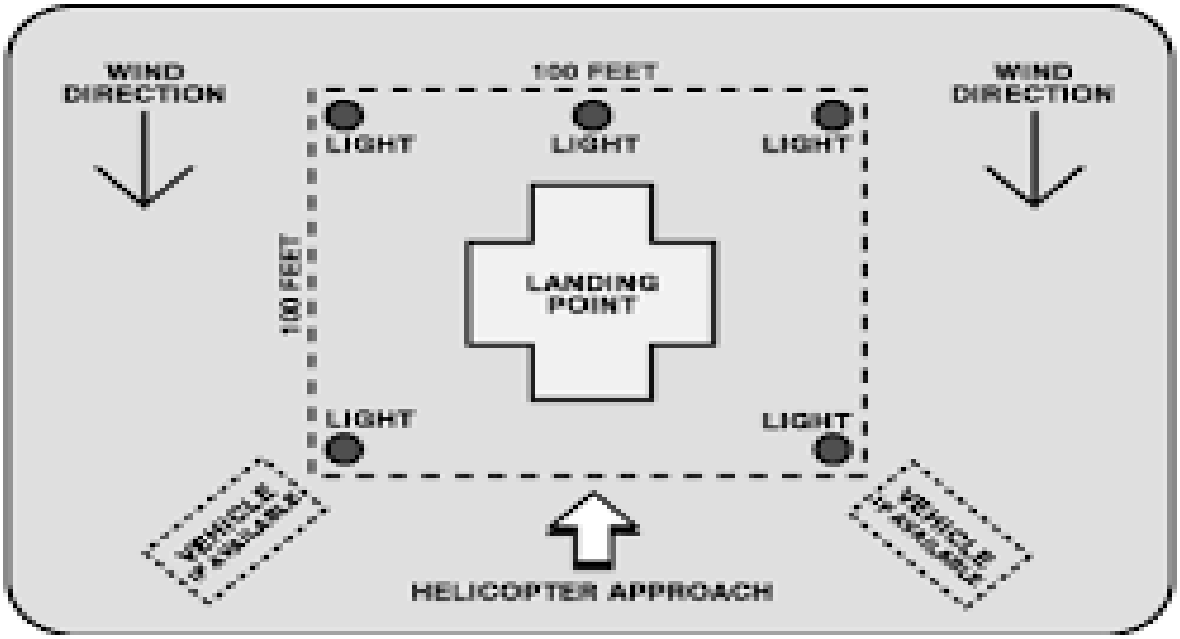
Marking the Landing Zone

- Mark the corners of the 100 ft x 100 ft touchdown area with steady vehicle headlights, box lights, or continuous burner amber-color lights. Red lights are preferred. Flashing lights are distracting.
- Direct light beams horizontally across the touchdown area.
- Mark any obstructions with red strobe or continuous burning lights.

The LZO, Safety Officer, or a designee should ensure that no vehicle traffic or non-essential personnel approach the landing zone unless instructed before, during, and after helicopter landing.

# Appendix VI: Helicopter Response Guidelines

**Helicopter Landing Zone**




Normally a helicopter will land and take off into the wind. To assist the pilot in determining wind direction and speed at the landing zone, a bright streamer of flag can be securely attached to a whip antenna on the apparatus.

**Landing Safety**

Once hovering over the scene, the air ambulance provider should communicate over radio, notifying ground responders where the helicopter will be landed and providing any other instructions. The LZO should notify the pilot of ALL slopes and potential obstructions in the vicinity – when in doubt, point it out. The pilot is the final authority in accepting an area for landing. If the pilot is uncomfortable with the landing zone an alternate area should be identified.

The landing and takeoff phases of helicopter flight are most dangerous. In the event of a landing accident, all ground personnel should take cover because there will likely be significant flying debris.

**Loading Procedure**

Always approach the helicopter from the front. No one should approach the aircraft without permission from the flight crew. Providers must wear protective eyewear at all times and secure all loose personal objects. Do not raise hands, IV solution, or any other objects over shoulder height.

An EMS service should not wait on the scene or delay transport waiting for the helicopter to arrive. If the patient is packaged and ready for transport, the ground EMS service should initiate transport to the hospital and reassign a landing zone where the AMS crew can intercept patient care. If the helipad of a non-appropriate receiving hospital is utilized as a landing zone, the ground EMS crew should not wait more than 8 minutes for the aircraft before proceeding downstairs to the hospital's ED for patient stabilization.

# Region One Protocol Effort

## Medications

March 2021

THIS PAGE INTENTIONALLY LEFT BLANK

# ADENOSINE

**Additional Names:** Adenocard, Adenoscan

**Classification:** Atrial antiarrhythmic, Endogenous nucleotide

**Indications:** Stable Narrow Complex Tachycardia, refractory to vagal maneuvers

**Contraindications:**
Known hypersensitivity
Bradycardias and AV blocks > than 1°
Sick-sinus syndrome

**Dosages:**

**Adult:**

Stable, Regular, Narrow-Complex Tachycardia
Initial: 6-12mg Rapid IV/IO push, followed by 20ml flush, q 1-2min
2nd: 12mg Rapid IV/IO push, followed by 20ml flush

**Pediatric:**

Probable SVT
Initial: 0.1mg/kg IV, q 1-2 min, max 6mg
2nd: Double first dose, max 12mg

Ventricular Tachycardia
If rhythm is regular and monomorphic:
Initial: 0.1mg/kg IV, q 1-2min, max 6mg
2nd: Double first dose, max 12mg

**Side Effects:** Transient periods of asystole/bradycardia/ventricular ectopy, hypotension, palpitations, chest pain, facial flushing, dyspnea, dizziness, tingling, or headache

**Physiological : Effects** Adenosine is an endogenous nucleotide, a derivative of Adenosine Triphosphate (ATP). Adenosine slows conduction time through the AV-node and can interrupt re-entry pathways through the AV-node, restoring sinus rhythms to patients experiencing SVTs. Adenosine half-life < 10 seconds. Onset is immediate.

**Additional Info:**
Vagal/Valsalva maneuvers/ice pack to face first, when clinically appropriate.
Large bore IV access (16g) should be obtained as proximal as possible.
Higher efficacy of conversion with use of stopcock and extremity elevation during administration. Follow with a rapid saline flush.
Does not convert Atrial Fibrillation, Atrial Flutter, or Ventricular Tachycardia.
Larger doses may be required for patients taking Theophylline or Caffeine.
Reduced doses may be required for patients taking Dipyridamole (Persantine) or Carbamazepine (Tegretol).

# ALBUTEROL SULFATE

| | |
|---|---|
| **Additional Names:** | Proventil, Ventolin, Salbutamol |
| **Classification:** | Beta Agonist, Bronchodilator (Sympathomimetic) |
| **Indications:** | Relief of bronchospasms<br>Asthma<br>COPD, chronic bronchitis, emphysema<br>Suspected hyperkalemia |
| **Contraindications:** | Known hypersensitivity<br>Symptomatic tachycardia (relative)<br>Cardiovascular or Cerebrovascular Disease (relative)<br>Congestive Heart Failure or Pulmonary Edema (relative)<br>Use of beta-blocker medications (relative) |
| **Dosages:** | **Adult:**<br><br>Wheezing/Bronchospasm<br>5mg Nebulized<br>Mild: may repeat x 1 prn. Moderate: may repeat prn. Severe: may repeat prn<br><br>Drowning<br>If fluid is auscultated (i.e. rales) in the lungs<br>5mg Nebulized, q5min, may repeat x3 prn<br><br>Crushing Injury/Syndrome<br>Signs of hyperkalemia present<br>20mg Nebulized<br><br>**Pediatric:**<br><br>Asthma/Wheeze > 2 yo<br>≥ 4yo = 5mg Nebulized<br>< 4yo = 2.5mg Nebulized<br>May repeat x2 while administering other treatments. Continue duonebs prn while en route |
| **Side Effects:** | Tachycardia, palpitations, hypertension, angina, nervousness, tremors |
| **Physiological : Effects** | Beta-2 sympathomimetic that produces bronchodilatation by causing smooth muscle relaxation of the smooth bronchial muscles through the stimulation of the beta-2 receptors in the lung tissue. |
| **Additional Info:** | Use cautiously in patients with CAD, HTN, DM, hyperthyroidism. |

# AMIODARONE

**Additional Names:** Cordarone, Nexterone

**Classification:** Antiarrhythmic (Class III)

**Indications:** Ventricular Tachycardia, Ventricular Fibrillation

**Contraindications:**
Known hypersensitivity
Cardiogenic Shock
Severe Sinus Bradycardia, AV Block without a functioning pacemaker
B and $Ca^{2+}$ Channel Blocker OD, with widened QT segment

**Dosages:**

**Adult:**

Cardiac Arrest – VF/pVT
Initial: 300mg IV/IO
2nd: 150mg IV/IO, q 3-5 minutes after 1st dose

Post ROSC
Loading Dose: 150mg IV/IO infusion over 10 minutes if two boluses (300 mg followed by 150 mg) were not already given during resuscitation
Maintenance Infusion: 1mg/min IV/IO infusion

Wide Complex Tachycardia
Regular/Irregular Rhythm:
Loading Dose: 150mg IV/IO infusion over 10 minutes
Maintenance Infusion upon conversion: 1mg/min IV/IO infusion

**Pediatric:**

Cardiac Arrest – VF/pVT
Initial: 5mg/kg IV/IO, max 300mg, may repeat bolus x2 prn, max 450mg total

Ventricular Tachycardia
If rhythm is regular and monomorphic:
Initial: 0.1mg/kg IV, q 1-2min, max 6mg
2nd: Double first dose, max 12mg

**Infusion Set-up:**
**Loading Dose Infusion:** 150mg over 10min: Add 150mg Amiodarone to 150mL NS/D5W, using a 10 gtt/ml macrodrip set, administer *2.5gtts/sec* (aka 150 gtt/min). If using a 15 gtt/ml macrodrip set, administer *3.75 gtts/sec* (aka 225 gtt/min)

**Maintenance Infusion:** 1mg/min: Add 150mg Amiodarone to 150 mL NS/D5W, using a 60 gtt/ml microdrip set, administer *1gtt/sec* (aka 60 gtt/min)

**Side Effects:** May slow heart rate, may cause hypotension with cumulative doses

# AMIODARONE (continued)

| | |
|---|---|
| **Physiological: Effects** | Amiodarone is a complex, multiple anti-arrhythmic agent. Amiodarone prolongs the action potential and refractory period of the myocardium, while slowing the sinus rate. Amiodarone increases PR and QT intervals and decreases peripheral vascular resistance. |
| **Additional Info:** | Do not administer with other medications that prolong QT intervals.<br>Potentiates bradycardia / hypotension with β and $Ca^{2+}$ Channel blockers.<br>Increases the risk of AV block and hypotension with $Ca^{2+}$ Channel blockers.<br>Increases anticoagulation effects of Warfarin |

# ASPIRIN

| | |
|---|---|
| **Additional Names:** | Acetylsalicylic Acid |
| **Classification:** | Non-Steroidal Anti-Inflammatory; Analgesic; Antipyretic; Anticoagulant |
| **Indications:** | Cardiac Chest Pain (ACS), STEMI |
| **Contraindications:** | Known hypersensitivity<br>GI bleed requiring hospitalization or blood transfusion within last 6 months |
| **Dosages:** | **Adult:**<br>Chest Pain / Suspected ACS<br>160-325mg PO |
| **Side Effects:** | May slow heart rate, may cause hypotension with cumulative doses |
| **Physiological: Effects** | Inhibits synthesis and the release of prostaglandins. Aspirin blocks the formation of thromboxane A-2 which causes platelets to aggregate and arteries to constrict. With the decrease in platelet aggregation the blood does not form clots easily. |
| **Additional Info:** | Reduces the mortality associated with myocardial infarction.<br>Aspirin *can* be administered to patients on anticoagulants but should be used with caution.<br>Morphine may reduce aspirin's ability to block platelet aggregation, which leads to higher mortality in AMI patients. |

# ATROPINE

**Additional Names:** Atropisol (ophthalmic), Atreza

**Classification:** Anticholinergic, Sympatholytic

**Indications:**
Symptomatic Bradycardia, Bradyarrhythmias
Organophosphate Poisoning
Pre-intubation in children requiring airway manipulation to prevent vagotropic bradycardia response

**Contraindications:**
Known hypersensitivity
Tachycardia (relative)

**Dosages:**

**Adult:**

Symptomatic Bradycardia
1mg IV/IO, q 3-5min prn, max dose 3mg

Organophosphate Poisoning
2mg IV/IO, q5min prn until secretions resolve, no max

**Pediatric:**

Symptomatic Bradycardia
0.02mg/kg IV/IO, may repeat x1 prn
Minimum single dose = 0.1mg
Maximum single dose for child = 0.5mg
Maximum single dose for adolescent = 1mg

Organophosphate Poisoning
0.02mg/kg IV/IO, q5min prn until secretions resolve, no max

**Side Effects:** Pupil dilation, blurred vision, headache, restlessness, confusion, tachycardia, angina, palpitations, hypertension, flushing of skin, drying of secretions, dry mouth, difficulty swallowing.

**Physiological: Effects** Decreases action of the parasympathetic nervous system increasing conduction velocity (dromotrope) and heart rate (chronotropic), enhances conduction through the AV junction. Decreases bodily secretions.

**Additional Info:** Overdose will cause anticholinergic toxidrome – “red as a beet, dry as a bone, blind as a bat, mad as a hatter, and hot as a desert”

# CALCIUM CHLORIDE

| | |
|---|---|
| **Additional Names:** | Calcium Replacement |
| **Classification:** | Electrolyte, Antidote |
| **Indications:** | $Ca^{2+}$ Channel Blocker overdose<br>Cardiac Arrest secondary to suspected hyperkalemia<br>Suspected hypocalcemia<br>Hypermagnesemia (Magnesium Sulfate overdose) |
| **Contraindications:** | Known hypersensitivity<br>Digoxin Overdose<br>Hypercalcemia |
| **Dosages:** | **Adult:**<br>Overdose / Acute Poisoning: $Ca^{2+}$ Channel Blocker OD<br>500-1,000mg IV/IO infusion over 10-20min *w/Medical Control orders.<br>Asystole/PEA<br>1g IV/IO for known/suspected hyperkalemia or renal disease/dialysis<br>Traumatic Shock<br>2g IV/IO<br>Crush Injury / Syndrome: Signs of Hyperkalemia present<br>1g IV/IO over 10min, not to exceed 1mL/min<br>**Pediatric:**<br>Asystole/PEA<br>20mg/kg IV/IO, max 1g |
| **Side Effects:** | Sensation of “heat wave” or tingling, local burning sensation |
| **Physiological: Effects** | Calcium is an essential component for proper functioning nervous, muscular, skeletal, and endocrine systems and also includes positive inotrope and dromotrope effects. |
| **Additional Info:** | Irritation with extravasation *(may cause tissue necrosis)<br>Rapid IV administration may cause sensation related to side effects.<br>Cardiotoxicity and local phlebitis with rapid IV administration<br>Use caution in patients with renal insufficiency or history of cardiac disease. |

# CALCIUM GLUCONATE

| | |
|---|---|
| **Additional Names:** | None listed |
| **Classification:** | Mineral supplement, Antidote |
| **Indications:** | $Ca^{2+}$ Channel Blocker Overdose<br>Hydrofluoric Acid Exposure |
| **Contraindications:** | Ventricular fibrillation<br>Hypercalcemia<br>Concurrent use of IV Calcium Gluconate |
| **Dosages:** | **Adult:**<br>Hydrofluoric Acid Exposure<br>Skin Exposure: Gel: 2.5% TD to affected area<br>Inhalation Exposure: 4ml Nebulized 2.5-5% |
| **Side Effects:** | Nausea, Constipation |
| **Physiological: Effects** | Calcium is the fifth most abundant element in the body and is essential for maintenance of the functional integrity of nervous, muscular, and skeletal systems and cell membrane and capillary permeability. |
| **Preparation:** | Calcium Gluconate Gel<br>Mix either of the following with 5 oz of water-soluble surgical lubricant (e.g. KY Jelly):<br>• 10ml of 10% Calcium Chloride<br>• 3.5g of Calcium Gluconate powder<br>Calcium Gluconate Nebulized<br>To obtain 100ml of a 2.5% solution, mix 75ml of NS with 25ml of Calcium Gluconate 10% |
| **Additional Info:** | Take appropriate BSI precautions and decontaminate the patient as needed.<br>Use transdermally on fingers by applying gel to the hand, squirting additional gel into a surgical glove, and inserting affected hand into the glove to keep the gel in place. Reapply every 15 minutes and massage until pain has abated.<br>May cause precipitation if mixed in IV fluids that contain carbonates, phosphates, sulfates, or tartrates. |

# DEXAMETHASONE

| | |
|---|---|
| **Additional Names:** | Decadron, Maxidex, Baycadron, DexPak, Ozurdex |
| **Classification:** | Corticosteroid, Glucocorticoid |
| **Indications:** | Anaphylaxis<br>Bronchospasm, Bronchiolitis, Asthma<br>COPD with acute exacerbation<br>Croup, Stridor |
| **Contraindications:** | Known hypersensitivity<br>Hyperglycemia (relative) |
| **Dosages:** | **Adult:**<br>Wheezing/Bronchospasm: Moderate/Severe<br>16mg PO/IV/IM/IO<br>**Pediatric:**<br>Lower Airway Obstruction: Asthma/Wheezing > 2yo<br>0.6mg/kg PO/IV/IM/IO, max 16mg<br>Upper Airway Obstruction: Croup/Stridor<br>0.6mg/kg PO/IV/IM/IO, max 16mg |
| **Side Effects:** | Hyperglycemia, Immunosuppression, GI discomfort |
| **Physiological: Effects** | Long acting corticosteroid with minimal sodium-retaining potential. It decreases inflammation by suppression of neutrophil migration, decreased production of inflammatory mediators, and reversal of increased capillary permeability; suppresses normal immune response. |
| **Additional Info:** | It is safe the give the IV formulation via PO route<br>Diabetes and hyperglycemia is a relative contraindication – administer the drug if anti-inflammatory benefit is likely to outweigh the risk.<br>The PO administration route is preferred in pediatric patients without an IV already established unless patient has altered LOC or airway compromise. |

# DEXTROSE

| | |
|---|---|
| **Additional Names:** | D10, D25, D50 |
| **Classification:** | Carbohydrate, Hyperglycemic |
| **Indications:** | Known hypoglycemia<br>Altered Mental Status of unknown origin with suspected hypoglycemia |
| **Contraindications:** | Head Injury (unless documented hypoglycemia)<br>Known or suspected Intracranial Hemorrhage (caution) |
| **Dosages:** | **Adult:**<br><br>Diabetic Emergency / Hypoglycemia<br>D50: 12.5g-25g IV/IO, (25g = 50mL of D50)<br>D10: 12.5g-25g IV/IO, (25g = 250mL D10)<br><br>Stroke: CBG < 60mg/dL<br>D50: 12.5g-25g IV/IO, (25g = 50mL of D50)<br>D10: 12.5g-25g IV/IO, (25g = 250mL D10)<br><br>**Pediatric:**<br>Diabetic Emergency / Hypoglycemia<br>D50: 1ml/kg IV/IO<br>D25: 2mL/kg IV/IO, optimal for age 1-7yo<br>D10: 5ml/kg IV/IO, optimal for age < 1yo<br><br>Cardiac Arrest<br>D50: 1ml/kg IV/IO<br>D25: 2mL/kg IV/IO, optimal for age 1-7yo<br>D10: 5ml/kg IV/IO, optimal for age < 1yo |
| **Side Effects:** | Irritation, thrombosis, or necrosis can occur if dextrose is infiltrated into tissue. |
| **Physiological: Effects** | Dextrose is a monosaccharide which provides calories for the metabolic needs of the cell as an aerobic metabolic substrate of APT synthesis. Dextrose reverses the CNS effects of hypoglycemia by rapidly elevating serum blood glucose when given parenterally. |
| **Additional Info:** | May worsen ICP or cerebral edema from trauma or CVA<br>Extravasation leads to severe tissue necrosis<br>* Incompatible with Sodium Bicarbonate and Diazepam, thoroughly flush IV between use of same administration access point |

# DIAZEPAM

| | |
|---|---|
| **Additional Names:** | Valium |
| **Classification:** | Benzodiazepine |
| **Indications:** | Seizure Control<br>Anxiolytic/Sedation |
| **Contraindications:** | Known hypersensitivity<br>Hypoglycemic seizure activity<br>Patients with a compromised respiratory status (relative)<br>*Do not give via IN route if patient is < 6yo |
| **Dosages:** | **Adult:**<br>Seizure<br>5mg IV/IM/IO, q 2min prn, max 10mg<br>Agitated/Combative Patient<br>5mg IV or 10mg IM, max 10mg<br>If agitation persists after 5min, repeat initial dose if max dose not already reached<br>Excited Delirium<br>10mg IV/IM<br>If agitation persists after 5min, repeat initial dose<br>Post Intubation Sedation<br>5mg IV or 10mg IM, q2min prn, max 10mg<br>**Pediatric:**<br>Seizure:<br>0.2mg/kg IV/IO/IM, max 5mg if < 5yo / max 10mg if < 10yo<br>0.2mg/kg IN if ≥ 12yo<br>0.3mg/kg IN if 6-11yo<br>0.5mg/kg PR, max 20mg, use PR route as last resort |
| **Side Effects:** | Rapid administration may cause respiratory depression/arrest.<br>Paradoxical excitement or stimulation sometimes occurs. |
| **Physiological: Effects** | Modulates post-synaptic effects of gamma-aminobutyric acid (GABA) transmission, which is a major inhibitory neurotransmitter in the brain. |
| **Additional Info:** | Not to be mixed with any other injectable medication, may precipitate when administered in a D5W IV line. |

# DILTIAZEM

**Additional Names:** Cardizem

**Classification:** Calcium Channel Blocker, Antihypertensive

**Indications:**
Atrial Fibrillation with Rapid Ventricular Response
Atrial Flutter
SVT non-responsive to Adenosine
Acute Hypertension
Angina

**Contraindications:**
Known hypersensitivity
Heart blocks, Bradycardia
Hypotension
Sick Sinus Syndrome
Ventricular Tachycardia

**Dosages:**

**Adult:**

Narrow-Complex Tachycardia: Regular rhythm: Unresponsive to Adenosine
10mg slow IV/IO push, q5min prn, max 20mg total

Narrow-Complex Tachycardia: Irregular rhythm: Stable
10mg slow IV/IO push, q5min prn, max 20mg total.

**Pediatric:**

Probable SVT
- Contraindicated

**Side Effects:** Hypotension, bradycardia, headache, dizziness, arrhythmias, nausea, vomiting. Prolongation of AV node conduction may result in 2nd/3rd degree blocks.

**Physiological: Effects** Inhibits the influx of calcium ions during membrane depolarization of cardiac and vascular smooth muscle, related to its ability to slow AV nodal conduction time and prolong AV nodal refractoriness. Diltiazem slows ventricular rates, interrupts the reentry circuit in AV nodal re-entry tachycardias and reciprocating tachycardias (e.g. WPW). Diltiazem also prolongs sinus cycle length and decreases peripheral vascular resistance.

**Additional Info:**
Monitor heart rate and blood pressure closely.
Diltiazem should be used with caution in patients with impaired liver or renal function.
Caution should be used in pregnant females and mothers that are nursing.
Caution should be used if administered in the presence of CHF.
Caution should be used when administering Diltiazem and anesthetics.

# DIPHENHYDRAMINE

| | |
|---|---|
| **Additional Names:** | Benadryl |
| **Classification:** | Antihistamine |
| **Indications:** | Blocks the cellular histamine receptors resulting in decreased capillary permeability; decreases itching, edema, bronchoconstriction, and vasodilation |
| **Contraindications:** | Known hypersensitivity |
| **Dosages:** | **Adult:**<br>Anaphylaxis / Allergic Reaction<br>50mg IV/IM (I/O Anaphylaxis)<br>Overdose / Acute Poisoning: Phenothiazines (Dystonic Reaction)<br>25-50mg IV/IO/IM<br>**Pediatric:**<br>Anaphylaxis / Allergic Reaction<br>1mg/kg IV/IO/IM, max 50mg<br>Overdose / Acute Poisoning: Phenothiazines (Dystonic Reaction)<br>1-2mg/kg IV/IM |
| **Side Effects:** | Drowsiness, dry mouth and throat |
| **Physiological: Effects** | Blocks the cellular histamine receptors resulting in decreased capillary permeability; decreases itching, edema, bronchoconstriction, and vasodilation. |
| **Additional Info:** | Concomitant CNS depressants may enhance effect<br>Diphenhydramine has anticholinergic effects when given at higher doses<br>Diphenhydramine toxicity may cause cardiac arrhythmias such as torsade de pointes |

# DOPAMINE

**Additional Names:** Intropin, Myocard-DX

**Classification:** Sympathomimetic, Inotrope, Vasopressor

**Indications:** Cardiogenic Shock

**Contraindications:** Known hypersensitivity
Hypovolemia secondary to trauma

**Dosages:**

**Adult:**

CHF / Acute Pulmonary Edema
5-20mcg/min
Titrate to MAP > 65mmHg

Post ROSC:
5-20mcg/kg/min

**Dopamine Infusion**
Mix 400mg Dopamine into 250mL NS/D5W, using microdrop (60 gtt/ml) set
Makes 1.6mg/mL

| | Patient Weight in kg | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Dosage* | 20kg | 30kg | 40kg | 50kg | 60kg | 70kg | 80kg | 90kg | 100kg |
| ***5mcg/kg/min*** | **4** | **6** | **8** | **9** | **11** | **13** | **15** | **17** | **19** |
| ***10mcg/kg/min*** | **8** | **11** | **15** | **19** | **23** | **26** | **30** | **34** | **38** |
| ***15mcg/kg/min*** | **11** | **17** | **23** | **28** | **34** | **39** | **45** | **51** | **56** |
| ***20mcg/kg/min*** | **15** | **23** | **30** | **38** | **45** | **53** | **60** | **68** | **75** |

**Side Effects:** Tachydysrhythmias

**Physiological: Effects** Chemical precursor of norepinephrine that stimulates dopaminergic, Beta2 adrenergic, and Alpha-adrenergic receptors.

**Additional Info:** If the heart rate exceeds 140bpm – the infusion should be discontinued.
Can cause hypertensive crisis in susceptible patients.

# EPINEPHRINE

**Additional Names:** Adrenaline

**Classification:** Sympathomimetic, Catecholamine

**Indications:**
Cardiac Arrest
Bradycardia
Severe Allergic Reaction, Severe Reactive Airway Disease
CHF exacerbation
Croup/Stridor, Bronchiolitis

**Contraindications:**
Known hypersensitivity
Hemorrhagic Shock

**Dosages:**

**Adult:**

Anaphylaxis
0.3-0.5mg IM (1:1,000), may repeat x1 after 5 min, prn
1mL IV/IO Push Dose Epi, q 3-5min, while preparing vasopressor infusion
2-20mcg/min IV/IO Infusion

Wheezing/Bronchospasm: Severe
0.3-0.5mg IM (1:1,000)

CHF/Acute Pulmonary Edema
2-20mcg/min IV/IO infusion, titrate to MAP ≥ 65mmHg

1mL IV/IO Push Dose Epi q 3-5min prn

Cardiac Arrest
1mg IV/IO (1:10,000), q 3-5min

Post ROSC
2-30mcg/min, titrate to MAP ≥ 65mmHg
1mL Push Dose Epi q 3-5min prn

Shock
2-20mcg/min, titrate to MAP ≥ 65mmHg
1ml IV/IO Push Dose Epi, q 3-5min, prn, while preparing vasopressor infusion

Bradycardia: In peri-arrest situations
1mL IV/IO Push Dose Epi, q 2min prn to maintain MAP ≥ 65mmHg

Bradycardia/Age-appropriate hypotension persists
0.01mg/kg IV/IO (1:10,000), q 5min prn, max 1mg total

Hypothermia Induced Cardiac Arrest: VF/pVT, Asystole
1mg IV/IO (1:10,000) ONCE until temp > 86°

# EPINEPHRINE (continued)

**Dosages: (continued)**

**Pediatric**

Anaphylaxis
< 25kg, 0.15mg IM (1:1,000), may repeat x1 after 5min, prn
≥ 25kg, 0.3mg IM (1:1,000)
0.01-0.5mcg/kg/min Infusion w/Medical Control orders

Croup/Stridor
3mg (1:1,000) in Nebulizers, repeat PRN if stridor still present at rest

Pediatric Lower Airway Obstruction: Wheezing due to Bronchiolitis
3mg (1:1,000) via Nebulizer with Medical Control orders

Asthma/Wheezing > 2yo: Severe
≥ 25kg = O.3mg IM (1:1,000)
< 25kg = 0.15mg IM (1:1,000)

Cardiac Arrest
0.01mg/kg IV/IO (1:10,000), q 3-5min, max 1mg/dose

Shock
0.01-0.5mcg/kg/min Infusion
Consider 1mL (10mcg) IV/IO Push Dose Epi

Neonatal Resuscitation
0.01-0.03mg/kg IV/IO, 0.1mg/ml (1:10,000)

**Push Dose Epi:**

**Adults:** Mix in syringe 1mL of Epi (1:10,000) with 9mL saline. Syringe = 10mcg/mL of Epi. Administer 1mL (10mcg) IV/IO, q 3-5min, prn. Consider while preparing vasopressor infusion.

**Peds:** 10mcg/mL (1:100,000), 1ml/1min IV/IO, not to exceed 1mL/1min. Using 1ml syringe, draw 0.1mL of (1:10,000) and 0.9mL saline = 10mcg/mL Titrate to maintain age appropriate SBP.

**Epinephrine Infusion**

Mix 2mg Epinephrine (1:1,000) into 250mL NS/D5W = 8mcg/ml

Infuse using microdrip (60gtt/ml) set

| *Dosage* | 2mcg/min | 4mcg/min | 8mcg/min | 12mcg/min | 16mcg/min | 20mcg/min | 24mcg/min | 30mcg/min |
|---|---|---|---|---|---|---|---|---|
| *gtts/sec* | 1gtt/4sec | 1gtt/2sec | 1gtt/1sec | 1.5gtts/1sec | 2 | 2.5gtts/1sec | 3gtts/1sec | ~4gtts/1sec |
| *gtts/min* | 15gtts | 30gtts | 60gtts | 90gtts | 120gtts | 150gtts | 180gtts | 240gtts |

## EPINEPHRINE (continued)

| | |
|---|---|
| **Side Effects:** | Sweating, dizziness, nervousness, palpitations, weakness, pale skin, headache |
| **Physiological: Effects** | An endogenous catecholamine that stimulates the α-adrenergic and β-adrenergic receptor sites in the sympathetic nervous system. The general physiologic expectation is smooth muscle relaxation of the bronchi, vasoconstriction in the arterioles of the skin and mucosa, and an increase in heart rate and blood pressure. |
| **Additional Info:** | IM administration of Epinephrine is recognized as generally safe regardless of age. Adverse cardiovascular events are most common when Epinephrine is given intravenously.<br>Consider the risks and benefits of Epi use in patients > 60 years old or persons with a cardiac history.<br>Contact Medical Control for use during pregnancy due to risk to fetus. |

# ETOMIDATE

| | |
|---|---|
| **Additional Names:** | Amidate |
| **Classification:** | General Anesthetic<br>Hypnotic |
| **Indications:** | To induce general anesthesia to facilitate intubation |
| **Contraindications:** | Known hypersensitivity |
| **Dosages:** | **Adult:**<br>Delayed/Rapid Sequence Intubation (if approved by agency's Medical Director)<br>0.3 mg/kg IV/IO |
| **Side Effects:** | Transient injection site pain, myoclonic muscle events, adrenal suppression |
| **Physiological: Effects** | Nonbarbiturate hypotonic that acts on the CNS by stimulating gamma-aminobutyric acid (GABA) receptors. Has minimal cardiovascular effects. Lacks analgesic activity. |
| **Additional Info:** | Muscle spasm is most commonly seen when Etomidate is injected quickly.<br>Airway should be directly observed at all times when this medication is administered. |

# FENTANYL

| | |
|---|---|
| **Additional Names:** | Sublimaze |
| **Classification:** | Opioid Analgesic, Synthetic Opioid |
| **Indications:** | Acute Pain<br>Sedation |
| **Contraindications:** | Known Hypersensitivity to Fentanyl or other opioid agonists<br>Known or suspected gastrointestinal obstruction<br>Significant respiratory depression<br>Bradycardia |
| **Dosages:** | **Adult:**<br>Post-Intubation Sedation<br>25-50mcg IV/IO, q 2min prn, max 200mcg<br>Non-Traumatic Abdominal Pain / Nausea & Vomiting<br>25-50mcg IV/IO/IM/IN, q 2min prn for severe pain concerning for a surgical pathology that is not bowel obstruction or ileus (max 100 mcg)<br>Chest Pain<br>25-50mcg IV/IO/IN/IM, q 2min prn, max 200mcg<br>Traumatic Pain Management<br>25-50mcg IM or slow IV push, q 2min prn, max 150mcg<br>If additional analgesia is needed for persistently severe pain (8-10) believed to be due to a surgical pathology contact Med Control<br>**Pediatric:**<br>Traumatic Pain Management<br>1mcg/kg IV, 1-2mcg/kg IN, max 100mcg, may repeat x1 with Medical Control orders |
| **Side Effects:** | Bradycardia, respiratory depression, apnea, muscle rigidity, diarrhea, nausea, constipation, dry mouth |
| **Physiological: Effects** | Narcotic agonist of opiate receptors; inhibits ascending pain pathways thus altering response to pain. Produces analgesia, respiratory depression, and sedation. |
| **Additional Info:** | Effects are related to the dose and speed of administration. May cause sudden respiratory depression/arrest.<br>Usual effects last for 30-60 min, IM onset 7-8 min with duration of 1-2 hrs<br>Use caution with elderly or debilitated patients<br>Use caution in patients taking other CNS depressant medications/ETOH use<br>Use caution in patients with respiratory disease |

# HYDROXYCOBALAMIN (CYANOKIT®)

| | |
|---|---|
| **Additional Names:** | Cyanokit |
| **Classification:** | Cyanide antidote , Vitamin B12 precursor |
| **Indications:** | Cyanide Poisoning (known or suspected) |
| **Contraindications:** | None |
| **Dosages:** | **Adult:**<br>Cyanide Poisoning<br>5g IV/IO<br><br>**Pediatric:**<br>Cyanide Poisoning<br>70mg/kg IV/IO, max 5g |
| **Side Effects:** | Elevated blood pressure, headache, nausea, erythema, rash, infusion site reaction, red colored urine |
| **Physiological: Effects** | Vitamin B12 molecule with hydroxyl group linked to cobalt binds one cyanide ion by substituting the cobalt molecule. Cyanocobalamin is formed and renders cyanide inactive. Cyanocobalamin is excreted in the urine. |
| **Additional Info:** | Consider cyanide poisoning regardless of $SpO_2$ levels<br>Cyanide can act independently from cyanide poisoning and synergistically |

# IPRATROPIUM BROMIDE

| | |
|---|---|
| **Additional Names:** | Atrovent |
| **Classification:** | Anticholinergic (parasympatholytic), Bronchodilator |
| **Indications:** | Relieve bronchospasm associated with asthma, emphysema, and chronic bronchitis |
| **Contraindications:** | Known Hypersensitivity to Atrovent or Atropine |
| **Dosages:** | **Adult:**<br>Wheezing / Bronchospasm<br>0.5mg Nebulized<br>**Pediatric:**<br>Asthma / Wheezing > 2yo<br>0.5mg Nebulized, may repeat x2 while administering other treatments |
| **Side Effects:** | Headache, dry mouth, dizziness, cough, upset stomach |
| **Physiological: Effects** | Inhibits vagally mediated reflexes by antagonizing acetylcholine receptors on bronchial smooth muscle; this leads to localized bronchodilatation |
| **Additional Info:** | Anaphylaxis / Allergic Reaction consideration: Patients who take β Blockers have an increased risk of developing a more severe reaction; these patients also may have a paradoxical response to Epinephrine. The use of inhaled Atrovent and Albuterol may help respiratory symptoms in these cases. |

# KETAMINE

| | |
|---|---|
| **Additional Names:** | Ketalar |
| **Classification:** | Dissociative Anesthetic |
| **Indications:** | Agitation/Excited Delirium, Pain Management, Post-Intubation Sedation |
| **Contraindications:** | Known hypersensitivity<br>Hypertensive Crisis |
| **Dosages:** | **Adult:**<br>Excited Delirium<br>2mg/kg IV/IO or 4mg/kg IM, max IM/IV dose = 400mg<br>If agitation persists after 5 minutes, repeat Ketamine at half the initial dose.<br><br>Post-Intubation Sedation<br>2mg/kg IV/IO or 4mg/kg IM, q 10min prn, may repeat x1<br><br>Cardiac Arrest/Post ROSC: for occurrence of varying states of consciousness<br>1mg/kg IV/IO for sedation/amnesia<br><br>Bradycardia: Prior to TCP<br>Premedicate with 1mg/kg IV/IO/IM, max 200mg, if possible<br><br>Traumatic Pain Management<br>25mg IV/IO/Infusion, q15min prn, max 50mg IV/IO<br>50mg IN/IM, q15min prn, max 100mg IN/IM<br>Contact Medical Control if additional analgesia in needed. |
| **Side Effects:** | Emergence reaction, visual hallucinations, tachycardia, hypertension, respiratory depression/laryngospasms when given rapidly, bronchodilation, hypersalivation |
| **Physiological: Effects** | Dissociative agent that blocks the NMDA receptor, producing profound anesthesia and analgesia. In lower doses, ketamine is a potent analgesic. Unlike opiates, ketamine does not suppress the central nervous system, which makes it ideal for use when sedation or pain management is needed in the hemodynamically compromised patient. |
| **Additional Info:** | Ketamine delivers optimal therapeutic effects when administered via slow push (at least over 60 seconds IV or via infusion over 10-15 minutes). Administration delivered over shorter periods of time have reported increase in discomfort, laryngospasm, and severity of dissociation.<br>If patient exhibits laryngospasms/respiratory depression/respiratory pause, assist ventilations with bag valve mask. Respiratory compromise is typically brief (i.e. less than 5-10 minutes) and does not require intubation.<br>Emergence reactions may occur when ketamine begins to wear off and can be mitigated with benzodiazepines. |

# LIDOCAINE

| | |
|---|---|
| **Additional Names:** | Lidocaine CV, Xylocaine |
| **Classification:** | Antidysrhythmic (class Ib), Local Anesthetic |
| **Indications:** | Ventricular Arrhythmia<br>Local Infiltration Anesthesia prior to IO infusion |
| **Contraindications:** | Known Hypersensitivity to lidocaine or amide-type local anesthetic<br>Congestive Heart Failure<br>Cardiogenic Shock<br>2° and 3° heart block if no pacemaker is present |
| **Dosages:** | **Adult:**<br>Cardiac Arrest<br>Consider 1 mg/kg slow IV bolus over 2-3 min after defibrillation, CPR, and vasopressor administration. Repeat x 1 after 5 min for persistent VF/VT<br>Intraosseous Access<br>20-40mg IO after IO insertion for pain relief in conscious patients |
| **Side Effects:** | Dermatologic: edema, erythema at injection site, petechiae. Cardiovascular: hypotension |
| **Physiological: Effects** | Class Ib antidysrhythmic combines with fast Na channels and inhibits recovery after repolarization, resulting in decreasing myocardial excitability |
| **Additional Info:** | Constant monitoring with and EKG is essential to the proper administration of IV lidocaine.<br>When lidocaine is administered with other antiarrhythmic drugs such as amiodarone, phenytoin, procainamide, propranolol, or quinidine, the cardiac effects may be additive or antagonistic. |

# LORAZEPAM

| | |
|---|---|
| **Additional Names:** | Ativan |
| **Classification:** | Benzodiazepine |
| **Indications:** | Seizure Control<br>Anxiolytic, Sedation |
| **Contraindications:** | Known Hypersensitivity<br>Narrow-Angle Glaucoma<br>Patients with a history of sleep apnea syndrome |
| **Dosages:** | **Adult:**<br>Seizure<br>2mg IV/IM/IO, q2min prn, max 8mg<br>Agitated/Combative Patient<br>2mg IV or 4mg IM, max 8mg<br>If agitation persists after 5min, repeat initial dose if max dose not already reached<br>Excited Delirium<br>4mg IV/IM<br>If agitation persists after 5min, repeat initial dose<br>Post Intubation Sedation:<br>2-4mg IV/IM, q2min prn, max 10mg<br>**Pediatric:**<br>Seizure<br>0.1mg/kg IV/IO/IM, max 4mg, may repeat x1 after 5 min |
| **Side Effects:** | Sedation, dizziness, fatigue, amnesia, drowsiness. Rapid administration may cause respiratory depression/arrest. |
| **Physiological: Effects** | Sedative hypnotic increases the action of gamma-aminobutyric acid (GABA), which is a major inhibitory neurotransmitter in the brain. |
| **Additional Info:** | Not to be mixed with any other agents or diluted with IV solutions. Administer via the proximal end of the IV tubing and flush well.<br>Most likely to produce respiratory depression in patients who have taken other depressant drugs, especially alcohol and barbiturates.<br>Can cause local venous irritation. Use relatively large veins, if possible. |

# MAGNESIUM SULFATE

**Additional Names:** $MgSO_4$

**Classification:** Antidysrhythmic, Electrolyte, Smooth Muscle Relaxant

**Indications:**
Asthma, Reactive Airway Disease
Eclampsia
Torsade de Pointes

**Contraindications:**
Known Hypersensitivity
Heart blocks, Bradycardia, Myocardial damage (relative)
Hypotension, Shock

**Dosages:**

**Adult:**

Wheezing/Bronchospasm: Severe
2g IV/IO over 10min (mixed in 100mL NS/D5W)

Seizure in pregnancy > 20 weeks gestation
4g IV/IO in 100mL NS/D5W infusion over 10min or 10g IM (5g in each buttock) if unable to obtain IV access

Cardiac Arrest – Torsade de Pointes / Polymorphic VT
2g IV/IO

Tachycardia – Torsade de Pointes / Polymorphic VT
1-2g IV/IO over 10min.

**Pediatric:**

Asthma/Wheezing > 2yo: Severe
50mg/kg IV over 10min, max 2g

Cardiac Arrest – Torsade de Pointes / Polymorphic VT
50mg/kg IV/IO, max 2g

Tachycardia – Torsade de Pointes / Polymorphic VT
50mg/kg IV/IO over 10-20min

**Infusion Set-Up:** Waste 150mL of 250mL NS/D5W leaving 100mL in bolus. Add 2g of $MgSO_4$ to bolus. Using a 15gtt/mL macrodrip set, administer infusion at a rate of *2.5gtts/sec* (aka 150 gtt/min) to deliver 2g over 10 minutes.

**Side Effects:** Hypotension, flushing, drowsiness, respiratory depression/paralysis, CNS depression and paralysis,

# MAGNESIUM SULFATE (continued)

| | |
|---|---|
| **Physiological: Effects** | Magnesium Sulfate reduces striated muscle contractions and blocks peripheral neuromuscular transmission by reducing acetylcholine release at the myoneural junction. Magnesium Sulfate effectively decreases the risk of preeclampsia progressing to eclampsia and effectively terminates seizures. The anticonvulsant activity is suspected to be due to magnesium's role as an N-methyl-D-aspartate (NMDA) antagonist. |
| **Additional Info:** | Administer with caution if flushing and sweating occurs.<br>Use with caution when co-administered with barbiturates, narcotics, other hypnotics, or systemic anesthetics. CNS depressants may be additive; dosages often require adjustments.<br>Because Magnesium is removed from the body solely by the kidneys, the drug should be used with caution in patients with renal impairment. Consider the risk and benefit of its use prior to administering to patients with renal failure.<br>High levels of magnesium can cause sinus bradycardia and blocks. Consider the risk and benefits of its prior to administering to patients with cardiac disease. |

# METHYLPREDNISOLONE

| | |
|---|---|
| **Additional Names:** | Solu-Medrol, Medrol |
| **Classification:** | Steroid-Glucocorticoid, Anti-Inflammatory Agent |
| **Indications:** | Anaphylaxis, Allergic Reaction<br>Asthma, COPD<br>Adrenal Crisis |
| **Contraindications:** | Known Hypersensitivity<br>Use with caution in patients with diabetics<br>Use with caution in patients with GI bleeding |
| **Dosages:** | **Adult:**<br>Wheezing/Bronchospasm: Moderate/Severe<br>125mg IV/IO/IM<br><br>Anaphylaxis<br>125mg IV/IO/IM<br><br>Shock – if patient has Addison's Disease or other forms of Adrenal Sufficiency<br>125mg IV/IO/IM with *Medical Control orders<br><br>**Pediatric:**<br>Lower Airway Obstruction: Asthma/Wheezing > 2yo<br>2mg/kg IV/IM/IO, max 125mg<br><br>Anaphylaxis<br>2mg/kg IV/IM/IO, max 124mg |
| **Side Effects:** | Dizziness, weakness, sleep disorders, sodium and water retention, nausea, hypokalemia, hyperglycemia |
| **Physiological: Effects** | Methylprednisolone is a synthetic corticosteroid. Corticosteroids are hormones produced by the adrenal glands and are involved in several physiological systems such as stress response, Immune system response, and regulation of inflammation. |
| **Additional Info:** | Adrenal Crisis / Addison's Disease presents with hypotension or shock out of proportion to the severity of the illness; it can be fatal if not diagnosed and treated aggressively with steroid replacement. Contact Medical Control for consultation. |

# METOPROLOL

| | |
|---|---|
| **Additional Names:** | Lopressor, Toprol |
| **Classification:** | Beta-Adrenergic Blocker |
| **Indications:** | Atrial Fibrillation Uncontrolled, Atrial Flutter, SVT non-responsive to Adenosine |
| **Contraindications:** | Known Hypersensitivity<br>2nd and 3rd degree Heart Blocks<br>Bradycardia, Hypotension<br>Cardiogenic Shock<br>Bronchial Asthma |
| **Dosages:** | **Adult:**<br>Narrow-Complex Tachycardia: Regular rhythm: Unresponsive to Adenosine<br>5mg slow IV/IO push, q5min prn (max 15mg total)<br>Narrow-Complex Tachycardia: Irregular rhythm: Stable<br>5mg slow IV/IO push, q5min prn (max 15mg total)<br>**Pediatric:**<br>Probable SVT<br>Contraindicated |
| **Side Effects:** | Bradycardia, headache, dyspnea, light-headedness, dizziness, weakness, nausea, vomiting, ankle swelling |
| **Physiological: Effects** | Beta-adrenergic receptor blocker, with preferential effect on Beta1-adrenoceptors chiefly located in the cardiac muscle. The preferential effect is not absolute and at high doses, Beta2-adrenoreceptors chiefly located in the smooth bronchial muscles and vascular musculature can be affected. Beta-blocking activity is shown to reduce heart rate and cardiac output. Metoprolol has no intrinsic sympathomimetic activity. |
| **Additional Info:** | Monitor heart rate and blood pressure closely.<br>Use with caution in pulmonary disease and CHF |

# MIDAZOLAM

**Additional Names:** Versed

**Classification:** Benzodiazepine, Anxiolytic

**Indications:**
Seizure Control
Anxiolytic, Sedation
Pre-medication before TCP

**Contraindications:**
Known Hypersensitivity
Narrow-Angle Glaucoma
Hypotension

**Dosages:**

**Adult:**

Seizure
10mg IM if seizing upon arrival
2.5mg IV/IM/IO, q2min prn, max 10mg (not including initial IM dose if seizing upon arrival)

Agitated/Combative Patient
2.5-5mg IV/IM/IN, max 10mg
If agitation persists after 5min, repeat initial dose if max dose not already reached

Excited Delirium
5mg IV/IM
If agitation persists after 5min, repeat initial dose

Post Intubation Sedation
5mg IV/IO/IM, q2min prn, max 20mg

Bradycardia – TCP Premedication
2.5-5mg IV/IO/IN, if possible, for sedation

Tachycardia – Cardioversion Premedication
2.5-5mg IV/IO/IN, if possible, for sedation

Congestive Heart Failure – Anxiolytic prior to CPAP
2.5 mg IV/IO/IM x1 prn

**Pediatric:**

Seizure:
0.2mg/kg IV/IO, max 5mg, if seizing on arrival, may repeat x1 q5min
0.1mg/kg IV/IO, max 2mg, may repeat x1 q5min

**Side Effects:**
Rapid administration may cause respiratory depression/arrest
Hypotension, cardiac arrhythmias, anterograde amnesia

# MIDAZOLAM (continued)

| | |
|---|---|
| **Physiological: Effects** | Induces effects by acting on parts of the gamma-amino butyric acid (GABA) and benzodiazepine receptors, the major inhibitory neurotransmitters in the CNS. Contains anxiolytic, anticonvulsant, sedative, muscle relaxant, and amnesic properties. |
| **Additional Info:** | Potentiates the effects of other CNS depressants.<br>Use lower end of dosing range in debilitated patients, including the elderly.<br>Do not dilute for IM/IN administration.<br>Considered to be twice as potent as Diazepam, milligram for milligram |

# MORPHINE SULFATE

**Additional Names:** MS Contin

**Classification:** Opioid Analgesic

**Indications:**
Chest pain unrelieved by Nitroglycerin
Traumatic Injury
Burn

**Contraindications:**
Known Hypersensitivity to Morphine or other opioid agonists
Paralytic ileus
Head injury

**Dosages:**

**Adult:**

Chest Pain
2-4mg IV/IO/IM, q2min prn, max 10mg

Traumatic Pain Management
2-4mg IV/IO/IM, q2min prn, max 10mg
If additional analgesia is needed for persistently severe pain (8-10) believed to be due to a surgical pathology contact Med Control

**Pediatric:**

Traumatic Pain Management
< 1yo: 0.05mg/kg IV/IO
≥ 1yo: 0.1mg/kg IV/IO max 4mg
May repeat x1 with Medical Control orders

**Side Effects:** Decreased blood pressure, nausea/vomiting, altered level of consciousness, respiratory depression

**Physiological Effects:** Narcotic agonist-analgesic that inhibits ascending pain pathways, thus altering response to pain. Acute administration causes vasodilatation and decreased sympathetic tone, resulting in bradycardia and decreased blood pressure. The  Increases venous capacitance, decreases venous return, and produces mild peripheral vasodilation. Morphine also decreases myocardial oxygen demand.

**Additional Info:**
The effects of morphine are potentiated by alcohol, antihistamines, barbiturates, sedatives, and beta blockers.

The decreased myocardial oxygen demand of morphine can be nullified if respiratory depression decreases oxygen supply.

The use of morphine in NSTEMI is controversial, as it may inhibit the absorption and efficacy of antiplatelet agents. Use judiciously.

# NALOXONE

| | |
|---|---|
| **Additional Names:** | Narcan |
| **Classification:** | Opioid Antagonist, Opioid Reversal Agent |
| **Indications:** | Respiratory and neurologic depression due to opioid intoxication |
| **Contraindications:** | Known hypersensitivity |
| **Dosages:** | **Adult:**<br>Overdose / Acute Poisoning: Suspected Opiate Overdose<br>0.5-2 mg IV/IM/IO, q2-3 min prn<br>2-4 mg IN, q2-3min prn<br>Cardiac Arrest<br>2mg IV/IO if suspected opioid overdose (should not delay CPR)<br>**Pediatric:**<br>Pediatric Altered Mental Status: Suspicion of Opiate/Opioid Ingestion<br>0.1mg/kg IV/IO/IN, q2-3min, titrate prn (max 2mg/dose)<br>Cardiac Arrest<br>1-2mg IV/IO if suspected opioid overdose (should not delay CPR) |
| **Side Effects:** | Withdrawal symptoms (especially in neonates), combativeness, hyperventilation, tachycardia, hypertension, nausea/vomiting |
| **Physiological Effects:** | Naloxone competitively binds to the β-endorphin receptors in the central nervous system, thereby reversing the effects of opiates and their derivatives. Naloxone completely reverses the effects of opioids and causes a sudden onset of withdrawal symptoms. |
| **Additional Info:** | Naloxone doses should be used to reverse respiratory depression, not to fully awaken the patient. Anticipate combative behavior and ensure provider safety in advance.<br>IV doses greater than 0.5mg increase the risk of flash pulmonary edema – this chance increases in proportion to the administration dose<br>Synthetic opioids (e.g. fentanyl, carfentanil) frequently require doses greater than 2mg. |

# NITROGLYCERIN

| | |
|---|---|
| **Additional Names:** | Nitrostat, NitroDur, Transderm Nitro |
| **Classification:** | Vasodilator, Antianginal Agent |
| **Indications:** | Chest Pain suspected to be cardiac in nature (ACS/STEMI)<br>Congestive Heart Failure |
| **Contraindications:** | Known Hypersensitivity<br>Recent use of erectile dysfunction medications (Viagra/Levitra within 24 hours, Cialis within 48 hours)<br>SBP < 100mHg<br>Hypovolemia<br>Suspected Right Ventricular Infarction (relative) |
| **Dosages:** | **Adult:**<br>Chest Pain / Suspected ACS<br>0.4mg SL, q 3min prn for chest pain, max 3 doses<br>– followed by –<br>1in paste TD, applied to left anterior chest wall<br><br>CHF / Acute Pulmonary Edema<br>0.4mg SL, q5min prn (no max) if SBP ≥ 100mmHg<br>0.8mg SL, q5min prn (no max) if age < 85 and SBP > 200mmHg<br>– followed by –<br>1in paste TD, applied to left anterior chest wall prn |
| **Side Effects:** | Headache, hypotension, palpitations, flushing, nausea/vomiting |
| **Physiological: Effects** | Relaxes smooth muscles, thus producing vasodilator effects on arteries and veins and reducing preload and afterload. Causes coronary artery dilatation. |
| **Additional Info:** | Monitor blood pressure after each dose.<br>Do not allow medication to come in contact with your skin. Use gloves for application. |

# NOREPINEPHRINE

**Additional Names:** Levophed

**Classification:** Sympathomimetic, Vasopressor

**Indications:** Shock

**Contraindications:** Known hypersensitivity
Hypovolemia

**Dosages:**

**Adult:**

Shock
2-12mcg/min IV/IO infusion, titrate to MAP ≥ 65mmHg

CHF/Acute Pulmonary Edema:
2-12mcg/min IV/IO infusion, titrate to MAP ≥ 65mmHg

Post ROSC
2-12mcg/min IV/IO infusion, titrate to MAP ≥ 65mmHg

**Pediatric:**

Shock
0.01-0.5mcg/kg/min Infusion

**Norepinephrine Infusion**

Mix 4mg Norepinephrine into 250mL NS/D5W = 16mcg/ml

Infuse using microdrip (60gtt/mL) set

| *Dosage* | 2mcg/min | 4mcg/min | 6mcg/min | 8mcg/min | 10mcg/min | 12mcg/min |
|---|---|---|---|---|---|---|
| *gtts/sec* | ~1gtt/8sec | 1gtt/4sec | ~1gtt/3sec | 1gtt/2sec | ~0.5-0.75 gtt/sec | ~0.75-1 gtt/sec |
| *gtts/min* | 8gtts/min | 15gtts/min | 22gtts/min | 30gtts/min | 38gtts/min | 45gtts/min |

** Do not forget to lab IV bag "Norepinephrine 16mcg/ml **

**Side Effects:** Hypertension, arrhythmias, reflex bradycardia ischemic injury due to vasoconstriction, headache, dyspnea (with or without respiratory difficulty)

**Physiological Effects:** Norepinephrine functions as a peripheral vasoconstrictor (α-adrenergic action) and as an inotropic stimulator of the heart and dilator of coronary arteries (β-adrenergic action).

# NOREPINEPHRINE (continued)

**Additional Info:**

Constantly monitor the blood pressure and adjust dose according to the MAP (Goal > 65). Avoid hypertension.

When possible, Norepinephrine infusion should be given via a large vein, preferable a vein in the antecubital fossa.

Ensure patient is not fluid depleted. Fluid resuscitation should be considered when appropriate.

# ONDANSETRON

| | |
|---|---|
| **Additional Names:** | Zofran |
| **Classification:** | Antiemetic |
| **Indications:** | Nausea and Vomiting |
| **Contraindications:** | Known hypersensitivity<br>History of congenital long QT syndrome |
| **Dosages:** | **Adult:**<br>Post Intubation Sedation: Consider pre-intubation<br>4mg IV/IO to decrease aspiration risk<br>Non-Traumatic Abdominal Pain / Nausea & Vomiting<br>4mg IV/IO/PO, q 15min prn, max 8mg<br>Chest Pain<br>4mg IV, prn for nausea vomiting with active pain<br>Traumatic Pain Management: Nausea/Vomiting due to Analgesia<br>4mg IV/IO/IM, q 15min prn, max 8mg<br>**Pediatric:**<br>Nausea / Vomiting and Dehydration<br>2mg IV/IO/PO, (8-15kg)<br>4mg IV/IO/PO, (> 15kg) |
| **Side Effects:** | Constipation, fatigue, headache. Rare cardiac effects include arrhythmias, QT prolongation, palpitations |
| **Physiological Effects:** | Selective 5-HT3 receptor antagonist that bind receptors in the CNS and GI tract. Mechanism not fully characterized. |
| **Additional Info:** | Onset in seconds<br>It is safe to give IV formulation orally, if tolerated |

# ORAL GLUCOSE

| | |
|---|---|
| **Additional Names:** | Glucose, Insta-Glucose |
| **Classification:** | Monosaccharide |
| **Indications:** | Hypoglycemia |
| **Contraindications:** | Known Hypersensitivity<br>Inability for patient to protect their own airway or follow commands |
| **Dosages:** | **Adult:**<br>Hypoglycemia<br>15g PO<br><br>**Pediatric:**<br>Hypoglycemia<br>15g PO |
| **Side Effects:** | Negligible |
| **Physiological: Effects** | Increases blood serum glucose level by absorption through mucous membranes |
| **Additional Info:** | May be administered by EMT/NRP provided there is no risk of aspiration related to the patient's mental status. |

# ROCURONIUM

| | |
|---|---|
| **Additional Names:** | Zemuron |
| **Classification:** | Neuromuscular Blocking Agent |
| **Indications:** | Pharmacologically assisted endotracheal intubation |
| **Contraindications:** | Known Hypersensitivity |
| **Dosages:** | **Adult:**<br>Delayed & Rapid Sequence Intubation (if approved by agency's Medical Director)<br>1.2 mg/kg IV/IO<br>1.6 mg/kg IV/IO if patient is hypotensive |
| **Side Effects:** | Dose-related tachycardia, hypertension, transient hypotension, injection site edema |
| **Physiological: Effects** | Nondepolarizing skeletal muscle relaxant; inhibits depolarization. |
| **Additional Info:** | Rapid onset of action (60-90 sec). Duration 45-120 min. Minimal cardiovascular effects. Additive/synergistic effect if administered with or following an opioid, sedative, or anesthetic agent |

# SODIUM BICARBONATE

**Additional Names:** None

**Classification:** Electrolyte Buffer

**Indications:**
Pre-existing metabolic acidosis (perfusing patient able to self-ventilate)
Hyperkalemia
TCA, Phenobarbital, or ASA overdose
During cardiac arrest, after prolonged resuscitation efforts

**Contraindications:**
Metabolic Alkalosis
Hypokalemia
Simultaneously with Calcium Chloride
Simultaneously with Catecholamines (Epinephrine, etc.)

**Dosages:**

**Adult:**

Overdose: ASA, TCA, or Unknown Medication OD with QRS > 120ms
1-2mEq/kg IV/IO, repeat prn until QRS ≤ 120ms *w/Medical Control orders

Cardiac Arrest: Suspected Acidosis / Hyperkalemia
1mEq/kg IV/IO

Excited Delirium: Cardiac Arrest
100mEq (2 amps) early in resuscitation
-followed by-
50mEq (1 amp) q10min for remainder of resuscitation

Sodium Channel Blocker OD with QRS > 120ms
1mEq/kg IV/IO, w/ Medical Control orders

Crush Injury / Syndrome: Signs of Hyperkalemia NOT present
50mEq added per liter of NaCl

Crush Injury / Syndrome: Signs of Hyperkalemia present
100mEq Bolus IV/IO

Irritant Gas / Simple Asphyxiant Exposure: Chlorine Exposure
2.5ml mixed with 2.5mL sterile water Nebulized

**Pediatric:**

Cardiac Arrest: Suspected Acidosis
1mEq/kg IV/IO of 8.4% solution

**Side Effects:**
Metabolic Alkalosis
CHF (edema secondary to sodium overload)
Hypernatremia

# SODIUM BICARBONATE (continued)

| | |
|---|---|
| **Physiological: Effects** | Bicarbonate is an anion that forms a salt (sodium bicarbonate) when it combines with its conjugate acid. Bicarbonate serves as the principal buffer for the body's acid/base buffer system maintaining the $CO_2$ level. |
| **Additional Info:** | During cardiac arrest, sodium bicarbonate should not be administered prior to establishing a definitive airway.<br>Sloughing will occur if infiltrated out of vein into tissue. |

# SUCCINYLCHOLINE

| | |
|---|---|
| **Additional Names:** | Suxamethonium, Anectine |
| **Classification:** | Neuromuscular Blocking Agent |
| **Indications:** | Pharmacologically assisted endotracheal intubation |
| **Contraindications:** | Known Hypersensitivity<br>CVA or spinal cord injury within the last 6 months<br>Chronic renal failure on hemodialysis<br>Suspicion of hyperkalemia<br>Known or suspected muscular disease (e.g. ALS, muscular dystrophy, myasthenia gravis, Guillain-Barre syndrome)<br>History of malignant hyperthermia |
| **Dosages:** | **Adult:**<br>Delayed & Rapid Sequence Intubation (if approved by agency's Medical Director)<br>2 mg/kg IV/IO |
| **Side Effects:** | Excessive salivation, muscle fasciculations, rise in intracranial, intraocular, intragastric pressure. May cause rhabdomyolysis. |
| **Physiological: Effects** | Depolarizing muscle relaxant. |
| **Additional Info:** | Rapid onset of action (45-60 sec). Duration 5-10 min. Do not use to maintain paralysis. |

# TRANEXAMIC ACID

| | |
|---|---|
| **Additional Names:** | TXA, Cyklokapron |
| **Classification:** | Antifibrinolytic Agent |
| **Indications:** | Major Hemorrhage (trauma) |
| **Contraindications:** | Known Hypersensitivity<br>≥ 3 hours from time of injury<br>Subarachnoid Hemorrhage<br>Active intravascular clotting |
| **Dosages:** | **Adult:**<br>Traumatic Shock<br>2g IV/IO over 10 min, if available |
| **Side Effects:** | Hypotension if given rapidly, diarrhea, nausea, vomiting, and blurred vision |
| **Physiological: Effects** | TXA is a synthetic amino acid that prevents plasminogen from being converted to plasmin. Plasmin is responsible for breaking down already formed clots in the body in a process known as fibrinolysis. When TXA is administered, it will prevent the body from breaking down clots so that the natural clotting processes can work to control non-compressible hemorrhage. |
| **Additional Info:** | May give IM as a last resort<br>Administer TXA no later than 3 hours from time of injury<br>TXA administered within 1 hour of time of injury has shown to significantly reduce the risk of death due to bleeding<br>If hypotension occurs slow down infusion rate |