Abstract
These guidelines will be maintained by NASEMSO to facilitate the creation of state and local EMS system clinical guidelines, protocols or operating procedures. System medical directors and other leaders are invited to harvest content as will be useful. These guidelines are either evidence based or consensus based and have been formatted for use by field EMS professionals.
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Introduction

The Future of Emergency Care: Emergency Medical Services at the Crossroads, an Institute of Medicine report published in 2007, states “NHTSA, in partnership with professional organizations, should convene a panel of individuals with multidisciplinary expertise to develop evidence-based model prehospital care protocols for the treatment, triage, and transport of patients.” The National Highway Transportation Safety Administration, Office of EMS (NHTSA OEMS) has embraced this recommendation with the development of the Evidence-Based Guideline Project.

The National Association of State EMS Officials (NASEMSO) recognizes the need for national EMS clinical guidelines to help state EMS systems ensure a more standardized approach to the practice of patient care and to encompass guidelines that areas they become available. Model EMS clinical guidelines promote uniformity in prehospital care which, in turn, promotes more consistently skilled practice as EMS providers move across healthcare systems. They also provide a standard to EMS Medical Directors upon which to base practice. Supported by grant funding from NHTSA OEMS and the Health Resources and Services Administration (HRSA), NASEMSO authorized its Medical Directors Council to partner with national stakeholder organizations with expertise in EMS medical direction and subject matter experts to create a unified set of patient care guidelines. For the aspects of clinical care where evidence-based guidelines derived in accordance with the national evidence-based guideline model process were not available, consensus-based clinical guidelines were developed utilizing currently available research.

The NASEMSO Model EMS Clinical Guidelines are not mandatory nor are they meant to be all-inclusive or to determine local scope of practice. The focus of these guidelines is solely patient-centric. As such, they are designed to provide a resource to clinical practice, maximize patient care, safety, and outcomes regardless of the existing resources and capabilities within an EMS system. They are a set of clinical guidelines that can be used as is or adapted for use on a state, regional or local level to enhance patient care and benchmark performance of EMS practice. Emergency care and EMS delivery is, by nature, inherently dynamic. NASEMSO supports the evolution of the model EMS clinical guidelines as new EMS research and evidence-based patient care measures emerge in the future.

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Co-Principal Investigator Co-Principal Investigator
Purpose

These guidelines are intended to help state EMS systems ensure a more standardized approach to the practice of patient care, and to encompass evidence-based guidelines as they are developed.

The long-term goal is to develop a full range of evidence-based prehospital care clinical guidelines. However, until there is a sufficient body of evidence to fully support this goal, there is a need for this interim expert, consensus-based step.

The National Model EMS Clinical Guidelines can fill a significant gap in uniform clinical guidance for EMS patient care, while also providing input to the evidence-based guideline (EBG) development process.

These guidelines will be maintained by the Medical Director Council of the National Association of State EMS Officials (NASEMSO) and will be reviewed and updated periodically. As EBG material is developed, it will be substituted for the consensus-based guidelines now comprising the majority of the content of this document. In the interim, additional consensus-based guidelines will also be added as the need is identified. For guidelines to be considered for inclusion, they must be presented in the format followed by all guidelines in the document.

Target Audience

While this material is intended to be integrated into an EMS system’s operational guidance materials by its medical director and other leaders, it is written with the intention that it will be consumed by field EMS practitioners.

To the degree possible, it has been assembled in a format useful for guidance and quick reference so that leaders may adopt it in whole or in part, harvesting and integrating as they deem appropriate to the format of their guideline, protocol, or procedure materials.
Universal Care

Universal Care Guideline

**Patient Care Goals:**
Facilitate appropriate initial assessment and management of any EMS patient and link to appropriate specific guidelines as dictated by the findings within the universal care guideline.

**Patient Presentation:**

**Inclusion Criteria**
All patient encounters with and care delivery by EMS personnel

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Assess scene safety: evaluate for hazards to EMS personnel, patient, bystanders.
   a. Determine number of patients
   b. Determine mechanism of injury
   c. Request additional resources if needed. Weigh the benefits of waiting for additional resources against rapid transport to definitive care
   d. Consider declaration of mass casualty incident if needed
2. Use appropriate personal protective equipment
3. Consider cervical spine stabilization if trauma
4. Primary Survey
   a. Airway: assess for patency
      i. Patient unable to maintain—open airway
         1. Head tilt chin lift
         2. Jaw thrust
         3. Suction
         4. Consider use of adjuncts: oral airway, nasal airway, blind insertion or supraglottic airway devices
   b. Breathing:
      i. Evaluate rate, breath sounds, accessory muscle use, retractions, patient positioning
      ii. Administer oxygen as appropriate with a goal of 94-98% oxygen saturation for most acutely ill patients or 88-92% for those at risk of hypercapnic respiratory failure
      iii. Not breathing (apnea) / obstructed airway: go to Prehospital Airway Management/Confirmation/Obstruction/Failed Airway guideline
c. Circulation:
   i. Assess pulse presence
      1. If none: go to Cardiac Arrest (VF/VT/Asystole/PEA) guideline
      2. Assess rate and quality of carotid and radial pulses
   ii. Evaluate perfusion by assessing skin color and temperature
      1. Evaluate capillary refill
      2. Control any major external bleeding. See also Extremity Trauma/
      External Hemorrhage Management guideline

d. Disability
   i. Evaluate patient responsiveness: AVPU scale (Alert, Verbal, Pain, Unresponsive)
   ii. Evaluate gross motor and sensory function in all extremities
   iii. Evaluate blood glucose in patients with altered mental status
   iv. If acute stroke suspected, go to Suspected Stroke/Transient Ischemic Attack
      guideline

e. Expose patient as appropriate to complaint
   i. Be considerate of patient modesty
   ii. Keep patient warm

5. Secondary Survey
   The performance of the secondary survey should not delay transport in critical patients. See also
   secondary survey specific to individual complaints in other protocols. Secondary surveys should
   be tailored to patient presentation and chief complaint. The following are suggested
   considerations for secondary survey assessment:
   a. Head:
      i. Pupils
   b. Neck
      i. Jugular venous distension
   c. Chest
      i. Retractions
   d. Abdomen / Back
      i. Flank pain
   e. Extremities
      i. Edema
      ii. Pulses
   f. Neurologic

6. Obtain baseline vital signs
   a. An initial full set of vital signs is required: pulse, blood pressure, respiratory rate, level of
      consciousness (AVPU)
   b. Patients with cardiac or respiratory complaints should have pulse oximetry
      i. 12-lead ECG should be obtained early in patients with cardiac complaints
      ii. Consider continuous cardiac monitoring
      iii. Consider waveform capnography
   c. Patient with altered mental status should have a blood glucose assessment
      i. Consider waveform capnography
   d. Stable patients should have at least two sets of pertinent vital signs. Ideally, one set
      should be taken shortly before arrival at receiving facility.
e. Critical patients should have pertinent vital signs frequently monitored

7. Obtain OPQRST history:
   a. O: onset of symptoms – any exacerbating or alleviating factors
   b. P: pain – location, pain scale
   c. Q: quality of pain
   d. R: radiation of pain
   e. S: severity of symptoms
   f. T: time of onset and circumstances around onset

8. Obtain SAMPLE history:
   a. S: symptoms
   b. A: allergies (medication, environmental, and foods)
   c. M: medications: both prescription and over-the-counter, bring all containers to hospital if possible
   d. P: past medical history
      i. look for medical alert tags, portable medical records, advance directives
      ii. look for medical devices / implants: some common ones may be dialysis shunt, insulin pump, pacemaker, central venous access port, gastric tubes, urinary catheter
   e. L: last oral intake
   f. E: events leading up to the 911 call. In patient with syncope, seizure, altered mental status, or acute stroke, consider bringing witness to the hospital or obtain their contact phone number to provide to ED care team.

**Treatment and Interventions:**
1. Oxygen supplementation if needed to reach target of 94-98% (88%-92% for patients at risk for hypercapnic respiratory failure)
2. Place appropriate monitoring equipment as dictated by assessment. These may include
   a. Continuous pulse oximetry
   b. Cardiac rhythm monitoring
   c. Waveform capnography
   d. Carbon monoxide assessment
3. Obtain vascular access if indicated
4. Monitor pain scale if appropriate
5. Reassess patient

**Patient safety considerations**
1. Be aware of legal issues and patient rights as they pertain to and impact patient care, e.g. patients with functional needs or children with special healthcare needs.
2. Be aware of potential need to adjust management on patient age and/or comorbidities, including medication dosages.

**Notes/Educational Pearls:**

**Key considerations**
1. Pediatrics: use a weight-based assessment tool (length-based tape or other system) to estimate patient weight and guide medication therapy and adjunct choice.
2. Vital signs:
   a. Oxygen
      i. Goal oxygen saturation is approximately 94-98% with a goal of 88-92% in patients at risk for hypercapnic respiratory failure. Supplemental oxygen should be provided to patients below this level. The goal is not to get the highest possible oxygen saturation.
   b. Normal vital signs—see chart
      i. Hypotension is considered a systolic blood pressure less than the lower limit on the chart
      ii. Tachycardia is considered a pulse above the upper limit on the chart
      iii. Bradycardia is considered a pulse below the lower limit on the chart
      iv. Tachypnea is considered a respiratory rate above the upper limit on the chart
      v. Bradypnea is considered a respiratory rate below the lower limit on the chart
3. Secondary survey may not be completed if patient has critical primary survey problems
4. In critical patients, proactive patient management should occur simultaneously with assessment. Ideally, one provider should be assigned to exclusively monitor and facilitate patient-focused care. Treatment and Interventions should be initiated as soon as practicable, but should not impede extrication or delay transport to definitive care.

Pertinent Assessment Findings
This guideline is too broad to list all possible findings.

Quality Improvement:

Key Documentation Elements
1. At least one full set of vital signs should be documented for every patient
2. All patient interventions should be documented

Performance Measures (Process, Structure and Outcomes)
1. Abnormal vital signs should be addressed and reassessed
2. Response to therapy provided should be documented including pain scale reassessment if appropriate
3. Limit scene time in patients with critical illness or injury
# Normal Pediatric Vital Signs

<table>
<thead>
<tr>
<th>Age</th>
<th>Pulse</th>
<th>Respiratory Rate</th>
<th>Systolic BP*</th>
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<tbody>
<tr>
<td>Preterm &lt; 1 kg</td>
<td>120-160</td>
<td>30-60</td>
<td>36-58</td>
</tr>
<tr>
<td>Preterm 1 kg</td>
<td>120-160</td>
<td>30-60</td>
<td>42-66</td>
</tr>
<tr>
<td>Preterm 2 kg</td>
<td>120-160</td>
<td>30-60</td>
<td>50-72</td>
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<tr>
<td>Newborn</td>
<td>126-160</td>
<td>30-60</td>
<td>60-70</td>
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<tr>
<td>Up to 1 year</td>
<td>100-140</td>
<td>30-60</td>
<td>70-80</td>
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<tr>
<td>1-3 years</td>
<td>100-140</td>
<td>20-40</td>
<td>76-90</td>
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<tr>
<td>4-6 years</td>
<td>80-120</td>
<td>20-30</td>
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<td>7-9 years</td>
<td>80-120</td>
<td>16-24</td>
<td>84-110</td>
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<tr>
<td>10-12 years</td>
<td>60-100</td>
<td>16-20</td>
<td>90-120</td>
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<td>13-14 years</td>
<td>60-90</td>
<td>16-20</td>
<td>90-120</td>
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<tr>
<td>15 years and older</td>
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<td>14-20</td>
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<tr>
<td>ADULT GLASGOW COMA SCALE</td>
<td>PEDIATRIC GLASGOW COMA SCALE</td>
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<tr>
<td>Eye Opening (4)</td>
<td>Eye Opening (4)</td>
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<tr>
<td>Spontaneous</td>
<td>Spontaneous</td>
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<tr>
<td>To Speech</td>
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<tr>
<td>To Pain</td>
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<tr>
<td>None</td>
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<tr>
<td>Best Motor Response (6)</td>
<td>Best Motor Response (6)</td>
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<td>Obeys Commands</td>
<td>Spontaneous Movement</td>
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<tr>
<td>Localizes Pain</td>
<td>Withdraws to Touch</td>
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<td>Withdraws From Pain</td>
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<tr>
<td>Abnormal Flexion</td>
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<td>Abnormal Extension</td>
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<td>None</td>
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<td></td>
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<tr>
<td>Verbal Response (5)</td>
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<td>Oriented</td>
<td>Coos, Babbles</td>
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<td>Confused</td>
<td>Irritable Cry</td>
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<td>Moans to Pain</td>
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**Pediatrics** = up to 40 kg or 14 years old, whichever comes first
**Geriatrics** = 65 years old or more. These reduced medication dosages also apply to patients with renal disease (i.e. on dialysis or a diagnosis of chronic renal insufficiency) or hepatic disease (i.e. severe cirrhosis or end-stage liver disease)

**References:**

**Version/Revision Dates:**
March 15, 2014
Functional Needs

**Patient Care Goals:**
To meet and maintain the additional support required for functional needs patients during the delivery of prehospital care.

**Patient Presentation:**

**Inclusion Criteria**
Patients who are identified by the World Health Organization’s International Classification of Functioning, Disability, and Health (ICF) that has experienced a decrement in health that results in some degree of disability.

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
Identify the functional need from the patient, the patient’s family, bystanders, medic alert bracelets or documents, or the patient’s adjunct assistance devices.

The performance of a physical examination should not intentionally be diminished during the assessment although the manner that the exam is performed will may need to accommodate the specific needs of the patient.

**Treatment and Interventions**
The quality of medical care should not intentionally be diminished during the triage, treatment, and transport of functional needs although the manner that the care is provided may need to accommodate the specific needs of the patient.

**Patient Safety Considerations**
For patients with communication barriers (language or sensory), it may be desirable to obtain secondary confirmation of pertinent data (e.g. allergies) from the patient’s family, interpreters, or written or electronic medical records.

**Notes/Educational Pearls:**

**Key Considerations**
1. Communication Barriers
   a. Language Barriers:
      i. Expressive and/or receptive aphasia
      ii. Nonverbal
      iii. Fluency in a different language than the EMS professional
      iv. Examples of tools to overcome language barriers include:
         1. Transport of the individual who is fluent in the patient’s language along with the patient to the hospital
2. Medical translation cards
3. Telephone-accessible services with live language interpreters
4. Methods through which the patient augments their communication skills (e.g. eye blinking, nodding) should be noted, utilized as able, and communicated to the receiving facility

b. **Sensory Barriers:**
   i. Visual impairment
   ii. Auditory impairment
   iii. Examples of tools to overcome sensory barriers include:
      1. Braille communication card
      2. Sign language
      3. Lip reading
      4. Hearing aids
      5. Written communication

**Pertinent assessment findings**

1. **Assistance Adjuncts**
   Examples of devices that facilitate the activities of life for the patient with functional needs include, but are not limited to:
   a. Extremity prostheses
   b. Hearing aids
   c. Magnifiers
   d. Tracheostomy speaking valves
   e. White or sensory canes

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

   Services animals are not classified as a pet and should, by law, always be permitted to accompany the patient with the following exceptions:

   A public entity may ask an individual with a disability to remove a service animal from the premises if:
   a. The animal is out of control and the animal's handler does not take effective action to control it; or
   b. The animal is not housebroken.

   Service animals are not required to wear a vest or a leash. It is illegal to make a request for special identification or documentation from the servicer animal’s partner. EMS providers may only ask the patient if the service animal is required because of a disability and the form of assistance the animal has been trained to perform.
EMS providers are not responsible for the care of service animal. 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 in this situation.

Animals that solely provide emotional support, comfort, or companionship do not quality as Service animals.

Quality improvement:

Key documentation elements
1. Language barriers:
   a. The patient’s primary language of fluency
   b. The identification of the person assisting with the communication
   c. The methods through which the patient augments their communication skills should be communicated to the receiving facility

2. Sensory barriers:
   a. The methods through which the patient augments their communication skills communicated to the receiving facility
   b. Written communication between the patient and the EMS professional is part of the medical record, even if it is on a scrap sheet of paper, and it should be retained with the same collation, storage, and confidentiality policies and procedures that are applicable to the written or electronic patient care report

3. Assistance adjuncts (devices that facilitate the activities of life for the patient)

Performance measures (process, structure and outcomes)
1. Accuracy of key data elements (chief complaint, past medical history, medication, allergies)
2. Utilization of the appropriate adjuncts to overcome communication barriers
3. Documentation of the patient’s functional need and avenue exercised to support the patient
4. Documentation of complete and accurate transfer of information regarding the functional need to the receiving facility

References:
1. Americans with Disabilities Act 1990, 42 U.S. Code, Chapter 126
4. International classification of functioning, disability and health; 54th World Health Assembly, WHA 54.21, Agenda Item 13.9, May 21, 2001

Version / Revision Dates:
February 27, 2014
Patient Refusals

Overview
If an individual (or the parent or legal guardian of the individual) refuses secondary care and/or ambulance transport to a hospital after prehospital providers have been called to the scene, providers should determine the patients’ capacity to make decisions. Competency is generally a legal status of a person’s ability to make decisions. However, state laws vary in the definition of competency and its impact upon authority. Therefore, one should consult with the respective state EMS office for clarification on legal definitions and patient rights.

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

Patient Care Guideline
1. Obtain a complete set of vital signs and complete an initial assessment with particular attention to the individual’s neurologic and mental status.
2. Determine the individual’s capacity to make a valid judgment concerning the extent of the individual’s illness or injury. If the EMS provider has doubts about whether the individual has the mental capacity to refuse or if the patient lacks capacity, the EMS provider should contact on-line medical control.
3. If patient has capacity, clearly explain to the individual and all responsible parties the possible risks and overall concerns with regards to refusing care.
4. Perform appropriate medical care with the consent of the individual.
5. Complete the patient care report clearly documenting the initial assessment findings and the discussions with all involved individuals regarding the possible consequences of refusing additional prehospital care and/or transportation.

Key Notes
1. An adult or emancipated minor who has demonstrated possessing sufficient mental capacity for making decisions has the right to determine the course of their medical care, including the refusal of care. These individuals must be advised of the risks and consequences resulting from refusal of medical care.
2. An individual determined to lack mental capacity by EMS providers or on-line medical direction should not be allowed to refuse care against medical advice or to be released at the scene. Mental illness, drugs, alcohol intoxication, or physical/mental impairment may significantly impair an individual’s mental capacity. Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS
providers to suspect suicidal intent, should not be regarded as having demonstrated sufficient or normal mental capacity.

3. EMS providers should not put themselves in danger by attempting to treat and/or transport an individual who refuses care.

4. Always act in the best interest of the patient. EMS providers, with the support of medical direction, must strike a balance between abandoning the patient and forcing care.

5. The legal definition of a minor is determined by each state. Therefore, one should consult the respective state EMS office to obtain the definition of a minor and any legislative or regulatory parameters that apply to minors. It is preferable for minors to have a parent or legal guardian as the party to refuse evaluation, treatment, and/or transport for an emergency condition. All states allow parental consent for treatment of a minor to be waived in the event of a medical emergency. The circumstances that should be present in order for a scenario to be classified as a medical emergency patient incapacitation to the point of being unable to provide an informed choice, serious or life-threatening circumstances that require immediate treatment, or cases where it is impossible or imprudent to obtain consent from someone regarding the patient. In these cases, consent of the parent is presumed since, otherwise, the minor would suffer avoidable injury.

6. If a minor is injured or ill and no parent contact is possible, the provider may contact on-line medical direction for additional instructions.

Version/Revision Dates:
March 17, 2014
Cardiovascular
Adult and Pediatric Syncope

**Patient Care Goals:**
1. Stabilize and resuscitate when necessary
2. Initiate monitoring and diagnostic procedures
3. Transfer for further evaluation

**Patient Presentation:**
Syncope is heralded by both the loss of consciousness and the loss of postural tone. Syncope typically is abrupt in onset and resolves equally quickly. EMS providers may find the patient awake and alert on initial evaluation.

**Inclusion criteria**
Abrupt loss of consciousness with loss of postural tone

**Exclusion criteria**
Conditions other than the above, including patients:
1. Who did not lose consciousness
2. With alternate and obvious cause of loss of consciousness (such as trauma)
3. With alternate symptoms (weakness, dizziness, palpitations, etc.)

Patients with ongoing mental status changes or coma should be treated per the Altered Mental Status guideline.

**Patient Management:**

**Assessment**
1. Follow general patient care guidelines, including the following.
   a. History
      i. Review the patient’s Past Medical History, including a history of:
         1. Cardiovascular disease (cardiac disease/stroke/ etc.)
         2. Seizure
         3. Recent trauma
         4. Anticoagulation
         5. Dysrhythmia
         6. Congestive heart failure (CHF)
         7. Syncope
      ii. History of Present Illness, including:
          1. Conditions leading to the event
          2. Patient complaints before or after the event including prodromal symptoms
3. History from others on scene, including seizures or shaking, presence of pulse/breathing (if noted), duration of the event, events that lead to the resolution of the event

iii. Review of Systems:
   1. Occult blood loss (GI/GU)
   2. Fluid losses (nausea/vomiting/diarrhea) and fluid intake
   3. Current Medications

b. Physical Exam Including:
   i. Attention to vital signs as well as evaluation for trauma
   ii. Detailed neurologic exam (including stroke screening and mental status)
   iii. Heart, lung, abdominal and extremity exam
   iv. Additional Evaluation:
      1. Finger stick blood glucose
      2. Rhythm monitoring
      3. Ongoing vital signs
      4. 12-lead ECG

**Treatment and Interventions:**
Should be directed at abnormalities discovered in the physical exam or on additional examination and may include management of cardiac dysrhythmias, cardiac ischemia/infarct, hypoglycemia, hemorrhage, shock, and the like.

1. Manage airway as indicated
2. Obtain detailed history
3. O₂ as appropriate
4. Evaluate for hemorrhage and treat for shock if indicated
5. Obtain blood glucose and treat per Diabetic Emergencies guideline as indicated
6. Establish IV access
7. Fluid bolus if appropriate
8. Cardiac Monitor
9. 12-lead ECG
10. Monitor for and treat arrhythmias

**Patient Safety Considerations:**
None

**Notes/Educational Pearls:**

**Key Considerations**

1. 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 rhythm as well as detailed exam and history are essential pieces of information to pass onto hospital providers.
2. All patients suffering from syncope deserve hospital level evaluation, even if they appear normal with few complaints on scene.
   a. High-risk causes of syncope include the following:
i. Cardiac causes – sinus node dysfunction, AV Node dysfunction, ventricular tachyarrhythmia’s, reduction in stroke volume (due to mechanical complications such as perforation/tamponade, ventral septal rupture, out flow track obstructions, papillary muscle ruptures, massive pulmonary embolus, etc.)

ii. Neurologic

b. Consider high risk 12-lead ECG features including:
   i. Evidence of QT prolongation
   ii. Delta waves

Pertinent Assessment Findings
1. Evidence of trauma
2. Evidence of cardiac dysfunction (e.g. evidence of CHF, arrhythmia)
3. Evidence of hemorrhage
4. Evidence of neurologic compromise
5. Evidence of alternate etiology, including seizure
6. Initial and ongoing rhythm
7. 12-lead ECG findings

Quality Improvement:

Key Documentation Elements
1. Standard Elements
   a. Patient demographic information – patient name, gender, date of birth
   b. Run Information – date and time of service, location of call, run report number if known
   c. EMS Service and Provider(s) names
   d. Patient Information
      i. Brief history – including chief complaint and mechanism of injury
      ii. Allergies
      iii. Medication
      iv. Past Medical History
      v. Exam – including vital signs and trends of vital signs, pertinent exam findings (including rhythm, 12-lead ECG findings, etc.)
      vi. Procedures performed or medications provided and changes in patient’s condition based on these procedures or medications
2. Performance Measures (Process/Structure/Outcomes)

References:
3. Benditt, D “Approach to the patient with syncope”
5. Ouyang, H “Diagnosis and Management of Syncope in the Emergency Department”
6. Khoo, C “Recognizing life threatening causes of syncope”
7. Fischer, J “Pediatric Syncope: Cases from the Emergency Department

Version/Revision Dates:
February 27, 2014
Non-cardiac Chest Pain

Patient Care Goals:
Assess and care for patients with chest pain of various non-ischemic sources. The recommended Treatment and Interventions noted are for adults, not children. Most pediatric chest pain is benign. A 12-lead ECG and analgesia is acceptable but it is recommended to defer other evaluation and treatment for children until arrival at definitive care.

Patient Presentation:
Inclusion Criteria
Differential considerations include:
1. Trauma vs. medical
2. Pericarditis
3. Pulmonary embolism
4. Asthma
5. Pneumothorax
6. Aortic dissection
7. GERD or hiatal hernia
8. Esophageal spasm
9. Costochondritis
10. Gall bladder disease
11. Pneumonia
12. Atypical chest pain

Exclusion Criteria
Typical chest pain concerning for acute coronary syndrome.

Patient Management:
Assessment
1. For chest pain secondary to pneumonia
   a. Quality of pain:
      i. May be pleuritic
      ii. May be gradual onset
      iii. Usually constant duration
   b. Associated symptoms and signs:
      i. Fever
      ii. Shortness of breath
      iii. Productive cough
      iv. Rales, rhonchi, or diminished breath sounds (localized)
      v. Nausea and/or vomiting
      vi. Associated flu-like symptoms
2. For chest pain secondary to **pulmonary embolus**
   a. Quality of pain:
      i. May be pleuritic
      ii. Usually sudden onset
      iii. Usually constant duration
   b. Associated signs and symptoms:
      i. Tachycardia
      ii. Tachypnea
      iii. Productive cough (may have blood tinged sputum)
      iv. Shortness of breath
      v. Associated leg pain
   c. Risk factors:
      i. Birth control pills
      ii. Clotting disorders
      iii. Pregnancy
      iv. Recent surgery or extended travel
      v. Prolonged immobilization (including casts)

3. For chest pain secondary to **aortic dissection**
   a. Quality of Pain:
      i. Usually sudden onset
      ii. Usually constant duration
   b. History of aneurysm
   c. Associated signs and symptoms:
      i. Associated back pain
      ii. Associated neurological signs
      iii. Hypotension
      iv. Unequal peripheral pulses

**Treatment and Interventions:**
1. 12-lead ECG
2. Aspirin
3. Consider nitroglycerin, especially if patient has his/her own
4. Analgesia (e.g. morphine, fentanyl)

**Patient Safety Considerations:**
Notes / Educational Pearls:
Diabetics and geriatric patients often have atypical pain, vague or only generalized complaints. Be suspicious of a “silent MI.”

Key Documentation elements
1. Pain relief
2. 12-lead ECG interpretation
3. Cardiac history/risk factors

Performance Measures (Process, Structure, and Outcomes)

References:
None

Version/Revision Dates
February 27, 2014
Cardiac Chest Pain/Acute Coronary Syndrome (ACS)/ST-segment Elevation Myocardial Infarction (STEMI)

Patient Care Goals:
1. Identify STEMI quickly. Determine the time of symptom onset.
2. Monitor vital signs and cardiac rhythm and be prepared to provide CPR and defibrillation if needed
3. Administer appropriate medications
4. Transport to appropriate facility

Patient Presentation:
Inclusion Criteria
Chest pain of suspected cardiac origin or discomfort in other areas of the upper body, shortness of breath, sweating, nausea, vomiting, and dizziness. Atypical or unusual symptoms are more common in women, the elderly, and diabetic patients.

Exclusion Criteria
None

Patient Management:
Assessment, Treatment, and Interventions
1. Signs and symptoms include chest pain, congestive heart failure, syncope, shock, symptoms similar to a patient’s previous myocardial infarction (MI)
2. Assess the patient’s cardiac rhythm
   a. Treat pulseless rhythms, tachycardia, or symptomatic bradycardia
   b. Consider the treatment of other dysrhythmias
   c. Initiate cardiopulmonary resuscitation (CPR), defibrillation, or cardioversion if indicated
3. If the patient is dyspneic, hypoxemic, or has obvious signs of heart failure, EMS providers should administer oxygen and titrate therapy to oxygen saturation of 94%
4. Administer enteric-coated aspirin (160 [Class I, LOE B] to a dose of 325 mg
5. Establish IV Access
6. The 12-lead electrocardiogram (ECG) is the primary diagnostic tool that identifies a STEMI. It is imperative that EMS providers routinely acquire a 12-lead ECG as soon as possible for all patients exhibiting signs and symptoms of ACS.
   a. The ECG may be transmitted for remote interpretation by a physician or screened for STEMI by properly trained paramedics, with or without the assistance of computer-interpretation.
   b. Advance notification should be provided to the receiving hospital for patients identified as having STEMI (Class I, LOE B). Implementation of 12-lead ECG diagnostic programs with concurrent medically-directed quality assurance is recommended (Class I, LOE B).
   c. Prehospital personnel can accurately identify ST-segment elevation from the 12-lead.
   d. If providers are not trained to interpret the 12-lead ECG, field transmission of the ECG or a computer report to the receiving hospital is recommended (Class I, LOE B).
e. Due to precautions during treatment, it is especially important for EMS providers to identify STEMI that involve the inferior myocardium (inferior MI), the posterior myocardial wall (posterior MI), or a right ventricular MI.

7. Administer up to three doses of nitroglycerin doses (tablets or spray) at intervals of 3 to 5 minutes. Nitrates in all forms are contraindicated in patients with initial systolic blood pressure <90 mm Hg or approximately 30 mm Hg below baseline and in patients with right ventricular infarction.
   a. Caution is advised in patients with known inferior wall STEMI, and a right-sided ECG should be performed to evaluate RV infarction.
   b. Administer nitrates with extreme caution, if at all, to patients with inferior STEMI and suspected right ventricular (RV) involvement because these patients require adequate RV preload. For these patients, IV fluid resuscitation may be the appropriate initial therapy based upon vital signs and patient symptoms.
   c. Nitrates are contraindicated when patients have taken a phosphodiesterase-5 (PDE-5) inhibitor within 24 hours (48 hours for tadalafil).

8. Morphine is indicated in STEMI when chest discomfort is unresponsive to nitrates (Class I, LOE C). Morphine should be used with caution in unstable angina (UA)/NSTEMI due to an association with increased mortality (Class IIa, LOE C).

9. Transport should be initiated immediately. Direct triage from the scene to a PCI capable hospital may reduce the time to definitive therapy and improve outcome.
   a. In a large historically controlled clinical trial, the mortality rate was significantly reduced (8.9% versus 1.9%) when transport time was less than 30 minutes.
   b. Increased out-of-hospital times with longer EMS-initiated diversion to a PCI-capable hospital may worsen outcomes.
   c. If PCI is the chosen method of reperfusion for the prehospital STEMI patient, it is reasonable to transport patients directly to the nearest PCI facility, bypassing closer EDs as necessary, in systems where time intervals between first medical contact and balloon times are <90 minutes and transport times are relatively short (i.e. <30 minutes) (Class IIa, LOE B).

**Patient Safety Considerations**

None

**Notes/Educational Pearls:**

**Key Considerations**

1. In PCI-capable hospitals an established “STEMI Alert” activation plan is critical. Components include prehospital ECGs and notification of the receiving facility, and activation of the cardiac catheterization team to shorten reperfusion and other hospital personnel important for treatment and resource allocation.

2. Continuous review and quality improvement involving EMS and prehospital care providers are important to achieve ongoing optimal reperfusion time. Quality assurance, real-time feedback, and healthcare provider education can also reduce the time to therapy in STEMI. Involvement of hospital leadership in the process and commitment to support rapid access to STEMI reperfusion therapy are critical factors associated with successful programs.
3. If the emergency physician activates the STEMI reperfusion protocol, including the cardiac catheterization team, significant reductions in time to reperfusion are seen, and the rate of “false-positive” activations are infrequent, ranging from 0% to 14%.

4. Observe for signs of decreased end-organ perfusion (chest pain, dyspnea, decreased level of consciousness, syncope, hypotension or other signs of shock)

5. Patients who have undergone a cardiac transplant will not respond to atropine

6. An abnormal 12-lead ECG that can mimic a STEMI can been seen in the patients with hypoxia, pacemaker failure, hypothermia, and sinus bradycardia,

7. Other patient populations where bradycardia is seen include healthy athletes, head injury with increased intracranial pressure, stroke, spinal cord lesion, sick sinus syndrome, atrioventricular (AV) blocks, and drug overdose

8. If cardiac rhythm has a wide complex morphology, consider hyperkalemia

9. The administration of atropine in the setting of MI can cause increase myocardial damage

**Pertinent Assessment Findings**

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

**Quality improvement:**

**Key Documentation Elements**

The time of arrival on scene to the time of 12-lead ECG acquisition

The time of 12-lead ECG acquisition to the time of identification of a STEMI

**Performance Measures (Process, Structure, and Outcomes)**

1. The time of a STEMI patient’s ultimate arrival to a PCI center

2. The time of EMS notification to the time of activation of a cardiac catheterization laboratory

3. The time of arrival at the PCI center to the time of cardiac catheterization (door-to-balloon time [D2B])

4. The time of prehospital 12-lead ECG acquisition to the time of cardiac catheterization (ECG-to-balloon time [E2B])

**References:**

None

**Version/Revision Dates:**

March 17, 2014
Bradycardia

**Patient Care Goals:**
1. Maintain adequate perfusion
2. Treat underlying cause:
   a. Hypoxia
   b. Shock
   c. 2nd or 3rd degree heart block
   d. Toxin exposure (beta-blocker, calcium channel blocker, organophosphates, digoxin)
   e. Electrolyte disorder
   f. Increased intracranial pressure (ICP)
   g. Other

**Patient Presentation:**

**Inclusion Criteria**
1. Heart rate < 60 with either symptoms (AMS, CP, CHF, seizure, syncope, shock, pallor, diaphoresis) or evidence of hemodynamic instability
2. The major ECG rhythms classified as bradycardia include:
   a. Sinus bradycardia
   b. Second-degree AV block
   c. Type I — Wenckenbach/Mobitz I
   d. Type II — Mobitz II
   e. Third-degree AV block complete block
   f. Ventricular escape rhythms
3. See additional inclusion criteria, below, for pediatric patients

**Exclusion Criteria**
None

**Patient Management:**

**Assessment, Treatment, and Interventions**
1. Adult Management
   a. Manage airway as necessary
   b. Provide supplemental O2 as needed to maintain O2 saturation > 94%
   c. Initiate monitoring and perform 12-lead ECG
   d. Establish IV/IO access
   e. Finger stick blood glucose and treat hypoglycemia per the Diabetic guideline.
   f. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:
      i. Atropine 0.5 mg IV q 3-5 min (max 3 mg)
      ii. Chronotropic medications
1. Epinephrine 2-10 micrograms/min or dopamine 2-20 micrograms/kg/min
   iii. Transcutaneous Pacing
       1. If pacing is performed, consider sedation or pain control

2. Pediatric Management

   Treatment is only indicated for patients that are symptomatic (pale/cyanotic, diaphoretic, altered mental status, hypoxic)

   a. Initiate chest compressions
   b. Manage airway and assist ventilations as necessary with minimally interrupted chest compressions using a compression to ventilation ratio 15:2 (30:2 if single provider is present)
   c. Provide supplemental O2 as needed to maintain O2 saturations > 94%
   d. Initiate monitoring and perform 12 lead ECG
   e. Establish IV/IO access
   f. Finger stick blood glucose and treat hypoglycemia per the Diabetes and Hypoglycemia Guideline.
   g. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:
      i. Epinephrine (1:10,000) 0.01 mg/kg every 3-5 minutes
      ii. Also consider atropine 0.01-0.02 mg/kg with minimum dose of 0.1 mg if increased vagal tone or cholinergic drug toxicity
      iii. Transcutaneous pacing
         1. If pacing is performed, consider sedation or pain control

Epinephrine may be used for bradycardia and poor perfusion unresponsive to ventilation and oxygenation. It is reasonable to administer atropine for bradycardia caused by increased vagal tone or cholinergic drug toxicity.

**Patient Safety Considerations**
None

**Notes/Educational Pearls:**
1. Observe for signs of decreased end-organ perfusion: chest pain (CP), shortness of breath (SOB), decreased level of consciousness, syncope or other signs of shock/hypotension
2. Patients who have undergone cardiac transplant will not respond to atropine
3. Consider potentially culprit medications include beta-blockers, calcium channel blockers, clonidine, digoxin, etc. If medication overdose is considered, refer to appropriate guideline in the Toxin/Environmental section.
4. The differential diagnosis includes the following: MI, hypoxia, pacemaker failure, hypothermia, sinus bradycardia, athletes, head injury with increased ICP, stroke, spinal cord lesion, sick sinus syndrome, AV blocks, overdose
5. Consider hyperkalemia in the patient with wide complex bradycardia
6. Bradycardia should be managed by the least invasive manner possible, escalating care as needed.
   a. Third degree heart block or the denervated heart (as in cardiac transplant) may not respond to atropine and in these cases, proceed quickly to chronotropic agents (such as epinephrine or dopamine) or transcutaneous pacing.
   b. In cases of impending hemodynamic collapse, proceed directly to transcutaneous pacing
7. Be aware of acute coronary syndrome as a cause of bradycardia in adult patients
8. For symptomatic bradycardia or unstable bradycardia IV infusion chronotropic agents (dopamine & epinephrine) are now recommended as an equally effective alternative to external pacing when atropine is ineffective.
9. When dosing medications for pediatric patient, does should be weight based in non-obese patient and based on ideal body weight for obese patients.
10. Pediatric patients who receive atropine for bradycardia improved their survival rates compared to those who received Epinephrine.

References:
4. 2010 American Heart Association; Pediatric Basic and Advanced Life Support: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

Version/Revision Dates:
February 27, 2014
Tachycardia with a Pulse

**Patient Care Goals:**
1. Maintain adequate oxygenation, ventilation and perfusion
2. Restore regular sinus rhythm - Correct rhythm disturbance
3. Search for underlying cause:
   a. Medications (caffeine, diet pills, thyroid, decongestants)
   b. Drugs (cocaine, amphetamines)
   c. Syncope
   d. CHF

**Patient Presentation:**
Patients will manifest elevated heart rate for age and may or may not also present with associated symptoms such as palpitations, dyspnea, chest pain, syncope/near-syncope, hemodynamic compromise, altered mental status or other signs of end organ malperfusion.

**Inclusion Criteria**
Heart Rate > 100 in adults or relative tachycardia in pediatric patients

**Exclusion Criteria**
1. Patients with normal or decreased
2. Sinus tachycardia
3. Pulseless patients

**Patient Management:**
**Assessment, Treatments, and Interventions**
1. Adult Management
   a. Manage airway as necessary
   b. Provide supplemental O2 as needed to maintain O2 saturation > 94%
   c. Initiate monitoring and perform 12-lead ECG
   d. Establish IV/IO access
   e. Finger stick blood glucose and treat hypoglycemia per the Diabetic guideline
   f. Consider the following additional therapies if tachycardia and symptoms or hemodynamic instability continue:
      i. **Regular Narrow Complex Tachycardia – Stable (SVT)**
         1. Perform vagal maneuvers
         2. Carotid massage
         3. Adenosine 6 mg IV followed by 10 cc fluid bolus; if tachycardia continues, give adenosine 12 mg IV; a 3rd bolus dose can be given
         4. Diltiazem 0.25 mg/kg slowly IV over 2 minutes. After 15 minutes, a second dose of diltiazem 0.35 mg/kg IV may be given if needed
         5. Metoprolol 5 mg IV given over 1-2 minutes. May repeat as needed every 5 minutes for a total of 3 doses
      ii. **Regular Narrow Complex Tachycardia – Unstable**
1. Deliver a synchronized shock at 120J; if additional shocks are required, increase energy to 150J and then 200J
2. For responsive patients, consider sedation

iii. **Irregular Narrow Complex Tachycardia – Stable** (atrial fibrillation, atrial flutter, multifocal atrial tachycardia)
   1. Diltiazem 0.25 mg/kg slowly IV over 2 minutes. After 15 minutes, a second dose of diltiazem 0.35 mg/kg IV may be given if needed. For patients greater than 65, recommend initial dose of diltiazem 10 mg IV and a second dose of 20mg
   2. Metoprolol 5 mg IV given over 1-2 minutes. May repeat as needed every 5 minutes for a total of 3 doses

iv. **Irregular Narrow Complex Tachycardia – Unstable**
   1. Deliver a synchronized shock at 120J; if additional shocks are required, increase energy to 150J and then 200J
   2. For responsive patients, consider sedation

v. **Wide Complex Tachycardia – Stable** (ventricular tachycardia (VT), supraventricular tachycardia (SVT), or atrial fibrillation/flutter with aberrancy, accelerated idioventricular rhythms, pre-excited tachycardias with accessory pathways, torsades de pointes)
   1. Amiodarone 150 mg IV over 10 min; may repeat; the drug of choice according to the American Heart Association (AHA)
   2. Lidocaine 1-1.5 mg/kg IV; may be repeated at 5 minute intervals for a maximum dose of 3 mg/kg IV
   3. Procainamide drip at 10 mg/min for a maximum dose of 17 mg/kg
   4. If torsades, give magnesium 1-2 grams IV

2. Pediatric Management
   a. Manage airway as necessary
   b. Provide supplemental O2 as needed to maintain O2 saturation > 94%
   c. Initiate monitoring and perform 12-lead ECG
   d. Establish IV/IO access
   e. Finger stick blood glucose and treat hypoglycemia per the **Diabetes and Hypoglycemia** guideline
   f. Consider the following additional therapies if tachycardia and symptoms or hemodynamic instability continue:
      i. **Regular Narrow Complex Tachycardia – Stable** (SVT)
         1. Perform vagal maneuvers
         2. Carotid massage
         3. Adenosine 0.1 mg/kg; second dose is doubled
      ii. **Regular Narrow Complex Tachycardia – Unstable**
         1. Deliver a synchronized shock; 0.5-2.0 J/kg
**Notes/Educational Pearls:**

**Key Considerations**

1. **Causes:**
   a. Hypovolemia
   b. Hypoxia
   c. Hydrogen (acidosis)
   d. Myocardial Infarction
   e. Hypo/hyperkalemia
   f. Hypoglycemia
   g. Hypothermia
   h. Toxins/Overdose
   i. Tamponade
   j. Tension pneumothorax
   k. Thrombus – central or peripheral
   l. Trauma
   m. Hyperthyroidism

2. Atrial fibrillation rarely requires cardioversion in the field. Difficult to ascertain onset time and therefore, risk of stroke needs to be addressed.

3. Extreme care must be taken in patients with preexcitation syndrome and atrial fibrillation. Blocking the AV node in some of these patients may lead to atrial fibrillation impulses that are transmitted exclusively down the accessory pathway, and this can result in ventricular fibrillation. Calcium channel blockers are contraindicated in these patients; Amiodarone can be used instead.

4. Amiodarone has a class IIa recommendation from the ACC/AHA/ESC for use as a rate-controlling agent for patients who are intolerant of or unresponsive to other agents, such as patients with CHF who may otherwise not tolerate diltiazem or metoprolol. Caution should be exercised in those who are not receiving anticoagulation, as amiodarone can promote cardioversion.

5. Administer metoprolol to patients with SBP greater than 120. Worsening CHF, COPD, asthma, as well as hypotension and bradycardia can occur with use of metoprolol.

6. Few studies have demonstrated the effectiveness of procainamide so it remains a second-line medication. Procainamide has been shown to cause hypotension, especially in situations when left ventricle function has been impaired. It may induce atrioventricular conduction disturbances, including heart block, and must be used with extreme caution in patients who have previously received amiodarone.

7. Biphasic waveforms are proved to convert atrial fibrillation at lower energies and higher rates than monophasic waveforms. Strategies include dose escalation (70, 120, 150, 170J for biphasic or 100, 200, 300, 360J for monophasic) versus beginning with single high energy/highest success rate for single shock delivered.

8. Studies in infants and children have demonstrated the effectiveness of adenosine for the treatment of hemodynamically stable or unstable SVT.

9. Adenosine should be considered the preferred medication for stable SVT. Verapamil may be considered as alternative therapy in older children but should not be routinely used in
infants. Procainamide or amiodarone given by a slow IV infusion with careful hemodynamic monitoring may be considered for refractory SVT.

10. When dosing medications for pediatric patient, does should be weight based in non-obese patient and based on ideal body weight for obese patients.

**Pertinent Assessment Findings**

None

**Quality Improvement:**

**Key Documentation Elements**

1. Carefully document all rhythm changes
2. Obtain monitor strips after each intervention

**Performance Measures (Process, Structure, Outcomes)**

**References:**

5. 2010 American Heart Association; Pediatric Basic and Advanced Life Support: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

**Version/Revision Dates:**

February 27, 2014
Suspected Stroke / Transient Ischemic Attack

**Patient Care Goals:**
1. To detect neurological deficits
2. Determine eligibility for transport to a stroke center

**Patient Presentation:**
1. Facial droop, arm drift slurred speech based on Cincinnati Stroke Scale
2. Severe hemiparesis or hemiplegia
3. Dysconjugate gaze, forced or crossed gaze (if patient is unable to voluntarily respond to exam, makes no discernible effort to respond, or LOC is such as there is no response) and
4. “Last seen normal” less than (<) 4.5 hours or signs of a hemorrhagic stroke (severe headache, neck pain/stiffness, sensitivity to light)

**Inclusion Criteria**
1. Patient has signs and symptoms consistent with stroke or transient ischemic attack (TIA)
2. “Last seen normal” is < 4.5 hours

**Exclusion Criteria**
“Last seen normal” is > 4.5 hours

**Patient Management:**

**Assessment**
1. Perform Cincinnati Pre-hospital Stroke exam
2. Facial smile/grimace – ask patient to smile
3. Arm drift – close eyes and hold out arms for count of 5
4. Speech - “you can’t teach an old dog new tricks”
5. The exam includes:
   a. Demographic data
   b. Basic data
   c. VS examination
   d. History: “Last Seen Normal”
   e. TPA exclusions
   f. SAMPLE history
   g. Management
   h. Stroke-specific ED report detail
   i. Physical for mental status, cranial nerves, limbs
**Treatment and Interventions**

1. Determine – Time “Last Seen Normal”
2. Provide oxygen only if SaO2 < 95%
3. If seizure activity present, refer to Seizure guideline
4. Obtain blood glucose level. Treat only if glucose <50

**Patient Safety Considerations**

1. Do not allow aspiration – elevate head of stretcher 15 -30 degrees if systolic BP >100 mm Hg; maintain head and neck in neutral alignment, without flexing the neck
2. Protect paralyzed limbs from injury
3. IV Normal saline (avoid multiple IV attempts)
4. Do not use IO unless the patient needs immediate treatment

**Notes/Educational Pearls:**

**Key Considerations**

1. Patients presenting with the following neurological findings should be transported directly to the nearest stroke center:
   a. Severe hemiparesis or hemiplegia
   b. Dysconjugate gaze, forced or crossed gaze (if patient is unable to voluntarily respond to exam, makes no discernible effort to respond, or LOC is such as there is no response) and
   c. “Last Seen Normal” < 4.5 hours or signs of a hemorrhagic stroke (severe headache, neck pain/stiffness, sensitivity to light)
   d. Do not treat hypertension
   e. Obtain 12-lead ECG
   f. Complete stroke checklist leave copy with hospital – forward one to EMS agency

**Quality Improvement:**

**Key Documentation Elements**

“Last Seen Normal” must be specific. If the patient was last seen normal prior to bedtime the night before, this is the time to be documented. (Not time the patient woke up with symptoms present)

**Performance Measures (Process, Structure, and Outcomes)**

**References:**

1. www.strokeassociation.org

**Version/Revision Dates:**

February 27, 2104
General Medical
Abuse and Maltreatment

Patient Care Goals:
1. Recognize any act or series of acts of commission or omission by a caregiver or person in a position of power over the patient that results in harm, potential for harm, or threat of harm to a patient.
2. These situations may involve safety issues for responding providers, so take appropriate steps to protect the safety of the responders as well as bystanders.
3. Get the patient out of immediate danger.
4. Assess for patient injuries that may be the result of acute or chronic events.
5. Attempt to preserve evidence whenever possible, however the overriding concern should be providing appropriate emergency care to the patient.

Patient Presentation:
1. Clues to abuse or maltreatment can vary with age group of the patient and type of abuse
2. Not all abuse or maltreatment is physical
3. EMS role is to:
   a. Document concerns
   b. Assess potentially serious injuries
   c. Disclose concerns to appropriate authorities
   d. Initiate help to get the patient into a safe situation
   e. Not investigate or intervene beyond the steps above
   f. Leave further intervention to law enforcement personnel

Inclusion/Exclusion Criteria
Absolute inclusion/exclusion criteria are not possible in this area. Rather, clues consistent with different types of abuse/maltreatment should be sought:

1. Potential clues to abuse/maltreatment from caregivers or general environment:
   a. Caregiver apathy about patient’s current situation
   b. Caregiver overreaction to questions about situation
   c. Inconsistent stories by caregivers or bystanders about what happened
   d. Information provided by caregivers or patient that is not consistent with injury patterns
   e. Injuries not appropriate for patient’s age or physical abilities (e.g. infants with injuries usually associated with ambulatory children, elders who have limited mobility with injury mechanisms inconsistent with their capabilities)
   f. Caregiver not allowing patient to speak for themselves or who appears controlling
   g. Inadequate facilities where the patient lives and/or evidence of security measures that appear to keep people in the facility
2. Potential clues to abuse or maltreatment that can be obtained from the patient:
   a. Multiple bruises in various stages of healing
b. Age inappropriate behavior (e.g. adults who are submissive or fearful, children who act in a sexually inappropriate way)
c. Pattern burns, bruises, or scars suggestive of specific weaponry used
d. Evidence of medical neglect for injuries or infections
e. Trauma to genitourinary systems or frequent infections to this system
f. Evidence of malnourishment and/or serious dental problems
g. Inability to communicate due to language and/or cultural barrier

3. Have a high index of suspicion for abuse in children presenting with an Apparent Life Threatening Event (ALTE).

**Patient Management:**

**Assessment**

1. Start with a primary survey and identify any potentially life threatening issues
2. Document thorough secondary survey for potential abuse/maltreatment red flags:
   a. Inability to communicate due to language and/or cultural barrier
   b. Multiple bruises in various stages of healing
   c. Age inappropriate behavior (e.g. adults who are submissive or fearful, children who act in a sexually inappropriate way)
   d. Pattern burns, bruises, or scars suggestive of specific weaponry used
   e. Evidence of medical neglect for injuries or infections
   f. Trauma to genitourinary systems or frequent infections to this system
   g. Evidence of malnourishment and/or serious dental problems

3. Assess physical issues and avoid extensive investigation of the specifics of abuse or maltreatment, but document any statements made by patient spontaneously

**Treatment and Interventions**

1. Address life threatening issues
2. Find way to get patient to a safe place even if no medical indication for transport
3. Report concerns about potential abuse/maltreatment to law enforcement immediately, in accordance with state law, about:
   a. Caregivers impeding your ability to assess/transport patient
   b. Caregivers refusing care for the patient
4. For patients transported, report concerns to hospital and/or law enforcement personnel per mandatory reporting laws

**Patient Safety Considerations**

1. If no medical emergency exists, next priority is safe patient disposition/removal from the potentially abusive situation
2. Do not confront suspected perpetrators of abuse/maltreatment This can create an unsafe situation for EMS and for the patient

**Notes/Educational Pearls:**
**Key Considerations**

1. **Definitions:**
   a. **Abuse/maltreatment:** Any act or series of acts of commission or omission by a caregiver or person in a position of power over the patient that results in harm, potential for harm, or threat of harm to a patient.
   b. **Child abuse:** a commonly discussed form of this issue, however, it is important to be aware of other widespread issues involving abuse and maltreatment such as elder abuse and human trafficking. People who may appear able to care for themselves can still be victims of abuse or maltreatment such as what can happen in human trafficking.
   c. **Human trafficking:** when people are abducted or coerced into service and often transported across international borders.

2. **Clues to abuse or maltreatment can vary depending on the age group of the patient and on the nature of the abuse.** Remember that not all abuse or maltreatment involves physical harm. It is important to realize that the job of EMS is to document their concerns, assess the patient for potentially serious injuries, make sure that their concerns are disclosed to the appropriate legal authorities, and work towards getting the patient into a safe situation. EMS personnel should not take it upon themselves to investigate or intervene above and beyond those concepts and should leave further intervention to the appropriate law enforcement personnel.

3. **It is very important to have a high index of suspicion for abuse in children presenting with an Apparent Life Threatening Event (ALTE).** Of the very serious causes of ALTE, child abuse has been found in as many as 11% of cases. One retrospective review noted that a call to 911 for ALTE was associated with an almost five times greater odds of abusive head trauma being diagnosed as the cause of the ALTE, clearly emphasizing the high index of suspicion EMS providers must have when responding to these calls.

4. **Abuse and maltreatment can happen to patients of all ages.**

5. **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.**

**Pertinent Assessment Findings**

None

**Quality Improvement:**

**Key Documentation Elements**
Meticulous documentation of any statements by the patient and any physical findings on the patient or the surroundings are critical in abuse or maltreatment cases.

**Performance Measures (Process, Structure, and Outcome)**
None
**References:**

1. Department of Homeland Security has an initiative called the Blue Campaign that focuses on helping EMS personnel recognize potential human trafficking – the website includes resources for EMS personnel and is at: [http://www.usfa.fema.gov/fireservice/ems/human Trafficking/](http://www.usfa.fema.gov/fireservice/ems/human_Trafficking/)
2. All states have specific mandatory reporting laws that dictate specific crimes such as suspect abuse or maltreatment must be reported and to whom they must be reported. It is important that you are familiar with the specific laws in your state including specifically who must make disclosures, what the thresholds are for disclosures, and to whom the disclosures must be made.

**Version/Revision Dates:**

February 28, 2014
Agitated or Violent Patient/Behavioral Emergency

**Patient Care Goals:**
1. Provision of emergency medical care to the agitated, violent, or uncooperative patient
2. Maximizing and maintaining safety for the patient, EMS personnel, and others

**Patient Presentation:**

**Inclusion criteria**
Patients of all ages who are exhibiting agitated, violent, or uncooperative behavior

**Exclusion criteria**
Patients exhibiting agitated or violent behavior due to medical conditions including, but not limited to:
1. Head trauma
2. Metabolic disorders (e.g. hypoglycemia, hypoxia)
3. Alcohol or drug-related conditions
4. Psychiatric or stress-related disorders

**Patient Management:**

**Assessment**
1. Note medications/substances on scene that may contribute to the agitation, or be treatment of relevant medical condition
2. Maintain and support airway
3. Respiratory rate and effort. Ideally, monitor pulse oximetry and/or capnography
4. Circulatory status:
   a. Blood pressure (if possible)
   b. Pulse rate
   c. Capillary refill
5. Mental status
   a. Obtain blood glucose
6. Temperature (if possible)
7. Evidence of traumatic injuries

**Treatment and Interventions**
1. Patient Rapport
   a. Verbal reassurance and calm patient prior to use of chemical and/or physical restraints
   b. Engagement family members/loved ones to encourage patient cooperation
   c. Continued verbal reassurance and calming of patient following chemical/physical restraints
2. Chemical Restraints
   a. Antipsychotics
      i. Droperidol (Inapsine®)
         1. Adults:
            a. 2.5 mg IV; 10 minute onset of action, or
            b. 5 mg IM; 20 minute onset of action
         2. Pediatrics: Not routinely recommended
      ii. Haloperidol (Haldol®)
         1. Adults:
            a. 5 mg IV; 5-10 minute onset of action, or
            b. 10 mg IM; 10-20 minute onset of action
         2. Pediatrics:
            a. Age 6-12 years: 1-3 mg IM (maximum dose 0.15 mg/kg)
      iii. Olanzapine (Zyprexa®)
         1. Adults: 10 mg IM; 15-30 minute onset of action
         2. Pediatrics:
            a. Age 6-11 years: 5 mg IM (limited data available for pediatric use)
            b. Age 12-18 years: 10 mg IM
      iv. Ziprasidone (Geodon®)
         1. Adults: 10 mg IM; 10 minute onset of action
         2. Pediatrics:
            a. Age 6-11 years: 5 mg IM (limited data available for pediatric use)
            b. Age 12-18 years: 10 mg IM
   b. Benzodiazepines
      i. Diazepam (Valium®)
         1. Adults:
            a. 5 mg IV; 2-5 minute onset of action, or
            b. 10 mg IM; 15-30 minute onset of action
         2. Pediatrics:
            a. 0.05-0.1 mg/kg IV, or
            b. 0.1-0.2 mg/kg IM
      ii. Lorazepam (Ativan®)
         1. Adults:
            a. 2 mg IV; 2-5 minute onset of action, or
            b. 4 mg IM; 15-30 minute onset of action
         2. Pediatrics:
            a. 0.05 mg/kg IV, or
            b. 0.05 mg/kg IM
      iii. Midazolam (Versed®)
1. Adults:
   a. 5 mg IV; 3-5 minute onset of action, or
   b. 5 mg IM; 10-15 minute onset of action, or
   c. 5 mg IN; 3-5 minute onset of action
2. Pediatrics:
   a. 0.05-0.1 mg/kg IV, or
   b. 0.1-0.15 mg/kg IM
   c. Dissociative Agents (Provide Sedation and Anesthesia)
      i. Ketamine (Ketaset®, Ketalar®)
         1. Adults:
            a. 2 mg/kg IV; 1 minute onset of action, or
            b. 4 mg/kg IM; 3-5 minute onset of action
         2. Pediatrics:
            a. 1 mg/kg IV, or
            b. 3 mg/kg IM
   d. Antihistamines (NOTE: For Pediatric Patients, Antihistamines Can Mitigate Acute Agitation)
      i. Diphenhydramine (Benadryl®)
         1. Pediatrics:
            a. 1 mg/kg IM/IV/PO (maximum dose of 25 mg)
3. Physical Restraints
   a. Body
      i. Stretcher straps should be applied as the standard procedure for all patients during transport
      ii. Sheets can be used as additional stretcher straps if necessary
      iii. Stretcher straps and sheets should never restrict the patient’s chest wall motion
      iv. Placement of stretcher straps or sheets (to prevent flexion/extension of torso, hips, legs) around:
         1. the lower lumbar region, below the buttocks, or
         2. the thighs, knees, and legs
   b. Extremities
      i. Soft or leather restraint devices should not require a key to release them
      ii. Restrain all four extremities to maximize safety for patient, staff, and others
      iii. Restrain all extremities to the stationary frame of the stretcher
      iv. Multiple knots should not be used to secure the restraint device

**Patient Safety Considerations**
1. Don personal protective equipment (PPE)
2. Do not attempt to enter or control a scene where physical violence or weapons are present
3. Dispatch law enforcement immediately to secure and maintain scene safety
4. Urgent de-escalation of patient agitation is imperative in the interest of patient safety as well as for EMS personnel and others on scene.
5. Uncontrolled or poorly controlled patient agitation and physical violence can place the patient at risk for sudden cardiopulmonary arrest due to the following etiologies:
   a. Excited delirium/exhaustive mania: A postmortem diagnosis of exclusion for sudden death thought to result from metabolic acidosis (most likely from lactate) stemming from physical agitation or physical control measures (including TASER®s) and potentially exacerbated by stimulant drugs (e.g. cocaine) or alcohol withdrawal
   b. Positional asphyxia: Sudden death from restriction of chest wall movement and/or obstruction of the airway secondary to restricted head or neck positioning resulting in hypercarbia and/or hypoxia
6. Apply a cardiac monitor as soon as possible, particularly when chemical restraints have been administered.
7. All patients who have received chemical restraints must be monitored closely for the development of oversedation.
8. Do not administer ketamine to patients with increased intracranial or intraocular pressures.
9. Patients who have received antipsychotic medication as a chemical restraint must be monitored closely for the potential development of:
   a. Dystonic reactions
   b. Mydriasis (dilated pupils)
   c. Ataxia
   d. Cessation of perspiration
   e. Dry mucous membranes
   f. Cardiac arrhythmias (particularly QT prolongation)

Notes/Educational Pearls

Key considerations
1. Medical direction should be contacted at any time for advice, especially when patient’s level of agitation is such that transport may place all parties at risk
2. Transport by air is not advised
3. Some chemical restraint medications are available in auto-injectors for rapid administration
4. Stretchers with adequate foam padding, particularly around the head, facilitates patient’s ability to self-position the head and neck to maintain airway patency
5. Placement of stretcher in sitting position prevents aspiration and reduces the patient’s physical strength by placing the abdominal muscles in the flexed position
6. Patients that are more physically uncooperative should be physically restrained in the lateral decubitus position (one arm above the head and the other arm below the waist), rather than the prone, to avoid airway compromise
7. For patients with key-locking restraint devices, applied by another agency, consider the following options:
   a. Remove restraint device and replace it with a restraint device that does not require a key
   b. Administer chemical restraints then remove and replace restraint device with non-key-locking device after patient has become more cooperative
   c. Transport patient, accompanied in patient compartment by person who has key for the device
   d. Transport patient in vehicle of person with device key if medical condition of patient is deemed stable, medical direction so authorizes, and law allows

**Pertinent assessment findings**
Continuous monitoring of:
1. Airway patency
2. Respiratory status with pulse oximetry and/or capnography
3. Circulatory status with frequent blood pressure measurements
4. Mental status and trends in level of patient cooperation
5. Cardiac status, especially if the patient has received chemical restraints
6. Extremity perfusion with capillary refill in patients in physical restraints

**Quality Improvement**
**Key Documentation Elements**
1. Etiology of agitated or violent behavior if known
2. Patient’s medications, other medications or substances found on scene
3. Patient’s medical history or other historic factors reported by patient, family or bystanders
4. Physical evidence or history of trauma
5. Adequate oxygenation by pulse oximetry
6. Blood glucose measurement
7. Patient rapport measures taken
8. Dose, route, and number of doses of chemical restraints administered
9. Clinical response to chemical restraints
10. Number and physical sites of placement of physical restraints
11. Duration of placement of physical restraints
12. Repeated assessment of airway patency
13. Repeated assessment of respiratory rate, effort, pulse oximetry/capnography
14. Repeated assessment of circulatory status with blood pressure, capillary refill, cardiac monitoring
15. Repeated assessment of mental status and trends in the level of patient cooperation
16. Repeated assessment of capillary refill in patient with extremity restraints
17. Communications with EMS medical direction
18. Initiation and duration of engagement with law enforcement

**Performance Measures (Process, Structure, and Outcomes)**
1. Incidence of injuries to patient, EMS personnel, or others on scene
2. Incidence of injuries to patient, EMS personnel, or others during transport
3. Medical or physical complications (including sudden death) in patients
4. Advance informational communication of EMS protocols for the management of agitated and violent patients to others within the emergency care system and law enforcement
5. Initiation and engagement with EMS medical direction
6. Initiation and duration of engagement with law enforcement

**References:**

**Version/Revision Dates:**
February 28, 2014
Anaphylaxis and Allergic Reaction

Patient Care Goals:
Allergic reactions and anaphylaxis are serious and potentially life-threatening medical emergencies. It is the body’s adverse reaction to a foreign protein (i.e. food, medicine, pollen, insect sting or any ingested, inhaled, or injected substance). A localized allergic reaction (i.e. urticaria or angioedema that does not compromise the airway) may be treated with antihistamine therapy. When anaphylaxis is suspected, EMS personnel should always consider epinephrine as first-line treatment. Cardiovascular collapse may occur abruptly, without the prior development of skin or respiratory symptoms. Constant monitoring of the patient’s airway and breathing is essential.

Goal is to prevent or mitigate effects of anaphylaxis/allergic reactions, especially cardiorespiratory collapse and shock.

Patient Presentation:

Inclusion Criteria/Exclusion Criteria

<table>
<thead>
<tr>
<th>Allergic Reaction</th>
<th>Anaphylaxis</th>
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</thead>
<tbody>
<tr>
<td>Symptoms involving only <strong>one</strong> organ system (i.e. localized angioedema that does not compromise the airway, urticaria, or vomiting)</td>
<td>More severe and is characterized by an acute onset involving 1) the skin (hives) and/or mucosa and either respiratory compromise or decreased B/P or signs of end-organ dysfunction, and/or 2) <strong>hypotension (B/P&lt;90) after exposure</strong> to a known allergen for that patient, and/or 3) <strong>two or more of the following occurring rapidly after exposure to a likely allergen:</strong> skin and/or mucosal involvement, respiratory compromise, persistent gastrointestinal symptoms (nausea, vomiting, or diarrhea), hypotension, or signs of end-organ dysfunction</td>
</tr>
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<table>
<thead>
<tr>
<th>HPI</th>
<th>Signs and Symptoms</th>
<th>Considerations</th>
</tr>
</thead>
</table>
| • Onset and location  
• Insect sting or bite  
• Food allergy/ exposure  
• New clothing, soap, detergent  
• Past history of reactions | • Itching or hives  
• Coughing, wheezing, or respiratory distress  
• Chest tightness or throat constriction  
• Hypotension or shock | • Angioedema (drug-induced)  
• Aspiration/ airway obstruction  
• Vasovagal event  
• Asthma or COPD  
• Heart failure |
• Medication history
• Persistent gastrointestinal symptoms (nausea, vomiting, and diarrhea)
• Altered mental status

Patient Management:

Assessment, Treatment, and Interventions:
1. Perform general patient management.
2. If signs of allergic reaction without signs of anaphylaxis, go to step 8
3. If signs of anaphylaxis, administer epinephrine via an epinephrine auto-injector, if available
4. If signs of anaphylaxis are exhibited and the contents of an epinephrine auto-injector have not been administered, administer epinephrine 1:1,000 0.01 mg / kg up to 0.3 mg IM.
5. If signs of anaphylaxis, consider administration of diphenhydramine 1 mg / kg up to 50 mg IM or IV. The IV route is preferred for the patient in severe shock. If an IV cannot be readily established, give diphenhydramine via the IM route.
6. If signs of anaphylaxis and the medication is available, consider administration of steroids (oral prednisone or IV methylprednisolone).
7. If signs of anaphylaxis and the patient is experiencing respiratory distress with wheezing, refer to the Bronchospasm/Obstructive Lung Disease guideline.
8. If signs of anaphylaxis and hypoperfusion persists following the first dose of epinephrine, consider administration of 20 mL/kg normal saline IV. While administering a fluid bolus, frequently reassess perfusion for improvement. If perfusion improves, slow the IV to KVO and monitor closely.
9. If signs of allergic reaction only, consider administration of diphenhydramine 1 mg / kg up to 50 mg PO, IM, or IV.
10. Transport as soon as possible and perform ongoing assessment as indicated.

Notes/Educational Pearls:

Key Considerations
1. A thorough assessment and a high index of suspicion are required for all potential allergic reaction patients.
2. Gastrointestinal symptoms occur most commonly in food-induced anaphylaxis, but can occur with other causes. Oral pruritus is often the first symptom observed in patients experiencing food-induced anaphylaxis. Abdominal cramping is also common, but nausea, vomiting, and diarrhea are frequently observed as well.
3. Contrary to common belief that all cases of anaphylaxis present with cutaneous manifestations, such as hives or mucocutaneous swelling, a significant portion of anaphylactic episodes may not involve these signs and symptoms on initial presentation. Moreover, most fatal reactions to food-induced anaphylaxis in children were not associated with cutaneous manifestations.

Pertinent Assessment Findings
None
Quality Improvement:

Key Documentation Elements
None

Performance Measures (Process, Structure, and Outcomes):
None

References:

Versions/Revision Dates:
March 15, 2014
Altered Mental Status

Patient Care Goals:
1. Identify treatable causes
2. Protect patient from harm
3. Assess following ABCs

Patient Presentation:
Inclusion criteria
1. Neurologic: seizure, stroke, dementia, unrecognized head trauma, bleeding aneurysm,
2. Endocrine: hypoglycemia, hyperglycemia, hyperthyroid, hypothyroid, adrenal insufficiency
3. Infectious: fever, sepsis
4. Overdose: prescription, recreational
5. Environmental: heat stroke, hypothermia, HACE
6. Psychiatric: decompensation of prior mental disorder, adverse drug reaction

Exclusion criteria
1. Known traumatic altered mental status
2. Traumatic coma

Patient management:
Assessment
1. Airway, breathing, circulation
2. Glasgow Coma Score
3. Pupils
4. Cincinnati stroke test

Treatment and Interventions
1. Oxygen
2. Glucose
3. Naloxone
4. Restraint: physical and chemical
5. ECG and rhythm strip
6. Flumazenil (Romazicon®)
7. Active cooling or warming
8. IV fluids

Patient Safety Considerations
Depressed mental status (airway and ventilatory support) versus agitated mental status (may need restraint; see Agitated or Violent Patient/Behavioral Emergency guideline).
Notes/Educational Pearls:

Key Considerations
1. History from bystanders
2. Recent complaints (e.g. headache, chest pain, difficulty breathing, vomiting, fever)
3. Pill bottles/medications: anti-coagulants, anti-depressants, narcotic pain relievers, benzodiazepines
4. Medical alert tags

Pertinent Assessment Findings
1. Track marks
2. Breath odor
3. Skin temperature
4. Location

Quality Improvement:

Key Documentation Elements
None

Performance measures (process, structure, and outcomes)
None

References:
None

Version/Revision Dates:
February 26, 2014
Diabetic

**Patient Care Goals:**
To limit morbidity from hypoglycemia and hyperglycemia by:
1. Describing appropriate use of glucose monitoring
2. Treating symptomatic hypoglycemia
3. Appropriate hydration for hyperglycemia

**Patient Presentation:**

**Inclusion Criteria**
1. Adult or pediatric patient with altered level of consciousness (also see Altered Mental Status guideline)
2. Adult or pediatric patient with stroke symptoms (e.g. hemiparesis, dysarthria; also see Suspected Stroke/Transient Ischemic Attack guideline)
3. Adult or pediatric patient with seizure [Also see Seizures guideline]
4. Adult or pediatric patient with symptoms of hyperglycemia (e.g. polyuria, polydipsia, weakness, dizziness)
5. Adult or pediatric patient with history of diabetes and other medical symptoms
6. Pediatric patient with suspected alcohol ingestion

**Exclusion Criteria**
Adult patient in cardiac arrest

**Patient Management:**

**Assessment**
1. Monitoring:
   a. Obtain point of care blood glucose level
2. Secondary survey pertinent to altered blood glucose level:
   a. Constitutional: assess for tachycardia and hypotension
   b. Eyes: assess for sunken eyes from dehydration
   c. Nose / mouth / ears: assess for dry mucus membranes or tongue bite from seizure
   d. Neurologic:
      i. Assess GCS and mental status
      ii. Assess for focal neurologic deficit: motor and sensory

**Treatment and Interventions**
1. If altered level of consciousness or stroke, also follow Altered Mental Status or Suspected Stroke/Transient Ischemic Attack guidelines accordingly
2. If hypoglycemia (glucose <60 mg/dL in adult; glucose <50 mg/dL in pediatric) with related symptoms; administer one of the following to increase blood sugar:
   a. Glucose, oral (in form of glucose tablets, glucose gel, tube of cake icing, etc.)
      i. Avoid oral glucose in patients that are unable to swallow or maintain airway
      ii. Adult Dosing: 25 gm
      iii. Pediatric Dosing: 0.5-1 gm
b. Dextrose IV/IO
   i. Adult Dosing: 25 gm of 10-50% dextrose IV/IO
      1. 50 mL of 50% dextrose
      2. 100 mL of 25% dextrose
      3. 250 mL of 10% dextrose
   ii. Pediatric Dosing: 0.5-1 gm/kg of 10-25% dextrose IV/IO
      1. 2 mL/kg of 25% dextrose
      2. 4 mL/kg of 12.5% dextrose
      3. 5 mL/kg of 10% dextrose

c. Glucagon IM/IN/IV/IO
   i. Adult Dosing: 1 mg IM/IN
   ii. Pediatric Dosing: 1 mg IM/IN if ≥ 20 kg (or ≥ 5 y/o)
      0.5 mg IM/IN if < 20 kg (or < 5 y/o)

3. If hyperglycemia (glucose > 300 mg/dL) with symptoms of dehydration, vomiting, or altered level of consciousness:
   a. Volume expansion with normal saline bolus
      i. Adult: Normal saline 2 L bolus IV/IO
      ii. Pediatric: Normal saline 20 mL/kg bolus IV/IO, reassess and repeat up to 60 mL/kg total

4. Reassess patient
   a. Reassess vital signs, mental status, and indications of dehydration
   b. Repeat point of care blood glucose level indicated if previous hypoglycemia and mental status has not returned to normal
      i. It is not necessary to repeat blood sugar if mental status has returned to normal
      ii. It is not necessary to repeat blood glucose level if initial hyperglycemia
   c. If continued altered mental status and hypoglycemia, give additional dextrose or glucagon using initial dosing

5. Disposition
   a. If hyperglycemia, transport to closest appropriate receiving facility
   b. If hypoglycemia with continued symptoms, transport to closest appropriate receiving facility
   c. If hypoglycemia with resolved symptoms, consider release without transport if all of the following are true:
      i. Repeat glucose is >80 mg/dL
      ii. Patient is insulin-dependent diabetic (not using long-acting oral antihyperglycemics)
      iii. Patient returns to normal mental status, with no focal neurologic signs/symptoms after receiving glucose/dextrose
      iv. Patient can promptly obtain and will eat a carbohydrate meal
      v. Patient refuses transport or patient and EMS providers agree transport not indicated
      vi. A reliable adult will be staying with patient
      vii. No major co-morbid symptoms exist, like chest pain, shortness of breath, seizures, intoxication, also received naloxone
      viii. Patient or legal guardian refuses transport
**Patient Safety Considerations**

1. Dextrose 50% can cause local tissue damage if it extravasates from vein. EMS systems may consider carrying no more than 25% concentration of dextrose for treating hypoglycemia in adults.
2. Dextrose 50% should not be used for children < 8 years of age.
3. Dextrose 10-12.5% should be used for neonates/infants < 1 month of age.

**Notes/Educational Pearls:**

A handy formula for calculating the dose of IV/IO dextrose is:

\[
\text{_____ mL/kg} \times \text{_____ % concentration of dextrose} = 50
\]

For example:

- 2 mL/kg of 25% dextrose
- 5 mL/kg of 10% dextrose
- 1 mg/kg of 50% dextrose

**Key Considerations**

None

**Pertinent Assessment Findings**

None

**Quality Improvement:**

**Key Documentation Elements**

1. Document reassessment of vital signs and mental status after administration of glucose/dextrose/glucagon.
2. Document point of care glucose level (when in scope of practice) when indicated.

**Performance Measures (Process, Structure and Outcomes)**

1. When in scope of practice, point of care blood glucose checked for all patients with symptoms of altered level of consciousness, seizure, stroke, or hyperglycemia.
2. Within scope of practice, oral glucose or parenteral dextrose/glucagon given when indicated.
3. When hyperglycemia documented, appropriate volume replacement given while avoiding overzealous repletion before insulin therapy at receiving center.
4. If patient released at scene, criteria documented for safe release.

**References:**

None

**Version / revision dates:**

February 28, 2014
Pain Management

Patient Care Goals
Overview:

The practice of prehospital emergency medicine requires expertise in a wide variety of pharmacological and non-pharmacological techniques to treat acute pain resulting from a myriad of injuries and illness. One of the most essential missions for all healthcare providers should be the relief and/or prevention of pain and suffering. Approaches to pain relief must be designed to be safe and effective in the organized chaos of the prehospital environment. The degree of pain and the hemodynamic status of the patient will determine the rapidity of care.

Patient Presentation:

Inclusion Criteria
Patient who are experiencing pain

Exclusion Criteria
Patients who are experiencing pain secondary to trauma (see Trauma guideline)

Patient Management:
Assessment, Treatment and Interventions
1. Apply a pulse oximeter and administer oxygen as needed to maintain a $\text{SPO}_2$ of 94-99%
2. Determine patient’s pain score assessment using standard pain scale.
   a. < 4 years: Observational scale (e.g. Faces, Arms, Legs, Cry, Consolability (FLACC) or Children’s Hospital of Eastern Ontario Pain Scale (CHEOPS)
   b. 4-12 years: Self-report scale (e.g. Wong Baker Faces, Faces Pain Scale (FPS), Faces Pain Scale Revised (FPS-R)
   c. > 12 years: Self-report scale (Numeric Rating Scale (NRS)
3. Place patient on cardiac monitor per patient assessment.
4. If available, consider use of non-pharmaceutical pain management techniques
   a. Placement of the patient in a position of comfort
   b. Application of ice packs and/or splints for pain secondary to trauma
   c. Verbal reassurance to control anxiety
5. If not improved and available, consider use of oral, inhaled, or intramuscular analgesics as permitted by medical direction
   a. Acetaminophen (Tylenol®) 10 mg/kg PO (maximum dose 1 gm)
   b. Ibuprofen (Motrin®, Advil®) 10 mg/kg PO for patients greater than 6 months of age (maximum dose 800 mg)
   c. Fentanyl 1 µg/kg IN
   d. Ketoralac (Toradol®) 60 mg IM in adults who are not pregnant
e. Morphine sulfate 0.1 mg/kg (maximum dose 15 mg)

6. Establish IV of normal saline per patient assessment

7. If the patient is experiencing significant pain, administer IV analgesics
   a. Ketoralac (Toradol®) 30 mg IV in adults who are not pregnant
   b. Morphine sulfate 0.1 mg/kg IV
   c. Fentanyl 1 µg/kg IV

8. Consider administration of oral, sublingual, or IV antiemetics to prevent nausea in high risk patients. See Nausea/Vomiting guideline.

9. If indicated based on pain assessment, repeat pain medication administration after 10 minutes of the previous dose

10. Transport in position of comfort and reassess as indicated.
Universal Pain Assessment Tool

<table>
<thead>
<tr>
<th>Verbal Descriptor Scale</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain</td>
<td>Mild pain</td>
<td>Moderate pain</td>
<td>Severe pain</td>
<td>Very severe pain</td>
<td>Excruciating Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wong-Baker Scale

<table>
<thead>
<tr>
<th>Activity Tolerance Scale</th>
<th>No pain</th>
<th>Can be ignored</th>
<th>Interferes with tasks</th>
<th>Interferes with concentration</th>
<th>Interferes with basic needs</th>
<th>Bed rest required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert</td>
<td>Smiling</td>
<td>No humor</td>
<td>Serious, flat</td>
<td>Furrowed brow</td>
<td>Pursed lips</td>
<td>Breath holding</td>
</tr>
</tbody>
</table>

Spanish

<table>
<thead>
<tr>
<th>Patient Safety Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All patients should have drug allergies identified prior to administration of pain medication.</td>
</tr>
<tr>
<td>2. Contraindications to the administration of narcotics include hypotension, head injury, respiratory depression, and severe COPD.</td>
</tr>
<tr>
<td>3. Fentanyl is contraindicated for patients who have taken monoamine oxidase inhibitors (MAOI) during the previous 14 days and should be used with caution in patients with head injuries, increased intracranial pressure, COPD, and liver or kidney dysfunction.</td>
</tr>
<tr>
<td>4. Non-steroidal anti-inflammatory medications should not be administered to pregnant patients.</td>
</tr>
</tbody>
</table>
Notes/Educational Pearls:

Key Considerations
1. Pain severity (0 - 10) is a vital sign that should be recorded before and after IV or IM medication administration and upon arrival at destination.
2. Patients receiving narcotic analgesics should be administered oxygen.
3. Narcotic analgesia was historically contraindicated in the prehospital setting for abdominal pain of unknown etiology. It was thought that analgesia would hinder the emergency physician’s or surgeon’s evaluation. Recent studies have demonstrated that opiate administration may alter the physical examination findings, but these changes result in no significant increase in management errors.

Pertinent Assessment Findings
None

Quality Improvement:

Key Documentation Elements
1. Documentation of patient vital signs with pulse oximetry
2. Acquisition of patient’s allergies prior to administration of medication
3. Documentation of initial patient pain scale assessment
4. Documentation of medication administration with correct dose
5. Documentation of patient reassessment with repeat vital signs and patient pain scale assessment

Performance Measures (Process, Structure and Outcomes)
1. The clinical efficacy of prehospital analgesia in terms of adequacy of dosing parameters
2. The utilization of alternate medications for patients with drug allergies or during emergency care drug shortages

Version/Revision Dates:
March 17, 2014
Seizures

**Patient Care Goals:**
1. Cessation of seizures in the prehospital setting
2. Minimizing adverse events in the treatment of seizures in the prehospital setting
3. Minimizing seizure recurrence during transport

**Patient Presentation:**

**Inclusion Criteria**
Seizure activity upon arrival of prehospital personnel

**Exclusion Criteria**
Seizures suspected to be related to:
1. Trauma
2. Pregnancy
3. Hyperthermia
4. Toxic exposure

**Patient Management:**

**Assessment**
1. History
   a. Duration of current seizure
   b. Prior history of seizures, diabetes, or hypoglycemia
   c. Typical appearance of seizures
   d. Baseline seizure frequency and duration
   e. Concurrent symptoms of apnea, cyanosis, vomiting, bowel/bladder incontinence, or fever
   f. Bystander administration of medications to stop the seizure
   g. Current medications, including anti-convulsants
   h. Recent dose changes or non-compliance with anti-convulsants
   i. History of trauma, pregnancy, heat exposure, or toxin exposure
2. Exam
   a. Full set of vital signs (T, BP, RR, P, O₂ saturation)
   b. Air entry
   c. Breath sounds
   d. Signs of perfusion (pulses, capillary refill, color)
   e. Neurologic status (GCS, nystagmus, pupil size)

**Treatment and Interventions**
1. Manage airway – ensure oxygen via face mask or non-rebreather mask is applied. If signs of airway obstruction and a chin-lift, jaw thrust, and/or suctioning does not alleviate it, place oropharyngeal airway (if gag reflex is absent) or nasopharyngeal airway. Place pulse oximeter and/or waveform capnography to monitor oxygenation/ventilation
2. Manage breathing – administer bag-valve mask ventilation if oxygenation/ventilation are compromised
3. Assess signs of perfusion
4. Assess neurologic status
5. Obtain a full set of vital signs
6. Glucometry
   a. If still actively seizing, check capillary blood glucose level
   b. If <60 mg/dL, give either IV dextrose (0.5 gm/kg; maximum dose=25 mg) or IM glucagon (0.02 mg/kg; maximum dose=1 mg)
7. IV/IO Access and Routes for Treatment
   a. Alternative routes (buccal, intranasal, intramuscular) for administration of anticonvulsants should be utilized as first line therapy, especially when transport time is expected to be short. If transport time is expected to be long, intravenous (IV)/Intraosseous (IO) needle placement should be considered
8. Anticonvulsant Treatment
   a. 0.2 mg/kg (maximum dose=4 mg) buccal, intramuscular or intranasal midazolam is preferred over rectal diazepam
   b. If IV/IO routes are utilized, 0.1 mg/kg (maximum dose=4 mg) of diazepam, lorazepam, or midazolam may be used

Patient safety considerations
1. Trained personal should be able to give medication without contacting online medical control. However, more than two doses of benzodiazepines are associated with high risk of airway compromise. Use caution, weigh risks/benefits of deferring treatment until hospital, and/or consider consultation with medical control if patient has received two doses of benzodiazepines by bystanders or prehospital providers
2. Hypoglycemic patients who are treated in the field should be transported to hospital, regardless of whether or not they return to baseline mental status after treatment

Notes/Educational Pearls:

Key Considerations
1. Many airway/breathing issues in seizing patients can be managed without intubation or placement of an advanced airway. Reserve these measures for patients that fail less invasive maneuvers as noted above.
2. For children with convulsive status epilepticus requiring medication management in the prehospital setting, trained EMS personnel should be allowed to administer medication without online medical direction.

Pertinent Assessment Findings
The presence of fever with seizure in children <6 months old and >6 years old is not consistent with a simple febrile seizure, and should be concerning for meningitis or encephalitis.

Quality improvement:

Key Documentation Elements
1. Actively seizing during transport and time of seizure onset/cessation
2. Concurrent symptoms of apnea, cyanosis, vomiting, bowel/bladder incontinence, or fever
3. Medication amounts/routes given by bystanders or prehospital providers
4. Neurologic status (GCS, nystagmus, pupil size)

**Performance Measures (Process, Structure and Outcomes)**

1. Process
   a. Prehospital on-scene time
   b. Prehospital transport time
   c. IV/IO placement
   d. Frequency of performing glucometry
   e. Time to administration of dextrose or glucagon, if hypoglycemic
   f. Time to administration of anticonvulsant medication

2. Structure
   a. The presence of protocols that recommend use of intramuscular, intranasal or buccal benzodiazepines for the treatment of seizures

3. Outcomes
   a. Time to seizure cessation
   b. Rate of respiratory failure
   c. ED length of stay (LOS)
   d. Hospital admission rate
   e. LOS in ED observation unit
   f. LOS in hospital
   g. LOS in Intensive Care Unit (PICU)
   h. Cost of hospital care
   i. Knowledge retention of prehospital providers
   j. Mortality

**References:**


**Version/Revision Dates**

Shock

**Patient Care Goals:**
1. To initiate early fluid resuscitation and pressors to maintain/restore adequate perfusion to vital organs
2. To differentiate between possible underlying causes of shock in order to promptly initiate additional therapy

**Patient Presentation:**

**Inclusion Criteria**
1. Signs of poor perfusion (due to a medical cause) such as one or more of the following:
   a. Altered mental status
   b. Delayed/flash capillary refill
   c. Hypoxia (pulse oximetry <95%)
   d. Decreased urine output
   e. Respiratory rate >20 in adults
   f. Hypotension for age (lowest acceptable systolic blood pressure in mm Hg):
      i. <1 year: 60
      ii. 1-10 years: (age in years)(2)+70
      iii. 10-18 years: 90
      iv. >18 years: 100
   g. Tachycardia for age, out of proportion to temperature

<table>
<thead>
<tr>
<th>Temp (°C)</th>
<th>Temp (°F)</th>
<th>Infant &lt;1 yr.</th>
<th>Toddler 1-4 yrs.</th>
<th>Child 5-11 yrs.</th>
<th>Adolescent 12-17 yrs.</th>
<th>Adult &gt;18 yrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;37</td>
<td>98.6</td>
<td>160</td>
<td>130</td>
<td>110</td>
<td>100</td>
<td>90</td>
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<tr>
<td>38</td>
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<td>&gt;42</td>
<td>107.6</td>
<td>208</td>
<td>178</td>
<td>158</td>
<td>148</td>
<td>138</td>
</tr>
</tbody>
</table>

Heart rates higher than the values noted above for the specified age and temperature should be concerning for potential shock, especially in children

2. **AND** potential shock situation:
   a. Hypovolemia (poor fluid intake, vomiting, diarrhea)
   b. Sepsis (fever)
   c. Anaphylaxis (hives, nausea/vomiting, facial edema, wheezing)
   d. Signs of heart failure (hepatomegaly, rales on pulmonary exam, extremity edema)

**Exclusion Criteria**
Shock due to suspected trauma (see Trauma guidelines)

**Patient Management:**

**Assessment**
1. History
   a. History of GI bleeding
   b. Cardiac problems
   c. Stroke
   d. Fever
   e. Nausea/vomiting, diarrhea
   f. Frequent or no urination
   g. Syncopal episode
   h. Allergic reaction
   i. Immunocompromise (malignancy, transplant, asplenia)
   j. Adrenal insufficiency
   k. Presence of a central line

2. Exam
   a. Airway/breathing (airway edema, rales, wheezing, pulse oximetry, respiratory rate)
   b. Circulation (heart rate, blood pressure, capillary refill)
   c. Abdomen (hepatomegaly)
   d. Mucous membrane hydration
   e. Skin (turgor, rash)
   f. Neurologic (GCS, sensorimotor deficits)

**Treatment and Interventions**
1. Check full vital signs
2. Administer oxygen (15 L/min via non-rebreather mask)
3. Cardiac monitor
4. Pulse oximetry
5. Check blood sugar, and correct if <60 mg/dL
6. EKG
7. Check lactate, if available (>2.5 mmol/L is abnormal)
8. Antipyretics for fever
   a. Acetaminophen (15 mg/kg; max dose of 500 mg)
   b. Ibuprofen (10 mg/kg; max dose of 800 mg)
9. Establish IV access; if unable to obtain within 2 attempts or <90 seconds, place an IO needle
10. IV/IO fluids (20 ml/kg isotonic fluid; max of 1 liter) over <15 minutes, using a push-pull method of drawing up the fluid in a syringe and pushing it through the IV/IO. May repeat up to 3 times
11. If there is a history of adrenal insufficiency, give:
   a. Hydrocortisone succinate, 2 mg/kg (max 100 mg) IV/IO/IM (preferred) or
   b. Methylprednisolone 2 mg/kg IV/IO (max 125 mg)
12. Pressors
   a. Cold Shock:
      i. Give dopamine, 5-10 mcg/kg/min
      ii. Give epinephrine, 0.05-0.3 mcg/kg/min
   b. Warm shock:
      i. Give norepinephrine, 0.05-0.5 mcg/kg/min
13. Provide advanced notification to the hospital

**Patient Safety Considerations**
Recognition of cardiogenic shock: if patient condition deteriorates after fluid administration, rales or hepatomegaly develop, then consider cardiogenic shock and holding further fluid administration.

**Notes/Educational Pearls:**

**Key Considerations**
1. Early, aggressive IV fluid administration is essential in the treatment of suspected shock.
2. Patients predisposed to shock:
   a. Immunocompromise (patients undergoing chemotherapy or with a primary or acquired immunodeficiency)
   b. Adrenal insufficiency (Addison's disease, congenital adrenal hyperplasia, chronic or recent steroid use)
   c. History of a solid organ or bone marrow transplant
   d. Infants
   e. Elderly
3. Tachycardia is the first sign of compensated shock, and may persist for hours. Hypotension indicates uncompensated shock, which may progress to cardiopulmonary failure within minutes.
4. Hydrocortisone succinate, if available, is preferred over methylprednisolone and dexamethasone for the patient with adrenal insufficiency, because of its dual glucocorticoid and mineralocorticoid effects. Patients with no reported history of adrenal axis dysfunction may have adrenal suppression due to their acute illness, and hydrocortisone should be considered for any patient showing signs of treatment-resistant shock. Patients with adrenal insufficiency may have an emergency dose of hydrocortisone available that can be administered IV or IM.

**Pertinent Assessment Findings**
Decreased perfusion manifested by altered decreased mental status, decreased urine output (<1 ml/kg/hr) or abnormalities in capillary refill or pulses:
1. **Cold shock**: capillary refill >2 secs, diminished peripheral pulses, mottled cool extremities
2. **Warm shock**: flash capillary refill, bounding peripheral pulses

**Quality improvement:**

**Key Documentation Elements**
1. Full vital signs with reassessment every 15 minutes
2. Lactate level
3. GCS
4. Amount of fluids given

**Performance Measures (Process, Structure and Outcomes)**
1. Process
   a. Prehospital on-scene time
b. Prehospital transport time
c. IV/IO placement
d. Time to administration of 1\textsuperscript{st} bolus
e. Time to administration of 2\textsuperscript{nd} bolus
f. Time to administration of 3\textsuperscript{rd} bolus
g. Percent of time that lactate was checked
h. Percent of time that hospital was notified prior to arrival

2. Structure
   a. The presence of a policy to provide advanced notification to the hospital for patients with suspected shock
   b. The presence of decision support tools to identify patients at risk for shock

3. Outcome
   a. Rate of respiratory failure
   b. Time to reversal of shock
   c. ED length of stay (LOS)
   d. Hospital admission rate
   e. LOS in hospital
   f. LOS in Intensive Care Unit (ICU)
   g. Cost of hospital care
   h. Mortality

References:

Version/Revision Dates:
March 16, 2014
Resuscitation

Cardiac Arrest (VF/VT/Asystole/PEA)

**Patient Care Goals:**
1. Return of spontaneous circulation (ROSC)
2. Preservation of neurologic function

**Inclusion Criteria**
Patients with cardiac arrest.

**Exclusion Criteria**
Include the following:
1. Patients suffering cardiac arrest due to severe hypothermia
2. Patients with identifiable Do Not Resuscitate (or equivalent such as POLST) order
3. Patients with transient loss of consciousness and presence of pulses upon EMS evaluation

**Patient Management:**

**Assessment**
The patient in cardiac arrest requires a prompt balance of treatment and assessment. In cases of cardiac arrest, assessments should be focused and limited to obtaining enough information to reveal the patient is pulseless. Once pulseless is discovered, treatments should be initiated immediately and any further history must be obtained by bystanders while treatment is ongoing.

**Treatment and Interventions**
The most important therapies for patients suffering from cardiac arrest are prompt cardiac defibrillation and effective chest compressions.

1. Initiate chest compressions in cases with no bystander chest compressions, or take over compressions from bystanders while a second rescuer is setting up the AED or defibrillator.
2. If adequate, uninterrupted bystander CPR has been performed or if the patient arrests in front of the EMS providers, immediately proceed with rhythm analysis and defibrillation, if appropriate.
3. If inadequate bystander CPR or no compressions and the arrest was not witnessed by EMS providers, perform 2 minutes of chest compressions at a rate of 100-120/min, followed by rhythm analysis and defibrillation, if appropriate.
   a. Defibrillation should be at the maximum output of the defibrillator, up to 360 joules (or 4 J/kg for pediatric patients), for initial and subsequent defibrillation attempts.
4. Chest compressions should resume immediately after defibrillation attempts with no pauses for pulse checks.
5. All attempts should be made to prevent avoidable interruptions in chest compressions, such as pre-charging the defibrillator and hovering over the chest, rather than stepping away during defibrillations.
6. IV/IO access should be obtained within the first 2-minute period of chest compressions and Epinephrine 1 mg (0.01 mg/kg for pediatrics) IV/IO should be provided every 3-5 minutes starting with the first or second round of chest compressions.
   a. The first or second dose of epinephrine may be substituted by vasopressin 40 U IV/IO (except in pediatrics)
7. Continue the cycle of chest compressions for 2 minutes, followed by rhythm analysis and defibrillation of shockable rhythms. During this period of time, the proper strategy of airway management is currently not defined and many options for airway management exist. Regardless of the airway management strategy, consider the following principles:
   a. The airway management strategy should not interrupt compressions
   b. Consider ventilation rates between 8-10 breaths/min 
      i. If no advanced airway, consider either a 15:1 or 30:2 ventilation to compression ratio. For pediatrics a ratio of 15:2 should be used when 2 rescuers are present. 
         Once advanced airway is applied, ventilations should not exceed 8-10 breaths/min
   c. Consider limited tidal volumes between 350-450 ml for adults. For neonates and young children, a self-inflating bag with a volume of 450-500 ml should be used to produce adequate chest rise. For older children and adolescents, a self-inflating bag with a volume of 1000 ml should be used to produce adequate chest rise
8. Consider use of antiarrhythmic for recurrent VF/Pulseless VT
   a. Amiodarone 300 mg (or 5 mg/kg for pediatrics) IV/IO, (Amiodarone may be repeated once at a dose of 150 mg after 10 minutes in adults and twice for pediatrics, up to a maximum of 15 mg/kg or 300 mg), or
   b. Lidocaine 1.5 mg/kg (or 1 mg/kg for pediatrics, although amiodarone is preferred) IV/IO (Lidocaine may be repeated every 5-10 minutes at a dose of 0.75 mg/kg IV/IO up to a total dose of 3 mg/kg. For pediatrics, the maximum total dose is 1 mg/kg), or
   c. For torsades de pointes, magnesium sulfate 2 g (or 25-50 mg/kg for pediatrics) IV/IO
9. Consider reversible causes of cardiac arrest which include the following:
   a. Hypothermia – additions to care include attempts at active rewarming. Refer to Cold Exposure guideline.
   b. The dialysis patient/known hyperkalemic patient – Additions to care include the following:
      i. Calcium chloride 10% 10ml IV/IO (for pediatrics, the dose is 20 mg/kg = 0.2 ml/kg)
      ii. Sodium Bicarbonate 1 mEq/kg IV/IO
   c. Tricyclic antidepressant overdose - Additions to care include the following:
      i. Sodium bicarbonate 1 mEq/kg IV/IO
   d. Hypovolemia - Additions to care include the following:
      i. Normal saline 2 L IV/IO (or 20 ml/kg, repeated up to 3 times for pediatrics)
   e. If the patient is intubated at the time of arrest, assess for tension pneumothorax and misplaced ETT. If tension pneumothorax suspected, perform needle decompression. 
      Assess ETT, if misplaced, replace ETT.
10. If at any time during this period of resuscitation the patient regains return of spontaneous circulation, proceed to the Post-Resuscitation Care guideline
11. If resuscitation remains ineffective, consider termination of resuscitation
   a. Refer to **Termination of Resuscitation** guideline

**Patient Safety Considerations**
It is not safe for the patient or providers to perform chest compressions during transport. Chest compressions during patient movement are less effective in regards to hands on time, depth, recoil and rate and providers performing chest compressions in a moving vehicle are at risk for injury. Therefore, patients should be resuscitated as close to the scene as operationally possible.

**Notes/Educational Pearls:**

**Key Considerations**
1. Effective chest compressions and defibrillation are the most important therapies to the patient in cardiac arrest. Effective chest compressions are defined as:
   a. A rate of greater than 100 and less than 120 compressions/minute,
   b. Depth of at least 2 inches (5 cm) for adults and children or 1.5 inches (4 cm) for infants,
   c. Allow for complete chest recoil.
   d. Minimize interruptions in compressions
   e. Avoid rescuer fatigue by rotating rescuers every 1-2 minutes
   f. Avoid excessive ventilation. If no advanced airway, consider either a 15:1 or 30:2 ventilation to compression ratio for adults, and 15:2 for children when 2 rescuers are present. Once advanced airway is applied, ventilations should not exceed 8-10 breaths/min
   g. Quantitative end-tidal CO2 should be used to monitor effectiveness of chest compressions. If ETCO2 < 10 mmHg, attempt to improve chest compression quality. Consider additional monitoring with biometric feedback which may improve compliance with suggested resuscitation guidelines.
h. Chest compressions are usually the most rapidly applied therapy for the patient in cardiac arrest and should be applied as soon as the patient is noted to be pulseless. If the patient is being monitored with pads in place at the time of arrest, immediate defibrillation should take precedence over all other therapies, however, if there is any delay in defibrillation (for instance, in order to place pads), chest compressions should be initiated while the defibrillator is being applied. There is no guidance on how long these initial compressions should be applied, however, it is reasonable to either complete the initial 2 minutes of chest compressions in cases of ineffective or no bystander chest compressions OR to perform defibrillation as soon as possible after chest compressions initiated in cases of witnessed arrest or effective bystander chest compressions.

i. Chest compressions should be reinitiated immediately after defibrillation as pulses, if present, are often difficult to detect and rhythm and pulse checks interrupt compressions.

j. Continue chest compressions between completion of AED analysis and AED charging.

k. Effectiveness of chest compressions decreases with any movements. Patients should therefore be resuscitated as close to the point at which they are first encountered and should only be moved if the conditions on scene are unsafe or do not operationally allow for resuscitation. Chest compressions are also less effective in a moving vehicle. It is also dangerous to EMS providers, patients, pedestrians and other motorists to perform chest compressions in a moving ambulance. For these reasons and because in most cases the care provided by EMS providers is equivalent to that provided in emergency departments, resuscitation should occur on scene.

l. Defibrillation dosing should follow manufacturer’s recommendation in the case of biphasic defibrillators. If the manufacturer’s recommendation is unknown, use highest setting possible. In the case of monophasic devices, setting should be 360J (or 4 J/kg for children).

2. Consider IV/IO access during first round of chest compressions
3. Administer epinephrine during the 1st or 2nd round of compressions
4. Airway management strategy should be considered early during the case. At present, the most effective mechanism of airway management is uncertain with some systems managing the airway aggressively and others managing the airway with basic measures and both types of systems finding excellent outcomes. Regardless of the airway management style, consider the following principles:
   a. Airway management should not interrupt chest compressions.
   b. Carefully follow ventilation rate and prevent hyperventilation
   c. Consider limited tidal volumes
   d. There is uncertainty regarding the proper goals for oxygenation during resuscitation. Current recommendations suggest using the highest flow rate possible through NRB or
BVM. This should not be continued into the post-resuscitation phase in which there becomes more clear guidance on oxygenation goals of 94-99%.

5. Special Circumstances in Cardiac Arrest
   a. Trauma
      i. Standard therapies including chest compressions and defibrillation should be initiated in arrest due to traumatic causes, however, may not have the same effectiveness as in cardiac arrest and therefore immediate consideration of causative factors and prompt attempts to reverse underlying causes of arrest should be started in parallel to standard therapies.
      ii. Three major causative factors for cardiac arrest in the trauma patient include loss of airway, tension pneumothorax and hypovolemia. Priority should be placed on aggressive management of the patient’s airway, consideration of tension pneumothorax and decompression of the chest, and IV fluid resuscitation.
      iii. If these efforts do not lead to ROSC, refer to the Termination of Resuscitation guideline.
   b. Pregnancy
      i. The best hopes for fetal survival is maternal survival.
      ii. Position the patient in the supine position with a second rescuer performing manual uterine displacement to the left in an effort to displace the gravid uterus and increase venous return by avoiding aorto-caval compression. AHA Ref
      iii. If manual displacement is unsuccessful, the patient may be placed in the left lateral tilt position at 30°. This position is less desirable than the manual uterine displacement as chest compressions are more difficult to perform in this position.
      iv. Chest compressions should be performed slightly higher on the sternum than in the non-pregnant patient to account for elevation of the diaphragm and abdominal contents in the obviously gravid patient.
      v. Defibrillation should be performed as in non-pregnant patients.
   c. Arrests of Respiratory Etiology (including drowning)
      Consider early and aggressive management of the patient’s airway as well as the above protocols for cardiac arrest.

6. Consider application of the “pit crew” model of resuscitation
   a. Ideally, providers in each EMS agency will use a “pit crew” approach when using this protocol to ensure the most effective and efficient cardiac arrest care. Training should include teamwork simulations integrating first responders, BLS, and ALS crewmembers that regularly work together. High-performance systems should practice teamwork using “pit crew” techniques with predefined roles and crew resource management principles. For example (the Pennsylvania State EMS Model for Pit Crew):
i. Rescuer 1 and 2 set up on opposite sides of patient’s chest and perform continuous chest compressions, alternating after every 100 compressions to avoid fatigue

ii. Consider use of a metronome or CPR feedback device to ensure that compression rate is 100-120/minute

iii. Chest compressions are only interrupted during rhythm check (AED analysis or manual) and defibrillation shocks. Continue compressions when AED/defibrillator is charging

iv. Additional rescuer obtains IO (or IV) access and gives Epinephrine. Consider tibial IO as first attempt at vascular access

v. During the first four cycles of compressions/defibrillation (approximately 10 minutes) avoid any attempt at intubation

vi. One responding provider assumes code leader position overseeing the entire response

vii. Use a CPR checklist to ensure that all best practices are followed during CPR

b. For efficient “pit crew” style care, the EMS agency medical director should establish the options that will be used by providers functioning within the EMS agency. Options include establishing:
   i. The airway/ventilation management, if any, that will be used
   ii. The initial route of vascular access

c. The EMS agency must, overseen by the agency medical director, perform a QI review of care and outcome for every patient that receives CPR.
   i. The QI should be coordinated with local receiving hospitals to include hospital admission, discharge, and condition information. This EMS agency QI can be accomplished by participation an organized cardiac arrest registry.
   ii. The QI should be coordinated with local PSAP/dispatch centers to review opportunities to assure optimal recognition of possible cardiac arrest cases and provision of dispatch-assisted CPR (including hands-only CPR when appropriate).

**Quality Improvement:**

**Key Documentation Elements**

Should be tailored to any locally utilized data registry but may include as a minimum the following elements:

1. Resuscitation attempted
2. Arrest Witnessed
3. Location of arrest
4. Location of arrest
5. First monitored rhythm
6. CPR before EMS arrival
7. Outcome
a. Any ROSC
8. Presumed etiology
   a. Presumed cardiac
   b. Trauma
   c. Submersion
   d. Respiratory
   e. Other non-cardiac
   f. Unknown

Performance Measures (Process, Structure, and Outcomes)

Process
1. Time to scene
2. Time to patient
3. Time to first CPR
4. Time to first shock
5. Review of CPR Quality

Structure
None

Outcomes
None

References:

Version/Revision Dates:
March 16, 2014
Adult Post-ROSC (Return of Spontaneous Circulation) Care

**Patient Care Goals:**
Out-of-hospital cardiac arrest in the U.S. has a mortality rate greater than 90% and results in excess of 300,000 deaths per year. Many of those who do survive suffer significant neurologic morbidity. Current research has demonstrated that care of patients with return of spontaneous circulation (ROSC) at specialized centers is associated with both decreased mortality and improved neurologic outcomes. It is believed that hypothermia suppresses the cascade of damaging biochemical events that causes secondary cellular injury and death after an anoxic insult.

The goal is therefore to optimize neurologic and other function following a return of spontaneous circulation following resuscitated cardiac arrest.

**Patient Presentation:**

**Inclusion Criteria**
Patient returned to spontaneous circulation following cardiac arrest resuscitation

**Exclusion Criteria**
None

**Patient Management:**

**Assessment, Treatment, and Interventions**
1. Perform general patient management
2. Support life-threatening problems associated with airway, breathing, and circulation. Monitor closely for reoccurrence of cardiac arrest
3. Titrate oxygen to keep pulse ox between 94% and 99%. Do NOT hyper-oxygenate
4. For hypotension (SBP less than 90 mmHg) associated with cardiogenic shock, give a Dopamine infusion at 5–20 mcg/kg/min IV. Titrate to SBP greater than 90 mmHg in adults
5. Check blood glucose. If hypoglycemic, see appropriate guideline. If hyperglycemic, notify hospital on arrival
6. If patient seizes, refer to seizure guideline
7. Perform 12-lead ECG
8. Awake post cardiac arrest patients with evidence or interpretation consistent with ST elevation myocardial infarction (STEMI/Acute MI) may be transported to any hospitals which offer percutaneous coronary intervention in their cardiac catheterization laboratory
9. Transport unresponsive patients to facility which offers specialized post-resuscitative care
10. Do not allow patient to become hyperthermic
11. Mild therapeutic hypothermia may be beneficial in unresponsive patients with ROSC. Only if a coordinated system of care exists to maintain therapy, *may* consider:
   a. Start an IV of ice-cold normal saline
   b. Infuse a 20 to 30 mL/kg bolus (Goal: 2 liters of ice cold saline in adult patients).
   c. While administering fluid boluses, frequently reassess perfusion for improvement and/or fluid overload respiratory distress. If perfusion improves, slow the IV to KVO and monitor
closely. If patient develops fluid overload respiratory distress (dyspnea, rales, crackles, decreasing SpO2), slow the IV to KVO.
d. If patient unresponsive and patient begins shivering, sedate further with benzodiazepines

**INDICATION FOR ICE SALINE:** Unresponsive adult patients (with return of spontaneous return of circulation after a non-traumatic cardiac arrest.

**CONTRAINDICATIONS FOR ICE SALINE:**

1. Major trauma.
2. Preexisting hypothermia.
3. Hypotension (SBP less than 90 mmHg) unresponsive to vasopressors.
4. Known bleeding disorders or liver failure.
5. Responsive patient.

**Patient Safety Considerations**

None

**Notes/Educational Pearls:**

**Key Considerations**

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

**Pertinent Assessment Findings**

None

**Quality Improvement:**

**Key Documentation Elements**

None

**Performance Measures (Process, Structure, and Outcomes)**

None
References:

2. Epidemiology, Pathophysiology, Treatment, and Prognostication A Consensus Statement From the International Liaison Committee on Resuscitation (American Heart Association, Australian and New Zealand Council on Resuscitation, European Resuscitation Council, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Asia, and the Resuscitation Council of Southern Africa); the American Heart Association Emergency Cardiovascular Care Committee; the Council on Cardiovascular Surgery and Anesthesia; the Council on Cardiopulmonary, Perioperative, and Critical Care; the Council on Clinical Cardiology; and the Stroke Council. Circulation 2008; 118: 2452-2483

Version/Revision Dates:
March 16, 2014
Determination of Death / Withholding Resuscitative Efforts

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

**Patient Presentation:**
A clinically dead patient is defined as any unresponsive patient found without respirations and without a palpable carotid pulse.

**Inclusion Criteria:**
Resuscitation must be started on all patients who are found apneic and pulseless UNLESS the following (Exclusion Criteria) conditions exist (determined as appropriate to provider scope of practice).

**Exclusion Criteria**
1. Traumatic injury or body condition clearly indicating biological death (irreversible brain death), limited to:
   a. Decapitation: the complete severing of the head from the remainder of the patient’s body.
   b. Decomposition or putrefaction: the skin is bloated or ruptured, with or without soft tissue sloughed off. The presence of at least one of these signs indicated death occurred at least 24 hours previously.
   c. Transection of the torso: the body is completely cut across below the shoulders and above the hips through all major organs and vessels. The spinal column may or may not be severed.
   d. Incineration: 90% of body surface area with full thickness burns as exhibited by ash rather than clothing and complete absence of body hair with charred skin.
   e. Dependent lividity with rigor mortis (when clothing is removed there is a clear demarcation of pooled blood within the body, and the body is generally rigid).
      i. **Does not apply to victims of lightning strikes, drowning or hypothermia**
   f. Injuries incompatible with life (such as massive crush injury, complete exsanguination, severe displacement of brain matter).

OR

2. A valid DNR order (form, card, bracelet) or other actionable medical order (e.g. POLST/MOLST form) present, when it:
   a. Conforms to the state specifications for color and construction.
   b. Is intact: it has not been cut, broken or shows signs of being repaired.
c. Displays the patient’s name and the physician’s name.

**Patient Management:**

**Assessment**
In cases of dependent lividity with rigor mortis and in cases of injuries incompatible with life, the condition of clinical death must be confirmed by observation of the following:
1. Reposition the airway and look, listen, and feel for at least 30 seconds for spontaneous respirations; respiration is absent
2. Palpate the carotid pulse for at least 30 seconds; pulse is absent
3. Examine the pupils of both eyes with a light; both pupils are nonreactive
4. Absence of a shockable rhythm with an AED for 30 seconds or lack of cardiac activity with an ALS cardiac monitor (in at least 2 leads) for 30 seconds

**Treatment and Interventions**
1. If all the components above are confirmed, no CPR is required.
2. If CPR has been initiated but all the components above have been subsequently confirmed, CPR may be discontinued and medical direction contacted as needed.
3. If any of the findings are different than those described above, clinical death is NOT confirmed and resuscitative measures must be immediately initiated or continued and the patient transported to a receiving hospital unless paramedic intercept is pending. The **Termination of Resuscitation** guideline should then be implemented
4. Do Not Resuscitate order (DNR/MOLST/POLST) with signs of life:
   a. If there is a DNR bracelet or DNR transfer form and there are signs of life (pulse and respiration), provide standard appropriate treatment under existing protocols matching the patient’s condition
   b. To request permission to withhold treatment under these conditions for any reason obtain online medical direction.
   c. If there is documentation of a DO NOT INTUBATE (DNI/MOLST/POLST) advanced directive, the patient should receive full treatment per protocols with the exception of any intervention specifically prohibited in the patient’s advanced directive.
   d. If for any reason an intervention that is prohibited by an advanced directive is being considered, online medical direction should be obtained.

**Patient Safety Considerations**
In cases where the patient’s status is unclear and the appropriateness of withholding resuscitation efforts is questioned, ems personnel should initiate CPR immediately and then contact online medical control for further direction.

**Notes / Educational Pearls:**
In the event there is a personal physician present at the scene who has an ongoing relationship with the patient, that physician may decide if resuscitation is to be initiated. In the event there is a registered
nurse from a home health care 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, that authorized nurse may decide if resuscitation is to be initiated. If the physician or nurse decides resuscitation is to be initiated, usual medical direction procedures will be followed.

Special Consideration: For scene safety and/or family wishes, provider may decide to implement CPR even if all the criteria for death are met.

**Key Documentation Elements**
1. Clinical/situational details that may be available from bystanders/caregivers
2. Documentation of details surrounding decision to determine death
3. Names/contact information for significant bystanders (e.g. MD/RN, caregivers)

**Performance Measures (Process, Structure, and Outcomes)**

**Process**
Compliance with guideline

**Structure**
None

**Outcomes**
None

**References:**
3. POLST/MOLST References

**Version/Revision Dates:**
February 28, 2014
Terminating or Not Starting Resuscitation Due to Do Not Resuscitate/Advanced Directive/Health Care Power of Attorney (POA)

**Patient Care Goals:**
Patients have a variety of ways that they can express their wishes to not receive cardiopulmonary resuscitation or even just aggressive care. It is important to respect these wishes while protecting yourself medicolegally.

**Patient Presentation:**

**Inclusion Criteria**
1. A patient with impending or current cardiopulmonary or respiratory arrest that requires CPR and/or airway management.
2. Patients must have one of the following documents or valid alternative (such as identification bracelet indicating wishes) immediately available – note that some specifics can vary widely from state to state:
   a. Physician Orders for Life Sustaining Treatment (POLST) or Medical Orders for Life Sustaining Treatment (MOLST) – explicitly describes acceptable interventions for the patient in the form of medical orders, must be signed by a physician to be valid
   b. Do Not Resuscitate (DNR) order – identifies that CPR and intubation is not to be initiated if the patient is in an arrest or peri-arrest state. A potential weakness is that these do not necessarily cover intubation if a patient is not to that point
   c. Advanced directives – document that describes acceptable treatments under a variable number of clinical situations including some or all of the following: what to do for cardiac arrest, whether artificial nutrition is acceptable, organ donation wishes, dialysis
3. One of the documents above is valid when it meets all of the following criteria:
   a. Conforms to the state specifications for color and construction
   b. Is intact: it has not been cut, broken or shows signs of being repaired
   c. Displays the patient’s name and the physician’s name
4. If a patient has a valid version of one of the above documents it will be referred to as a “valid exclusion to resuscitation” for the purposes of this protocol.

**Exclusion Criteria**
If there is question about the validity of the form the best course of action is to proceed with the resuscitation until additional information can be obtained to clarify the best course of action.

**Patient Management:**

**Assessment, Treatment and Interventions**
1. If the patient has a valid exclusion to resuscitation then no CPR or airway management should be attempted. However, this does not exclude comfort measures including medications for pain as appropriate
2. There is ethically no substantial difference between not starting resuscitation and terminating it once a valid exclusion to resuscitation has been verified. If CPR has been initiated but all the components above have been subsequently confirmed, CPR may be
discontinued and medical direction contacted as needed.

3. If there is a valid exclusion to resuscitation and there are signs of life (pulse and respiration), EMS providers should provide standard appropriate treatment under existing protocols matching the patient’s condition. If the patient has a MOLST or POLST it may provide specific guidance on how to proceed in this situation. These orders should be followed but if there is any question contact medical direction.

4. To request permission to withhold treatment under these conditions for any reason obtain online medical direction.

5. If there is documentation of a do not intubate document (DNI/MOLST/POLST/advanced directive) the patient should receive full treatment per protocols with the exception of any intervention specifically prohibited in the patient’s advanced directive.

6. If for any reason an intervention that is prohibited by an advanced directive is being considered, online medical direction should be obtained.

**Patient Safety Considerations:**
In cases where the patient’s status is unclear and the appropriateness of withholding resuscitation efforts is questioned, initiate CPR immediately and then contact online medical control for further direction.

**Notes / Educational Pearls:**
1. If there is a personal physician present at the scene who has an ongoing relationship with the patient, that physician may decide if resuscitation is to be initiated
2. If there is a registered nurse from a home health care 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, that nurse (authorized nurse) may decide if resuscitation is to be initiated
3. If the physician or nurse decides resuscitation is to be initiated, usual medical direction procedures will be followed.
4. Special Consideration: For scene safety and/or family wishes, provider may decide to implement CPR even if all the criteria for death are met

**Key Documentation elements**
1. Detailed description of the documentation used to not resuscitate the patient including, if possible, a copy of the document
2. Names/contact information for significant bystanders (e.g. MD/RN, caregivers)

**Performance Measures (Process, Structure, and Outcomes)**
**Process**
Compliance with guideline

**Structure**
None

**Outcomes**
None
References:

Version/Revision Dates:
February 28, 2014
Termination of Resuscitative Efforts

Patient Care Goals:
When there is no response to prehospital cardiac arrest treatment, it is acceptable and often preferable to cease futile resuscitation efforts in the field.

1. In patients with cardiac arrest, prehospital resuscitation is initiated with the goal of returning spontaneous circulation before permanent neurologic damage occurs. In most situations ALS providers are capable of performing an initial resuscitation that is equivalent to an in-hospital resuscitation attempt, and there is usually no additional benefit to emergency department resuscitation in most cases.

2. CPR that is performed during patient packaging and transport is much less effective than CPR done at the scene. Additionally, EMS providers risk physical injury while attempting to perform CPR in a moving ambulance while unrestrained. In addition, continuing resuscitation in futile cases places other motorists and pedestrians at risk, increases the time that EMS crews are not available for another call, impedes emergency department care of other patients, and incurs unnecessary hospital charges. Lastly, return of spontaneous circulation is dependent on a focused, timely resuscitation. The patient in arrest should be treated as expeditiously including quality, uninterrupted CPR and timely defibrillation as indicated.

3. When cardiac arrest resuscitation becomes futile, the patient’s family should become the focus of the EMS providers. Families need to be informed of what is being done, and transporting all cardiac arrest patients to the hospital is not supported by evidence and inconveniences the grieving family by requiring a trip to the hospital where they must begin grieving in an unfamiliar setting. Most families understand the futility of the situation and are accepting of ceasing resuscitation efforts in the field.

Patient Presentation:
Patient in cardiac arrest.

Inclusion Criteria

1. Any cardiac arrest patient that has received resuscitation in the field but has not responded to treatment.

2. When resuscitation has begun and it is found that the patient has a DNR order or other actionable medical order (POLST/MOLST, etc. form)

Exclusion Criteria

Consider continuing resuscitation and transporting patients with the following conditions (although under certain circumstances, a medical control physician may order termination of resuscitation in these conditions also):

1. Cardiac arrest associated with medical conditions that may have a better outcome despite prolonged resuscitation, including:
   a. Hypothermia
   b. Near-drowning
   c. Lightning strike
d. Electrocution  
e. Drug overdose  
f. Cardiac arrest in infants and children  
g. Cardiac arrest in a public place  

**Patient Management:**  
Resuscitation may/should be terminated under the following circumstance:  

1. Non-traumatic Arrest  
   a. Patient must be least 18 years of age.  
   b. Patient is in cardiac arrest at the time of arrival of advanced life support  
      i. No pulse  
      ii. No respirations  
      iii. No evidence of meaningful cardiac activity (e.g. no heart sounds, asystole or wide complex PEA <60)  
   c. Advanced life support resuscitation is administered for at least 20 minutes  
   d. There is no return of spontaneous pulse and no evidence of neurological function (non-reactive pupils, no response to pain, no spontaneous movement).  
   e. No evidence or suspicion of any of the following:  
      i. Drug/toxin overdose  
      ii. Hypothermia  
      iii. Active internal bleeding  
      iv. Preceding trauma.  
   f. All EMS personnel involved in the patient’s care agree that discontinuation of the resuscitation is appropriate.  

2. Traumatic Arrest  
   a. Patient must be least 18 years of age.  
   b. Resuscitation efforts may be terminated in any blunt trauma patient who, based on thorough primary assessment, is found apneic, pulseless, and asystolic on ECG upon arrival of emergency medical services at the scene.  
   c. Victims of penetrating trauma found apneic and pulseless by EMS, should be rapidly assessed for the presence of other signs of life, such as pupillary reflexes, spontaneous movement, response to pain and electrical activity on ECG.  
      i. Resuscitation may be terminated with online medical direction if these signs of life are absent.  
      ii. If resuscitation is not terminated, transport is indicated.  
   d. Cardiopulmonary arrest patients in whom mechanism of injury does not correlate with clinical condition, suggesting a non-traumatic cause of arrest, should have standard ALS resuscitation initiated.  
   e. Resuscitation may be terminated for other traumatic circumstances by online medical direction with a physician.  
   f. All EMS personnel involved in the patient’s care agree that discontinuation of the resuscitation is appropriate.
Assessment
1. Pulse
2. Respirations
3. Neurologic status (purposeful movement, pupillary response)
4. Cardiac activity (including electrocardiography, cardiac auscultation and/or ultrasonography)
5. Quantitative capnography

Treatment and Interventions
1. Focus on continuous, quality CPR that is initiated as soon as possible
2. Focus attention on the family and/or bystanders. Explain the rationale for termination
3. Consider support for family members such as other family, friends, clergy, faith leader, or chaplain

Patient Safety Considerations:
1. All patients who are found in ventricular fibrillation or whose rhythm changes to ventricular fibrillation should in general have full resuscitation continued and transported.
2. Patients who arrest after arrival of EMS should be transported.

Notes / Educational Pearls:
1. Remote or wilderness situations, EMS providers should make every effort to contact medical control, but resuscitation may be terminated in the field without medical command when the following have occurred:
   a. There has been no return of pulse despite >30 minutes of CPR (This does not apply in the case of hypothermia)
   b. EMS providers are exhausted and it is physically impossible to continue the resuscitation
2. Logistical factors should be considered, such as collapse in a public place, family wishes, and safety of the crew and public.
3. Survival and functional neurologic outcomes are unlikely if ROSC is not obtained by EMS. It is dangerous to crew, pedestrians, and other motorists to attempt to resuscitate a patient during ambulance transport.
4. Quantitative end-tidal carbon dioxide measurements of less than 10 mmHg or falling >25% despite resuscitation indicates a poor prognosis and provide additional support for termination.

Key Documentation Elements
1. All items listed under patient management must be clearly documented in the EMS patient care report in addition to the assessment findings supporting this medical decision making.
2. If resuscitation is continued for special circumstance or despite satisfying the criteria in this guideline, the rationale for such decision making must be documented.

Performance Measures (Process, Structure, and Outcomes)
Process
1. Time to CPR
2. Time to AED application if applicable
3. Review of CPR quality
4. Assurance of appropriateness of transport and CPR during transport

**Structure**
None

**Outcomes**
None

**References:**

5. AHA/ACLS/ILCOR 2010

**Version/Revision Dates:**
February 28, 2014
Pediatric Specific Guidelines
Prehospital Airway Management of Children

**Patient Care Goals:**
1. To provide effective oxygenation and ventilation in children
2. To recognize and alleviate respiratory distress
3. To provide necessary interventions quickly and safely to children with the need for respiratory support

**Patient Presentation:**

**Inclusion Criteria**
1. Children with signs of respiratory distress/respiratory failure
2. Children with evidence of hypoxemia or hypoventilation

**Exclusion Criteria**
1. Patients with tracheostomies
2. Chronically ventilated patients
3. Newborn patients

**Patient Management:**

**Assessment**
1. History: Assess for
   a. Time of onset of symptoms
   b. Associated symptoms
   c. History of asthma or other breathing disorders
   d. Choking or other evidence of upper airway obstruction
   e. History of trauma

2. Physical Examination: Assess for
   a. Shortness of breath
   b. Abnormal respiratory rate and/or effort
   c. Use of accessory muscles
   d. Quality of air exchange
   e. Wheezing, rhonchi, rales, or stridor
   f. Cough
   g. Abnormal color (cyanosis or pallor)
   h. Abnormal mental status
   i. Evidence of hypoxemia

**Treatment and Interventions**

1. Non-Invasive Ventilation Techniques
a. Use continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP), intermittent positive pressure breathing (IPPB), humidified high-flow nasal cannula (HFNC), and/or bilevel nasal CPAP for severe respiratory distress or impending respiratory failure
b. Use bag-valve mask (BVM) ventilation in the setting of respiratory failure or arrest

2. Oropharyngeal Airways (OPA) and Nasopharyngeal Airways (NPA)
   a. Consider the addition of an OPA and/or NPA to make BVM more effective, especially in patients with altered mental status

3. Supraglottic Invasive Airways
   a. Consider the use of a Laryngeal Mask Airway (LMA) or King Laryngeal Tube (KLT) if BVM is not effective in maintaining oxygenation and/or ventilation

4. Endotracheal Intubation
   a. When less-invasive methods are ineffective or prolonged transport time would make BVM not feasible, use endotracheal intubation to maintain oxygenation and/or ventilation
   b. Other indications may include potential airway obstructions, severe burns, multiple traumatic injuries, altered mental status or loss of normal protective airway reflexes
   c. Monitor clinical signs, pulse oximetry, and capnography for the intubated patient

Patient safety considerations
1. Avoid excessive pressures or volumes during BVM
2. Avoid endotracheal intubation, unless less invasive methods fail, since it can be associated with aspiration, oral trauma, worsening of cervical spine trauma, malposition of the ET tube (mainstem intubation, esophageal intubation), or adverse effects of sedation. Once a successful intubation has been performed, obstruction or displacement of the ET tube can have further deleterious effects on patient outcome
3. Providers who do not routinely use medications for rapid sequence intubation (RSI) should not use it on children, since the loss of airway protection with the use of RSI may increase complications

Notes/Educational Pearls:

Key Considerations
1. Note on History
   A 2005 study by Edil et al underscores the importance of the pediatric airway in prehospital trauma management. Patients with prehospital intubation or respiratory compromise were more likely to die, and had an Injury Severity Score three times higher than patients without respiratory compromise. In trauma, prehospital management of pediatric airway problems and chest trauma are most likely to be inappropriate. When compared to the management of adults with cardiac arrest, paramedics are less likely to attempt endotracheal intubation in children with cardiac arrest. Further, paramedics are more likely to be unsuccessful when intubating children in cardiac arrest and complications such as malposition of the ET tube or aspiration can be nearly three times as common in children when compared to adults.

2. Note on Exam
End-tidal carbon dioxide (ETCO2) is an important adjunct in the monitoring of patients with respiratory distress, respiratory failure, and those treated with positive pressure ventilation, particularly endotracheal intubation.

3. CPAP, BiPAP, IBBP, HFNC
   a. Contraindications to these non-invasive ventilator techniques include intolerance of the device, increased secretions inhibiting a proper seal, or recent gastrointestinal and/or airway surgery

4. Bag-Valve Mask:
   a. Appropriately-sized masks should completely cover the nose and mouth and maintain an effective seal around the cheeks and chin
   b. Ventilation should be delivered with only sufficient volume to achieve chest rise
   c. Ventilating breaths should be delivered over one second, with a two second pause between breaths (20 breaths/minute)

5. Orotracheal intubation
   a. Endotracheal tubes sizes

<table>
<thead>
<tr>
<th>Age</th>
<th>Size (mm) – Uncuffed</th>
<th>Size (mm) – Cuffed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Term to 3 months</td>
<td>3.0</td>
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<tr>
<td>3-7 months</td>
<td>3.5</td>
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<tr>
<td>7-15 months</td>
<td>4.0</td>
<td>3.5</td>
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<tr>
<td>15-24 months</td>
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</table>
   | 2-15 years           | \[
   \text{age(yr)}/4\]+4 |
   |                      | \[
   \text{age(yr)}/4\]+3.5 |

   b. Successful ET placement is confirmed by bilateral chest rise, bilateral breath sounds, maintenance of oxygenation, end-tidal CO2 return (colorimetric change or quantitative assessment), or mist visualized in the tube.
   c. Ongoing education and hands-on practice is essential to maintain skills, especially since pediatric intubation is an infrequently utilized skill for many prehospital providers
   d. Video laryngoscopy may be helpful, if available, to assist with endotracheal intubation

**Pertinent Assessment Findings**
1. Ongoing assessment is critical in children with an airway device
2. Acute worsening of respiratory status or evidence of hypoxemia is can be secondary to displacement or obstruction of the airway device, pneumothorax or equipment failure

**Quality Improvement:**

**Key Documentation Elements**
1. Initial vital signs and physical exam
2. Interventions attempted including the method of airway intervention, the size of equipment used, and the number of attempts to achieve a successful result
3. Subsequent vital signs and physical exam to assess for change after the interventions
Performance Measures (Process, Structure and Outcomes)
Pediatric airway management is a skill that requires significant training and practice for both initial and ongoing competency. The following should be recorded for prehospital providers to ensure that competencies are maintained:

Process
1. Airway management events
2. Overall intubation attempts
3. Successful intubation attempts

Structure
1. Airway skills training

Outcomes
1. Mortality
2. Survival to hospital discharge

References:


**Version/Revision Dates**
March 16, 2014
Apparent Life Threatening Event (ALTE)

**Patient Care Goals:**
1. To recognize patient characteristics and symptoms consistent with an ALTE
2. To promptly identify and intervene for patients who require escalation of care
3. To choose proper destination of transport of patient

**Patient Presentation:**

**Inclusion Criteria**
Suspected ALTE: A patient with an episode that is frightening to the observer with some combination of the following:
1. Apnea (central or obstructive)
2. Color change (usually cyanosis or pallor)
3. Marked change in muscle tone (flaccid or rigid)

**Exclusion Criteria**
1. > 12 months
2. Presumed underlying cause that includes one of the following:
   a. Seizure
   b. Respiratory distress
   c. Cardiopulmonary arrest
   d. Trauma with known mechanism of injury

**Patient Management:**

**Assessment**
1. History
   a. History and circumstances associated with event of symptoms
   b. History of color change (including cyanosis and/or pallor), irregular breathing or change in muscle tone
   c. Concurrent symptoms (fever, cough, rhinorrhea, vomiting, diarrhea, rash, labored breathing)
   d. Prior history of ALTE, prior ALTE event in last 24 hours
   e. Family history of SIDS
   f. Treatment and Interventions performed (resuscitation attempts at home)
   g. History of premature birth before 37 weeks gestation
   h. Past medical history (cardiac, neurologic, respiratory, or chromosomal anomalies)
   i. History of gastroesophageal reflux
2. Exam
   a. Full set of vital signs (T, BP, RR, P, O2 sat)
   b. Signs of respiratory distress (grunting, nasal flaring, retracting)
   c. Color (pallor, cyanosis, normal)
   d. Mental status (alert, tired, lethargic, unresponsive, irritability)
   e. Physical exam for external signs of trauma
**Treatment and Interventions**

1. **Monitoring**
   a. Place on cardiac monitor
   b. Pulse oximetry should be routinely used as an adjunct to other monitoring

2. **Airway**
   a. Give supplemental oxygen for signs of respiratory distress or hypoxemia. Escalate from a nasal cannula to a simple face mask to a non-rebreather mask as needed, in order to maintain normal oxygenation
   b. Suction the nose and/or mouth (via bulb, suction catheter) if excessive secretions are present.

3. **Utility of IV Placement and Fluids**
   IVs should only be placed in children for clinical concerns of shock, or when administering IV medications

4. **Advanced Airway Management**
   a. If apnea persists, initiate bag-valve-mask ventilation.
   b. Supraglottic devices and intubation should be utilized only if bag-valve-mask ventilation fails in setting of respiratory failure or apnea. The airway should be managed in the least invasive way possible

**Patient Safety Considerations**

1. Routine use of lights and sirens (Code 3 transport) is not recommended during transport

2. **Destination Considerations**
   a. Consider transport to a facility with pediatric critical care capability for patients with history of cyanosis, past medical history, resuscitation attempt by caregiver, or more than one ALTE in 24 hours
   b. Given possible need for intervention, all patients should be transported to facilities with baseline readiness to care for children

**Notes/Educational Pearls:**

**Key Considerations**

1. ALTE is a group of symptoms, not a disease process
2. As many as 10% of patients will require ED or hospital intervention
3. Determine severity, duration, and nature of event
4. All patients should be transported
5. Contact medical control if parent/guardian is refusing medical care and/or transport

**Pertinent Assessment Findings**

1. Assess for irritability (cries with minimal provocation)
2. Look for external signs of trauma

**Quality Improvement:**

**Key Documentation Elements**

1. Document key aspect of history
a. Color change  
b. Apnea  
c. Change in muscle tone  
d. Caregiver resuscitation efforts  
e. History of prematurity  
f. Prior ALTE events  
g. Past medical history  

2. Document key aspects of the exam to assess for a change after each intervention:  
a. Respiratory rate and effort  
b. Oxygen saturation  
c. Air entry  
d. Mental status, presence of irritability  
e. Color  

Performance Measures (Process, Structure, and Outcomes)  

Process  
1. Prehospital on-scene time  
2. Prehospital transport time  
3. IV/IO placement  
4. Appropriate transport destination  

Structure  
None  

Outcomes  
None  

References:  


Version/Revision Dates:
March 15, 2014
Pediatric Respiratory Distress (Asthma)

Patient Care Goals:
1. To alleviate respiratory distress
2. To promptly identify and intervene for patients who require escalation of therapy
3. To deliver appropriate therapy by differentiating other causes of pediatric respiratory distress

Patient Presentation:
Inclusion Criteria
Presumed asthma in children ≥2 years of age. (History of recurrent wheezing that improves with beta-agonist inhalers/nebulizers such as albuterol or levalbuterol)

Exclusion Criteria
Presumed underlying cause that includes one of the following:
1. Anaphylaxis
2. Bronchiolitis (wheezing <2 years of age)
3. Croup
4. Epiglottitis
5. Foreign body aspiration
6. Submersion/drowning

Patient Management:
Assessment
1. History
   a. Onset of symptoms
   b. Concurrent symptoms (fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, foreign body aspiration)
   c. Usual triggers of symptoms (cigarette smoke, change in weather, upper respiratory infections)
   d. Sick contacts
   e. Treatments given
   f. Number of emergency department visits in the past year
   g. Number of admissions in the past year
   h. Number of ICU admissions ever
   i. Family history of asthma, eczema, or allergies
2. Exam
   a. Full set of vital signs (T, BP, RR, P, O2 sat)
   b. Air entry (normal vs. diminished)
   c. Breath sounds (wheeze, crackles, rales, rhonchi, diminished, clear)
   d. Signs of distress (grunting, nasal flaring, retracting, stridor)
   e. Inability to speak full sentences (sign of shortness of breath)
   f. Color (pallor, cyanosis, normal)
   g. Mental status (alert, tired, lethargic, unresponsive)

Treatment and Interventions
1. Monitoring
   a. Pulse oximetry and end-tidal CO\(_2\) (ETCO\(_2\)) should be routinely used as an adjunct to other forms of respiratory monitoring. (Strong recommendation, Low quality evidence)
   b. Check an electrocardiogram (EKG) only if there are no signs of clinical improvement after treating respiratory distress. (Weak recommendation, Very low quality evidence)

2. Airway
   a. Give supplemental oxygen. Escalate from a nasal cannula to a simple face mask to a non-breather mask as needed, in order to maintain normal oxygenation. (Strong recommendation, Very low quality evidence)
   b. Suction the nose and/or mouth (via bulb, Yankauer, suction catheter) if excessive secretions are present. (Strong recommendation, Very low quality evidence)

3. Inhaled Medications
   a. Albuterol 2.5 mg nebulized (or 6 puffs metered dose inhaler) should be administered to all children in respiratory distress with signs of bronchospasm (e.g. known asthmatics, quiet wheezers) either by basic life support (BLS) or advanced life support (ALS) providers. This medication should be repeated at this dose with unlimited frequency for ongoing distress. (Strong recommendation, Moderate quality evidence)
   b. Ipratropium 0.5 mg nebulized should be given up to 3 doses, in conjunction with albuterol. (Strong recommendation, Moderate quality evidence)

4. Utility of IV Placement and Fluids
   IVs should only be placed in children with respiratory distress when there are clinical concerns of dehydration, or when administering IV medications. (Weak recommendation, Very low quality evidence)

5. Steroids
   Methylprednisolone (2 mg/kg, max dose =125 mg) or dexamethasone (0.6 mg/kg, max dose = 16 mg) IV/IM/IO should be administered to children in respiratory distress with presumed asthma in the prehospital setting. Other steroids at equivalent doses, even given by the oral route, are also equally efficacious. (Strong recommendation, Moderate quality evidence)

6. Magnesium
   Magnesium sulfate (40 mg/kg IV, max dose of 2 grams) should be administered to children with presumed asthma in impending respiratory failure. (Strong recommendation, Moderate quality evidence)

7. Epinephrine
   Epinephrine (0.01 mg/kg of 1:1,000 IM/IV/SQ, max dose of 0.3 mg) should only be administered to children with impending respiratory failure as adjunctive therapy when there are no clinical signs of improvement. (Strong recommendation, Moderate quality evidence)

8. Improvement of Oxygenation and/or Respiratory Distress with Non-invasive Airway Adjuncts
   a. Continuous positive airway pressure (CPAP) for bronchospasm should be administered for severe respiratory distress. (Weak recommendation, Low quality evidence)
   b. Bag-valve-mask ventilation should be utilized in children with respiratory failure. (Strong recommendation, Moderate quality evidence)

9. Supraglottic Devices and Intubation
   Supraglottic devices and intubation should be utilized only if bag-valve-mask ventilation fails. The airway should be managed in the least invasive way possible. (Weak recommendation, Very low quality evidence)
**Patient Safety Considerations**
Routine use of lights and sirens (Code 3 transport) is not recommended during transport. *(Strong recommendation, Low quality evidence)*

**Notes/Educational Pearls:**

**Key Considerations**
1. Inhaled magnesium sulfate should not be administered to children in respiratory distress in the prehospital setting. *(Weak recommendation, Low quality evidence)*
2. Heliox should not be routinely administered to children with respiratory distress. *(Strong recommendation, Moderate quality evidence)*

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

**Quality Improvement:**

**Key Documentation Elements**
Document key aspects of the exam to assess for a change after each intervention:
1. Respiratory rate
2. Oxygen saturation
3. Use of accessory muscles
4. Breath sounds
5. Air entry
6. Mental status
7. Color

**Performance Measures (Process, Structure and Outcomes)**

**Process**
1. Prehospital on-scene time
2. Prehospital transport time
3. CPAP utilization
4. IV/IO placement
5. Time to administration of specified interventions in the protocol
6. Rate of administration of accepted therapy (whether or not certain medications/interventions were given)

**Structure**
None

**Outcome**
1. ED length of stay (LOS)
2. Hospital admission rate
3. LOS in ED observation unit
4. LOS in hospital
5. LOS in Pediatric Intensive Care Unit (PICU)
6. Change in vital signs (i.e. heart rate, blood pressure, temperature, respiratory rate, pulse oximeter, capnography values)
7. Time to administration of specified interventions in the protocol
8. Rate of administration of accepted therapy
9. Number of advanced airway attempts
10. Cost of hospital care
11. Knowledge retention of prehospital providers
12. Mortality

References:


dexamethasone compared with prednisolone for children with acute asthma. Pediatric Emergency Care, 23(8), 521-527.


42. Carroll, C. L., & Schramm, C. M. (2006). Noninvasive positive pressure ventilation for the


Version/Revision Date:
March 15, 2014
Pediatric Respiratory Distress (Bronchiolitis)

**Patient Care Goals:**
1. To alleviate respiratory distress
2. To promptly identify respiratory distress, failure, and/or arrest, and intervene for patients who require escalation of therapy
3. To deliver appropriate therapy by differentiating other causes of pediatric respiratory distress

**Patient Presentation:**

**Inclusion Criteria**
Child < age 2 with wheezing or diffuse rhonchi

**Exclusion Criteria**
1. Anaphylaxis
2. Croup
3. Epiglottitis
4. Foreign body aspiration
5. Submersion/drowning

**Patient Management:**

**Assessment**
1. History
   a. Onset of symptoms
   b. Concurrent symptoms (fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, foreign body aspiration)
   c. Sick contacts
   d. History of wheezing
   e. Treatments given
   f. Number of emergency department visits in the past year
   g. Number of admissions in the past year
   h. Number of ICU admissions ever
   i. History of prematurity
   j. Family history of asthma, eczema, or allergies
2. Exam
   a. Full set of vital signs (T, BP, RR, P, O2 saturation)
   b. Air entry (normal vs. diminished)
   c. Breath sounds (wheeze, crackles, rales, rhonchi, diminished, clear)
   d. Signs of distress (grunting, nasal flaring, retracting, stridor)
   e. Weak cry or inability to or speak full sentences (sign of shortness of breath)
   f. Color (pallor, cyanosis, normal)
   g. Mental status (alert, tired, lethargic, unresponsive)
   h. Hydration status (+/- sunken eyes, delayed capillary refill, mucus membranes moist vs. tacky, fontanel flat vs. sunken)
Treatment and Interventions
1. Pulse oximetry and end-tidal CO₂ (ETCO₂) should be routinely used as an adjunct to other forms of respiratory monitoring. (Strong recommendation, Low quality evidence)
2. Check an electrocardiogram (ECG) only if there are no signs of clinical improvement after treating respiratory distress (Weak recommendation, Very low quality evidence)
3. Airway
   a. Give supplemental oxygen. Escalate from a nasal cannula to a simple face mask to a non-breather mask as needed, in order to maintain normal oxygenation (Strong recommendation, Very low quality evidence)
   b. Suction the nose and/or mouth (via bulb, Yankauer®, or suction catheter) if excessive secretions are present
4. Inhaled Medications
   a. Insufficient data exist to recommend the use of inhaled steam
   b. Albuterol should be administered to all children in respiratory distress with signs of bronchospasm in the prehospital setting, either via nebulized route or metered-dose inhaler, by basic life support (BLS) or advanced life support (ALS) providers (Strong recommendation, Moderate quality evidence)
   c. Ipratropium and other anticholinergic agents should not be given to children with bronchiolitis in the prehospital setting
   d. Nebulized hypertonic saline should not be administered to children in respiratory distress in the prehospital setting (Weak recommendation, Low quality evidence)
   e. Nebulized epinephrine should be administered to children in severe respiratory distress with refractory bronchiolitis (e.g., coarse breath sounds) in the prehospital setting if other treatments (e.g., suctioning, oxygen, albuterol) fail to result in clinical improvement (Strong recommendation, Moderate quality evidence)
5. Utility of IV Placement and Fluids
   IVs should only be placed in children with respiratory distress for clinical concerns of dehydration, or when administering IV medications (Weak recommendation, Very low quality evidence)
6. Steroids
   Are generally not efficacious, and not given in the prehospital setting
7. Improvement of Oxygenation and/or Respiratory Distress with Non-invasive Airway Adjuncts
   a. Heliox
   b. Continuous positive airway pressure (CPAP) for bronchospasm should be administered for severe respiratory distress (Weak recommendation, Low quality evidence)
   c. Bag-Valve-Mask Ventilation should be utilized in children with respiratory failure (Strong recommendation, Moderate quality evidence)
8. Supraglottic Devices and Intubation
   Supraglottic devices and intubation should be utilized only if bag-valve-mask ventilation fails. The airway should be managed in the least invasive way possible (Weak recommendation, Very low quality evidence)

Patient Safety Considerations
Routine use of lights and sirens (Code 3 transport) is not recommended during transport (Strong recommendation, Low quality evidence)

Notes/Educational Pearls:
**Key Considerations**

1. Suctioning can be a very effective intervention to alleviate distress, since infants are obligate nose breathers.

**Pertinent Assessment Findings**

None

**Quality Improvement:**

**Key Documentation Elements**

Document key aspects of the exam to assess for a change after each intervention:

1. Respiratory rate
2. Oxygen saturation
3. Use of accessory muscles
4. Breath sounds
5. Air entry
6. Mental status
7. Color

**Performance Measures (Process, Structure, and Outcomes)**

**Process**

1. Prehospital on-scene time
2. Prehospital transport time
3. CPAP utilization
4. IV/IO placement
5. Time to administration of specified interventions in the protocol
6. Rate of administration of accepted therapy (whether or not certain medications/interventions were given)

**Structure**

None

**Outcome**

1. ED length of stay (LOS)
2. Hospital admission rate/ED Disposition
3. LOS in ED observation unit
4. LOS in hospital
5. LOS in Pediatric Intensive Care Unit (PICU)
6. Change in vital signs (i.e. heart rate, blood pressure, temperature, respiratory rate, pulse oximeter, capnography values)
7. Time to administration of specified interventions in the protocol
8. Rate of administration of accepted therapy
9. Number of advanced airway attempts  
10. Cost of hospital care  
11. Knowledge retention of prehospital providers  
12. Mortality

References:


**Version/Revision Dates:**
March 16, 2014
Pediatric Respiratory Distress (Croup)

**Patient Care Goals:**
1. To alleviate respiratory distress
2. To promptly identify respiratory distress, respiratory failure, and respiratory arrest, and intervene for patients who require escalation of therapy
3. To deliver appropriate therapy by differentiating other causes of pediatric respiratory distress

**Patient Presentation:**

**Inclusion Criteria**
Suspected Croup (history of stridor or history of barky cough)

**Exclusion Criteria**
Presumed underlying cause that includes one of the following:
1. Anaphylaxis
2. Asthma
3. Bronchiolitis (wheezing <2 years of age)
4. Foreign body aspiration
5. Submersion/drowning

**Patient Management:**

**Assessment**
1. History
   a. Onset of symptoms (history of choking)
   b. Concurrent symptoms (fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, foreign body aspiration)
   c. Sick contacts
   d. Treatments given
   e. Personal history of asthma, wheezing, or croup in past
2. Exam
   a. Full set of vital signs (T, BP, RR, P, O₂ sat)
   b. Presence of stridor at rest or when agitated
   c. Description of cough
   d. Other signs of distress (grunting, nasal flaring, retracting,)
   e. Color (pallor, cyanosis, normal)
   f. Mental status (alert, tired, lethargic, unresponsive)

**Treatment and Interventions**
1. Monitoring
   a. Pulse oximetry and end-tidal CO₂ (ETCO₂) should be routinely used as an adjunct to other forms of respiratory monitoring. *(Strong recommendation, Low quality evidence)*
   b. Check an electrocardiogram (EKG) only if there are no signs of clinical improvement after treating respiratory distress. *(Weak recommendation, Very low quality evidence)*
2. Airway
a. Give supplemental oxygen. Escalate from a nasal cannula to a simple face mask to a non-breather mask as needed, in order to maintain normal oxygenation.
b. Suction the nose and/or mouth (via bulb, Yankauer®, or suction catheter) if excessive secretions are present.

3. Inhaled Medications
   a. Epinephrine 5 mL of 1:10,000 (=0.5 mg) nebulized, should be administered by advanced life support (ALS) providers to all children in respiratory distress with signs of stridor at rest. This medication should be repeated at this dose with unlimited frequency for ongoing distress. (Strong recommendation, moderate quality evidence)
   b. Humidified oxygen or mist therapy is not indicated. (Weak recommendation, moderate quality evidence)

4. Medications
   Dexamethasone 0.15 to 0.6 mg/kg oral, IV, or IM to max dose of 8 mg should be administered to patients with suspected croup. (Weak recommendation, excellent quality evidence)

5. Utility of IV Placement and Fluids
   IVs should only be placed in children with respiratory distress for clinical concerns of dehydration, or when administering IV medications. (Weak recommendation, Very low quality evidence)

6. Improvement of Oxygenation and/or Respiratory Distress with Non-invasive Airway Adjuncts
   a. Heliox can be considered for severe distress not responsive to more than 2 doses of epinephrine. (Weak recommendation, low quality evidence)
   b. Continuous positive airway pressure (CPAP) should be administered for severe respiratory distress. (Weak recommendation, Low quality evidence)
   c. Bag-valve-mask ventilation should be utilized in children with respiratory failure. (Strong recommendation, Moderate quality evidence)

7. Supraglottic Devices and Intubation
   Supraglottic devices and intubation should be utilized only if bag-valve-mask ventilation fails. The airway should be managed in the least invasive way possible. (Weak recommendation, Very low quality evidence)

Patient Safety Considerations
1. Routine use of lights and sirens (Code 3 transport) is not recommended during transport. (Strong recommendation, Low quality evidence)
2. Patients who receive inhaled epinephrine should be transported to definitive care (Strong recommendation, moderate quality evidence)

Notes/Educational Pearls:
Key Considerations
1. Upper airway obstruction can have inspiratory, expiratory, or biphasic stridor
2. Foreign bodies can mimic croup, it is important to ask about a possible choking event
3. Impending respiratory failure is indicated by:
   a. Change in mental status such as fatigue and listlessness
   b. Pallor
   c. Dusky appearance
   d. Decreased retractions
   e. Decreased breath sounds with decreasing stridor
Pertinent Assessment Findings
Without stridor at rest or other evidence of respiratory distress, inhaled medications may not be necessary

Quality improvement:

Key Documentation Elements
Document key aspects of the exam to assess for a change after each intervention:
1. Respiratory rate
2. Oxygen saturation
3. Use of accessory muscles or tracheal tugging
4. Breath sounds
5. Air entry
6. Mental status
7. Color

Performance Measures (Process, Structure and Outcomes)

Process
1. Prehospital on-scene time
2. Prehospital transport time
3. CPAP utilization
4. IV/IO placement
5. Time to administration of specified interventions in the protocol
6. Frequency of administration of specified interventions in the protocol

Structure
None

Outcomes
None

References:


**Version/Revision Dates:**
March 16, 2014
Neonatal Resuscitation

Patient Care Goals:
1. Provide routine care to the newly born infant
2. Perform a neonatal assessment
3. Rapidly identify newly born infants requiring resuscitative efforts
4. Provide appropriate interventions to minimize distress in the newly born infant
5. Recognize the need for additional resources based on patient condition and/or environmental factors

Patient Presentation:

Inclusion Criteria
Newly born infants

Exclusion Criteria
Documented gestational age < 20 weeks (usually calculated by date of last menstrual period). If any doubt about accuracy of gestational age, initiate resuscitation

Patient Management:

Assessment
1. History
   a. Date and time of birth
   b. Onset of symptoms
   c. Prenatal history (prenatal care, substance abuse, multiple gestation, maternal illness)
   d. Birth history (maternal fever, presence of meconium, prolapsed or nuchal cord, maternal bleeding)
   e. Estimated gestational age (may be based on last menstrual period)
2. Exam
   a. Respiratory rate and effort (strong, weak, or absent; regular or irregular)
   b. Signs of respiratory distress (grunting, nasal flaring, retractions, gasping, apnea)
   c. Heart rate (fast, slow, or absent)
      i. precordium, umbilical stump or brachial pulse may be used. Umbilical stump is preferred for accuracy and ease of access.
   d. Muscle tone (poor or strong)
   e. Color/Appearance (central cyanosis, acrocyanosis, pallor, normal)
   f. APGAR score (appearance, pulse, grimace, activity, respiratory effort)
      i. May be calculated for documentation, but not necessary to guide resuscitative efforts
   g. Estimated gestational age (term, near term, premature)
   h. Pulse oximetry should be considered if prolonged resuscitative efforts
      i. Goal oxygen saturation at 10 minutes is 85-95%

Treatment and Interventions
1. Clamp and cut cord if still attached to mother
2. Warm, dry, and stimulate
a. Wrap infant in dry towel or thermal blanket to keep infant as warm as possible during resuscitation; keep head covered if possible
b. If strong cry, regular respiratory effort, good tone, and term gestation, infant should be placed skin-to-skin with mother and covered with dry linen
3. If weak cry, signs of respiratory distress, poor tone, or preterm gestation then position airway (sniffing position) and clear airway as needed
   a. If thick meconium or secretions present _and_ signs of respiratory distress, suction mouth then nose
4. If heart rate >100 beats per minute
   a. Monitor for central cyanosis
      i. Provide blow-by oxygen as needed
   b. Monitor for signs of respiratory distress
      i. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute
      ii. Consider endotracheal intubation as per local guidelines
5. If heart rate <100 beats per minute
   a. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute
      i. Primary indicator of effective ventilation is improvement in heart rate
      ii. Rates and volumes of ventilation required can be variable, only use the minimum necessary rate and volume to achieve chest rise and a change in heart rate
   b. If no improvement after 90 seconds change to oxygen source until heart rate normalizes
   c. Consider endotracheal intubation per local guidelines if bag-valve-mask ventilation is ineffective
6. If heart rate <60 beats per minute
   a. Ensure effective ventilations with supplementary oxygen and adequate chest rise
   b. If no improvement after 30 seconds, initiate chest compressions
      i. Two-thumb-encircling-hands technique is preferred
   c. Coordinate chest compressions with positive pressure ventilation (3:1 ratio, 90 compressions and 30 breaths per minute)
   d. Consider endotracheal intubation per local guidelines
   e. Contact medical control for online medical direction

**Patient Safety Considerations**
Hypothermia is common in newborns and worsens outcomes of nearly all post-natal complications. Ensure heat retention by drying the infant thoroughly, covering the head, and wrapping the baby in dry cloth. When it does not encumber necessary assessment or required interventions, “kangaroo care” (i.e. placing the infant skin-to-skin directly against mother’s chest and wrapping them together) is an effective warming technique

**Notes/Educational Pearls:**
**Key Considerations**
1. Approximately 10% of newly born infants require some assistance to begin breathing
2. Deliveries complicated by maternal bleeding (placenta previa, vas previa, or placental abruption) place the infant at risk for hypovolemia secondary to blood loss.
3. Low birth weight infants are at high risk for hypothermia due to heat loss.
4. If pulse oximetry is used as an adjunct, place probe in preductal location (right arm, preferably wrist or medial surface of the palm).
   a. Normalization of blood oxygen levels will not be achieved until approximately 10 minutes following birth.
5. Both hypoxia and excess oxygen administration can result in harm to the infant.
   a. Titrate oxygen to maintain a normal heart rate
   b. If prolonged oxygen use is required, titrate to maintain an oxygen saturation of 85-95%
6. While not ideal, a larger facemask than indicated for patient size may be used to provide bag-valve-mask ventilation.
   a. Avoid pressure over the eyes as this may result in bradycardia.
7. Increase in heart rate is the most reliable indicator of effective resuscitative efforts.
8. If arrest is thought to be due to cardiac etiology rather than respiratory, a compression-to-ventilation ratio of 15:2 should be considered.
9. A multiple gestation delivery may require additional resources and/or providers.

**Pertinent Assessment Findings**
1. It is difficult to determine gestational age in the field. If there is any doubt as to viability, resuscitation efforts should be initiated.
2. Acrocyanosis, a blue discoloration of the distal extremities, is a common finding in the newly born infant transitioning to extrauterine life. This must be differentiated from central cyanosis.

**Quality Improvement:**

**Key Documentation Elements**
1. Historical elements
   a. Prenatal complications
   b. Delivery complications
   c. Date and time of birth
   d. Estimated gestational age
2. Physical exam findings
   a. Heart rate
   b. Respiratory rate
   c. Respiratory effort
   d. Appearance
   e. APGAR score at 1 and 5 minutes

**Performance Measures (Process, Structure, and Outcomes)**

**Process**
1. Prehospital on-scene time
2. Call time for additional resources
3. Arrival time of additional unit
4. Prehospital transport time
5. Time to initiation of interventions
6. Use of oxygen during resuscitation
Structure
1. Number of response units on scene
2. Presence of advanced life support (ALS) versus basic life support (BLS) providers

Outcome
1. ROSC and/or normalization of heart rate
2. Length of stay in neonatal intensive care unit
3. Length of stay in newborn nursery
4. Length of stay in hospital
5. Knowledge retention of prehospital providers
6. Number of advanced airway attempts
7. Mortality

References:

Version/Revision Dates:
March 16, 2014
Childbirth

**Patient Care Goals:**
Normal delivery and care of an infant once crowning is detected

**Patient Presentation:**

**Inclusion Criteria**
Imminent delivery with crowning

**Exclusion Criteria**
Obstetrical or gynecological emergency

**Patient Management:**

**Assessment:**
1. Signs of preeclampsia:
   a. Hypertension
   b. Nausea
   c. Vomiting
   d. Headache
   e. Vision changes
   f. Edema
2. Signs of imminent delivery:
   a. Contractions
   b. Urge to push
   c. Urge to move bowels
   d. Membrane rupture
   e. Bloody show

**Treatment and Interventions**
1. Delivery should be controlled so as to allow a slow controlled delivery of infant. This will prevent injury to mother and infant
2. Support infant’s head as needed
3. Check umbilical cord surrounding neck. If present, slip it over the head. If unable to free cord from neck, double clamp cord and cut between clamps
4. Suction the airway with a bulb syringe – mouth then nose
5. Grasping head with hand over ears, gently pull down to allow delivery of anterior shoulder
6. Gently pull up on head to allow delivery of posterior shoulder
7. Clamp cord two inches from abdomen with two clamps and cut cord between clamps
8. Record APGAR scores at one and five minutes
9. Placenta will deliver spontaneously, often within 5-15 minutes of infant. Do not force placenta to deliver. Contain all tissue in plastic bag and transport
10. After delivery, massaging uterus and allowing infant to nurse will promote uterine contraction and help control bleeding

**Patient Safety Considerations**
1. If supine hypotension syndrome occurs, place the mother in the lateral recumbent position
2. Newborns are very slippery, take care not to drop the infant
3. Do not pull on the umbilical cord while the placenta is delivering.
4. If possible, transport between deliveries if mother is expecting twins

**Notes/Educational Pearls:**
1. OB assessment:
   a. Length of pregnancy
   b. Number of pregnancies
   c. Number of viable births
   d. Number of non-viable births
   e. Last menstrual period
   f. Due date
   g. Prenatal care
   h. Number of expected babies
   i. Drug use
2. Notify medical control if:
   a. Prepartum hemorrhage
   b. Postpartum hemorrhage
   c. Breech presentation
   d. Limb presentation
   e. Nuchal cord
   f. Prolapsed cord
3. Some bleeding is normal with any childbirth. Large quantities of blood or free bleeding are abnormal

**Quality Improvement:**
**Key Documentation Elements**
Document all times (delivery, contraction frequency and length)

**Performance Measures (Process, Structure, and Outcomes)**
None

**References:**
None

**Version/Revision Dates:**
February 28, 2014
Nausea/Vomiting

**Patient Care Goals:**
Decrease discomfort secondary to nausea and vomiting

**Patient Presentation:**

- **Inclusion criteria**
  Currently nauseated and/or vomiting

- **Exclusion Criteria**
  None

**Patient Management:**

**Assessment**
1. Routine patient care (vital signs)
2. History and physical examination focused on potential causes of nausea and vomiting (gastrointestinal, cardiovascular, gynecologic, pharmacologic, etc.)

**Treatment and Interventions**
1. Anti-emetic medication administration:
   a. Ondansetron (Zofran®) 4mg IV/PO, or sublingual
      i. For children between 6 m/o – 14 y/o:
         ii. Ondansetron 0.15 mg/kg IV/PO (maximum dose of 4 mg)
   b. Prochlorperazine 5 mg IV/IM,
   c. Metoclopramide 10 mg IV/IM
   d. May repeat x 1 in 20-30 minutes if no relief
2. Consider NS bolus of 500 ml unless contraindicated (e.g. h/o CHF, renal failure).
   a. May repeat as indicated
   b. Consider 10-20 ml/kg IV fluid unless contraindicated

**Patient Safety Considerations**
Although less common then with other anti-emetics, dystonic and extrapyramidal symptoms are possible in response to ondansetron administration

**Notes/Educational Pearls:**

- **Key Considerations**
  1. IV form of ondansetron may be given PO in same dose
  2. For dystonia/akathesia induced by an anti-emetic provide diphenhydramine 25-50 mg IV/PO
     a. For children provide 1-2 mg/kg IV/PO
  3. Nausea and vomiting are symptoms of illness – in addition to treating the patient’s nausea and vomiting a through history and physical are key to identifying what may be a disease in need of emergent treatment (bowel obstruction, myocardial infarction, pregnancy)

**Pertinent Assessment Findings**
1. Vital Signs
2. Risk factors for heart disease/ECG is applicable
3. Pregnancy status
4. Abdominal exam

Quality Improvement:

Key Documentation Elements
1. Vital signs
2. History and physical in regards to etiology of nausea/vomiting
3. Vital sign and subjective response to interventions

Performance Measures (Process, Structure, and Outcomes)
None

References:

Version/Revision Dates:
February 28, 2014
Obstetrical/Gynecological Conditions

**Patient Care Goals:**
1. To recognize serious conditions associated with hemorrhage during pregnancy
2. Providing adequate resuscitation for hypovolemia

**Patient Presentation:**

**Inclusion Criteria**
1. Female patient with vaginal bleeding in any trimester
2. Female patient with pelvic pain or possible ectopic pregnancy
3. Female patient who has been victim of sexual assault

**Exclusion Criteria**
1. Childbirth and active labor [See Childbirth guideline]
2. Seizure related to pregnancy/eclampsia [See Seizures guideline]
3. Post-partum hemorrhage [See Childbirth guideline]

**Patient Management:**

**Assessment**
1. Obtain history
   a. Abdominal Pain – onset, duration, quality, radiation, provoking or relieving factors, associated symptoms (e.g. syncope, lightheadedness, nausea, vomiting, fever)
   b. Vaginal Bleeding – onset, duration, quantity (pads saturated), associated symptoms (e.g. syncope, lightheadedness)

2. Monitoring
   a. Monitor ECG if patient reports lightheadedness or if there is a history of syncope
   b. Monitor pulse oximetry if signs of hypotension or respiratory symptoms

3. Secondary survey pertinent to obstetric issues:
   a. Constitutional: vital signs, orthostatic vital signs, skin color
   b. Eyes: evaluate conjunctival color
   c. Abdomen: distention, tenderness
   d. Genitourinary: visible bleeding
   e. Neurologic: mental status

**Treatment and Interventions**
1. If signs of shock or orthostasis:
   a. Position patient supine and keep patient warm
   b. Volume resuscitation:
      Normal saline 1-2 liters IV/IO
   c. Reassess vital signs and response to fluid resuscitation

2. Disposition:
   Transport to closest appropriate receiving facility

**Patient Safety Considerations**
None
Notes/Educational Pearls:
  Key Considerations
    When dealing with victims of abuse or sexual assault...

Pertinent Assessment Findings
None

Quality Improvement:
  Key Documentation Elements
None

  Performance Measures (Process, Structure, and Outcomes)
None

References:
None

Version/Revision Dates:
February 28, 2014
Respiratory

Prehospital Airway Management/Confirmation/Obstruction/Failed Airway

**Patient Care Goals:**
1. To provide effective oxygenation and ventilation
2. To recognize and alleviate respiratory distress
3. To provide necessary interventions quickly and safely to patients with the need for respiratory support
4. To identify a potentially difficult airway in a timely fashion

**Patient Presentation:**

**Inclusion Criteria**
1. Patients with signs of respiratory distress/respiratory failure
2. Patients with evidence of hypoxemia or hypoventilation

**Exclusion Criteria**
1. Patients whom are able to be ventilated/oxygenated with supplemental oxygen alone
2. Patients with tracheostomies
3. Chronically ventilated patients
4. Newborn patients

**Patient Management:**

**Assessment**
1. History:
   a. Time of onset of symptoms
   b. Associated symptoms
   c. History of asthma or other breathing disorders
   d. Choking or other evidence of upper airway obstruction
   e. History of trauma
2. Physical Examination; Assess for:
   a. Shortness of breath
   b. Depth and equality of breath sounds
   c. Abnormal respiratory rate and/or effort
   d. Use of accessory muscles
   e. Quality of air exchange
   f. Wheezing, rhonchi, rales, or stridor
   g. Cough
   h. Abnormal color (cyanosis or pallor)
   i. Abnormal mental status
   j. Evidence of hypoxemia
   k. Assess for difficult airway
      i. Short jaw
      ii. Large tongue
iii. Obesity  
iv. Large tonsils  
v. Large neck  
vi. Facial distortion or excessive facial hair  

l. End-tidal carbon dioxide (ETCO$_2$) is an important adjunct in the monitoring of patients with respiratory distress, respiratory failure, and those treated with positive pressure ventilation, particularly endotracheal intubation.

**Treatment and Interventions**

1. Non-Invasive Ventilation Techniques  
   a. Supplemental oxygen (nasal cannula (NC), OxyMask®, Venturi mask, bag valve mask)  
   b. Continuous positive airway pressure (CPAP)  
   c. Bilevel positive airway pressure (BiPAP)  
   d. Intermittent positive pressure breathing (IPPB)  
   e. Oropharyngeal and nasopharyngeal airways

2. Invasive Ventilation Techniques  
   a. Supraglottic airways  
      i. Laryngeal mask airway (LMA)  
      ii. King® laryngeal tube (KLT)  
   b. Endotracheal tubes (ET)  
      i. Endotracheal intubation with direct laryngoscopy  
      ii. Fiberoptic-assisted endotracheal intubation

**Patient safety considerations**

1. Unrecognized respiratory distress or inadequate ventilation and oxygenation are associated with patient discomfort and additional morbidity and mortality.

2. Potential complications associated with airway interventions:  
   a. Pulmonary injury can occur with excessive pressures or volumes used during BVM.  
   b. Orotracheal intubation can be associated with aspiration, oral trauma, worsening of cervical spine trauma, malposition of the ET tube (main-stem intubation, esophageal intubation), or adverse effects of sedation.  
   c. Once a successful intubation has been performed, obstruction or displacement of the ET tube can have further deleterious effects on patient outcome.

**Notes/Educational Pearls:**

1. Patient approach prior to intubation:  
   a. Assemble and confirm that all of the anticipated equipment for intubation is available and operating properly (e.g. suction is working, the light on the laryngoscope blade is sufficiently bright for visualization) prior to an attempt at intubation.  
   b. Even with the most diligent and through patient assessment, the identification of a difficult airway in advance of an intubation attempt may not be 100% accurate.  
   c. With all airways, including the ones that are not anticipated to be difficult, always have a second plan for airway management in the event of a failure of the initial airway management plan.
2. Monitoring:
   a. In-line end tidal CO$_2$ detectors are useful for patients being ventilated by bag valve mask.
   b. For patients with long transport times from the field to the hospital, or for interfacility transport, endotracheal intubation may be reasonable management for the airway. Vigilant monitoring of clinical signs, pulse oximetry, and capnography are requisites for establishing and maintaining the intubated airway. The value of capnography as a means of verifying endotracheal tube position and proper ventilation is well-established.
   c. All EMS providers should be taught multiple methods of verification of endotracheal tube placement
   d. Continuous waveform capnography is the ideal method to verify endotracheal tube placement, monitor the patient’s ventilator status, and to assess circulatory perfusion. It is superior compared to colorimetric methods in non-perfusing or poorly perfusing patients.

3. Non-Invasive Ventilation Techniques:
   a. These techniques involve delivery of ventilator pressure and often oxygen, without the insertion of a pharyngeal device. Examples include:
      i. Continuous positive airway pressure (CPAP)
      ii. Bilevel positive airway pressure (BiPAP)
      iii. Intermittent positive pressure breathing (IPPB)
      iv. Humidified high-flow nasal cannula (HFNC)
      v. Bilevel nasal CPAP
   b. Non-invasive methods may be used to alleviate respiratory distress, or to treat respiratory failure.
      i. Be aware of aspiration risk, especially in patients with altered mental status.
      ii. Patients’ intolerance of the mask or nasal cannula, increased secretions, and recent gastrointestinal and/or airway surgery are contraindications to the use of non-invasive ventilatory techniques.

4. Bag Valve Mask:
   a. Appropriately-sized masks should completely cover the nose and mouth and maintain an effective seal around the cheeks and chin.
   b. Ventilation should be delivered with only sufficient volume to achieve chest rise.
   c. Bag valve mask ventilation (BVM), when used by the skilled provider is as effective in maintaining oxygenation and ventilation in most children when compared to oropharyngeal airways.
   d. Use ventilation bags, masks and ventilation with pressures and volumes that are appropriate for the patient’s size are critical to effective BVM ventilation.
   e. Oral or nasal airways can make BVM more effective in patients with altered mental status.

5. Orotracheal intubation
   a. Use appropriately sized ET tube.
   b. Successful ET placement is confirmed by bilateral chest rise, bilateral breath sounds, maintenance of oxygenation, end-tidal CO$_2$ return (colorimetric change or quantitative assessment), and mist visualized in the tube.
c. Though prehospital pediatric endotracheal intubation is considered a required standard for advanced life support, there is little evidence to support that this practice leads to better patient outcomes.

d. The depth of ETT insertion in centimeters is generally 3 times the size of the ETT. For example, a 4.0 mm ETT is inserted to 12 cm.

e. It is notable that in one of the largest retrospective studies of prehospital pediatric intubation, there was a low occurrence of unrecognized esophageal intubations. A single center study published in 1989 identified additional barriers to successful intubation, including selection of inappropriately small endotracheal tubes, non-visualization of the vocal folds, and accidental extubation in transport.

6. Additional pediatric considerations
   For several reasons, we recommend caution toward prehospital pediatric endotracheal intubation:
   a. The pediatric airway is smaller, more difficult to manage and more easily injured during the procedure.
   b. There is risk of unrecognized esophageal intubation and right main-stem bronchus intubation.
   c. Unsuccessful attempts are more common.
   d. Endotracheal intubation delays transport to the emergency department.
   e. Maintaining proficiency with pediatric endotracheal intubation is difficult, especially for advanced life support providers in rural areas, where pediatric intubation is rare. Educational interventions can help improve success rates, however duration of skill retention is unclear.
   f. Pediatric patients with prehospital intubation or respiratory compromise were more likely to die, and had an Injury Severity Score three times higher than patients without respiratory compromise.
   g. In trauma, prehospital management of pediatric airway problems and chest trauma are most likely to be inappropriate.
   h. Compared to adults, children are:
      I. Less likely to have endotracheal intubation attempts when in cardiac arrest.
      II. More likely to have unsuccessful intubation attempts in cardiac arrest
      III. Complications such as malpositioning of the ET tube or aspiration can be nearly three times as common.
   i. Endotracheal tubes sizes

<table>
<thead>
<tr>
<th>Age</th>
<th>Size (mm) – Uncuffed</th>
<th>Size (mm) – Cuffed</th>
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</thead>
<tbody>
<tr>
<td>Premature</td>
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<td></td>
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<tr>
<td>Term to 3 months</td>
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<td>3-7 months</td>
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<td>15-24 months</td>
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<td>2-15 years</td>
<td>[age(yr)/4]+4</td>
<td>[age(yr)/4]+3.5</td>
</tr>
</tbody>
</table>

7. Patients with long transport times from the field to the hospital, or for interfacility transport, endotracheal intubation may be reasonable management for the airway.
   a. Vigilant monitoring of clinical signs, pulse oximetry, and capnography are requisites for establishing and maintaining the intubated airway.
   b. The value of capnography as a means of verifying endotracheal tube position and proper ventilation is well-established.

8. Intervention selection
   a. These techniques have important advantages and limitations. The non-invasive techniques allow ventilation without risk of a displaced endotracheal tube or other pharyngeal device. In contrast with endotracheal intubation, there is less need for sedation and little need for muscle relaxants with non-invasive ventilation. Non-invasive methods may be used to alleviate respiratory distress, or to treat respiratory failure. Drawbacks include a persistent risk of aspiration, especially in patients with altered mental status. Patients’ intolerance of the mask or nasal cannula, increased secretions, and recent gastrointestinal and/or airway surgery are relative contraindications to the use of non-invasive ventilatory techniques.
   b. Some EMS agencies selectively employ nasotracheal intubation. A 2010 meta-analysis pooling pediatric and adult patient data compared nasal and oral endotracheal intubation. The investigators found nasal intubation attempts to be generally less successful than oral attempts. Some EMS agencies selectively employ nasotracheal intubation. We recommend against nasotracheal intubation.

9. Fiberoptic-assisted tracheal intubation
   The use of fiberoptic visualization of the airway, including the glottis, has been described as a means to verify endotracheal intubation performed via direct laryngoscopy, and as a means to perform primary endotracheal intubation. There are few data to support the use of fiberoptic imaging in children in the prehospital setting.

10. Airway selection
    a. Assistance with a BVM can make ventilation more effective in patients with altered mental status. Indications for ET intubation may include cardiopulmonary arrest, potential airway obstruction, severe burns, multiple traumatic injuries, severe head injury, altered mental status or loss of the normal protective airway reflexes. Laryngeal mask airways (LMA) provide a useful airway adjunct for oxygenation and ventilation. A randomized control trial comparing the LMA and endotracheal intubation for the management of respiratory failure in an infant human patient simulator found the LMA had more rapid establishment of effective ventilation and fewer complications than endotracheal intubation. Other work has shown the importance of educational interventions for the proper use of the LMA. An important limitation of LMAs is the relative lack of protection from aspiration of secretions and gastric contents.
    b. King® laryngeal airway devices have been used in prehospital pediatric airway management. This device has two lumens, one to occlude the esophagus and allow the insertion of a gastric tube, and a second to allow extraglottic ventilation and oxygenation. The King LT® (KLT) is passed blindly, and has an inflatable cuff. A 2012 study of the KLT compared to endotracheal intubation showed the KLT took a similar amount of time to insert, resulted in successful ventilation, and that paramedics preferred it to traditional endotracheal intubation.
11. Miscellaneous
The use of fiberoptic visualization of the airway, including the glottis, has been described as a means to verify endotracheal intubation performed via direct laryngoscopy, and as a means to perform primary endotracheal intubation. There are few data to support the use of fiberoptic imaging in children in the prehospital setting.

**Pertinent Assessment Findings**
1. Ongoing assessment is critical with an airway device.
2. In addition to ongoing patient evaluation, confirmation of tube placement is a dynamic process requiring ongoing assessment.
3. Acute worsening of respiratory status or evidence of hypoxemia is can be secondary to displacement or obstruction of the airway device, pneumothorax, or equipment failure.

**Quality Improvement:**
**Key Documentation Elements**
1. Initial vital signs and physical exam
2. Interventions attempted including the method of airway intervention, the size of equipment used, and the number of attempts, the result of said attempts.
3. Method of endotracheal tube placement confirmation with the number of times and frequency the placement was reassessed.
4. Subsequent vital signs and physical exam to assess for change after the interventions.

**Performance Measures (Process, Structure, and Outcomes)**
1. Airway management is a skill that requires significant training and practice for both initial and ongoing competency.
2. Airway skills training, airway management events, overall intubation attempts, and successful intubation attempts should be recorded for prehospital providers to ensure that competencies are maintained.
3. Documentation of capnography monitoring.

**References:**

**Version/Revision Dates:**
February 28, 2014
Bronchospasm / Obstructive Lung Disease

**Patient Care Goals:**
Patients with bronchospasm including asthma and chronic obstructive lung disease can be effectively treated in the prehospital setting. Patients with severe respiratory distress require support. Often the patient’s condition can be dramatically improved with oxygenation, bronchodilators, and supportive ventilation to reduce the work of breathing.

**Patient Presentation**

**Inclusion Criteria**
A patient with signs and symptoms of acute respiratory distress from bronchospasm or obstructive lung disease:

1. Symptoms/signs may include:
   a. Wheezing - will have expiratory wheezing unless they are unable to move adequate air to generate wheezes
   b. May have signs of respiratory infection (e.g. fever, nasal congestion, cough, sore throat)
   c. May have acute onset after inhaling irritant
2. This includes:
   a. Asthma exacerbation
   b. COPD exacerbation
   c. Wheezing from suspected pulmonary infection (e.g. pneumonia, acute bronchitis)

**Exclusion Criteria**
1. Respiratory distress secondary to trauma – Follow appropriate Trauma guideline
2. Respiratory distress secondary to congestive heart failure
3. Allergic reactions – Follow Allergic Reaction guideline
4. Suspected Croup – Follow Croup guideline

**Patient Management:**
Aggressive use of bronchodilators is generally the most important therapy for severe asthma exacerbation. Continuous reassessment is required as patient condition can deteriorate rapidly.

**Assessment**
1. Indications of obstructive physiology include:
   a. Wheezing
   b. Prolonged exhalation
   c. “Sharkfin” waveform on capnography

2. Indications of severe respiratory distress include:
   a. Apprehension, anxiety, combativeness
   b. Hypoxia, SpO2 < 90%
   c. Intercostal and/or subcostal retractions
d. Nasal flaring
e. Cyanosis
f. Use of accessory muscles

**Treatment and Interventions**
1. Nebulized bronchodilators – beta agonist and anticholinergic (e.g. albuterol, ipratropium)
2. Intravenous volume, isotonic crystalloid bolus if fever, infection, or signs of dehydration.
3. Non-invasive positive pressure ventilation (CPAP/BiPAP)
4. Steroids (i.e. methylprednisolone, prednisone, dexamethasone, hydrocortisone)
5. Magnesium sulfate IV push or infusion.
6. Epinephrine for severe distress (1:1,000 IM lateral thigh preferred or 1:10,000 IV/IO for impending cardiac arrest)
7. Endotracheal intubation for patient with severe distress not responding to other treatment

**Patient Safety Considerations**
1. WARNING: Endotracheal intubation should only be required in the most exceptional cases. Although sometimes needed, intubation further narrows the airway restriction in a severe asthma exacerbation, and this may worsen some cases.
2. Asthma and COPD patients do not do well when intubated, intubation can exacerbate distal air trapping. Hypotension or cardiovascular collapse in asthma and COPD patients undergoing positive pressure ventilation may be from air trapping or “auto-PEEP.” Patients should first be disconnected from ventilation and allowed spontaneously exhale (this can be augmented with manual compression).

**Notes/Educational Pearls:**
1. COPD patients not in respiratory distress should be given oxygen to maintain adequate O2 saturation (e.g. > 90%).
2. Nebulizer droplets can carry viral particles. If infection is a potential, additional personal protective equipment should be considered, including placing a surgical mask over the nebulizer to limit droplet spread.

**Key Documentation Elements**
1. Assessment of severity and work of breathing
2. Response to interventions
3. History of previous respiratory distress requiring intubation or ICU admission
4. Serial vital signs

**Performance Measures (Process, Structure, and Outcomes)**
References:


Version/Revision Dates:
February 28, 2014
Pulmonary Edema

Patient Care Goals:
To decreased respiratory distress and work of breathing while maintaining adequate oxygenation and perfusion. Supportive efforts are directed towards decreasing afterload and increasing preload.

Patient Presentation:

Inclusion Criteria
1. History of congestive heart failure (CHF)
2. History of pulmonary edema
3. Missed dialysis
4. Medical non-compliance (e.g. diuretic non-adherence)

Exclusion Criteria
1. Clinical impression consistent with infection (e.g. fever)
2. Clinical impression consistent with asthma/COPD

Patient Management:

Assessment
1. History
   a. Use of diuretics and compliance
   b. Weight gain
   c. Leg swelling
   d. Orthopnea
2. Exam
   a. Breath sounds – crackles/rales
   b. Lower extremity edema
   c. JVD
   d. Cough and/or productive cough with pink/frothy sputum
   e. Diaphoresis
   f. Chest discomfort
   g. Hypotension,
   h. Shock
   i. Respiratory distress, assess:
      i. Patient’s ability to speak in full sentences
      ii. Respiratory accessory muscle use

Treatment and Interventions
1. Manage airway as necessary
2. Provide supplemental O₂ as needed to maintain O₂ saturation > 94%
3. Initiate monitoring and perform 12-lead EKG
4. Establish IV/IO access
5. Nitroglycerin 0.4 mg SL, can repeat q 5 min as long as SBP > 100
6. CPAP/BiPAP
7. Consider advanced airway for severe distress or if not improving with less invasive support
8. If suspect high altitude pulmonary edema, follow Altitude Illness guideline

Notes/Educational Pearls:
1. Differential:
   a. MI
   b. CHF
   c. Asthma
   d. Anaphylaxis
   e. Aspiration
   f. COPD
   g. Pleural effusion
   h. Pneumonia
   i. PE
   j. Pericardial tamponade
   k. Toxin exposure
2. Non-Invasive Positive Pressure Ventilation:
   a. Contraindications:
      i. Hypoventilation
      ii. Altered level of consciousness
      iii. Airway compromise
      iv. Aspiration risk
      v. Pneumothorax
      vi. Facial trauma/burns
      vii. Systolic BP < 90 mmHg
      viii. Recent oropharyngeal/tracheal/bronchial surgery
   b. Benefits:
      i. Increased oxygenation and perfusion by reducing work of breathing
      ii. Maintaining inflation of atelectic alveoli
      iii. Improving pulmonary compliance
      iv. Decreases respiratory rate and the work of breathing, HR, and SBP
      v. Improves delivery of bronchodilators
      vi. Reduces preload and afterload, improving cardiac output
   c. Complications:
      i. Most common is anxiety
      ii. Theoretical risk of hypotension and pneumothorax as NIPPV increases intrathoracic pressure which decreases venous return and cardiac output
      iii. Sinusitis
      iv. Skin abrasions
      v. Conjunctivitis – minimized with proper size mask,
      vi. Potential for barotrauma - pneumothorax or pneumomediastinum (rare)
3. Allow patient to remain in position of comfort. Patients may decompensate if forced to lie down.
4. CHF is a common cause of pulmonary edema. Other causes include:
   a. Medications
b. High altitude exposure
c. Kidney failure
d. Lung damage caused by gases or severe infection
e. Major injury

5. Avoid nitroglycerin in patients who have taken Viagra® in the last 24 hours, or Cialis® or Levitra® in the last 72 hours. Nitroglycerin reduces left ventricular (LV) filling pressure primarily via venous dilation. At higher doses the drug variably lowers systemic afterload and increases stroke volume and cardiac output. Although some have advocated early use of ACE inhibitor in patients with acute decompensated heart failure, we do not recommend this approach. There are limited data on the safety and efficacy of initiating new ACE inhibitor or angiotensin receptor blockers (ARB) therapy in the early phase of therapy of acute decompensated heart failure (i.e. the first 12 to 24 hours)

Quality Improvement:

Key Documentation Elements
None

Performance Measures (Process, Structure, and Outcomes)
1. Time to NIPPV
2. Number of CPAP/BiPAP who require intubation
3. Time to clinical improvement
4. Assessment/auscultation of lung sounds before and after each intervention

References:

**Version/Revision Dates:**
February 28, 2014
Trauma

General Trauma Management

**Patient Care Goals:**
1. Rapid assessment and management of life-threatening injuries
2. Safe movement of patient to prevent worsening injury severity
3. Rapid and safe transport to the appropriate level of trauma care

**Patient Presentation:**

**Inclusion Criteria**
Patients of all ages who have sustained an injury as a result of mechanical trauma. This includes both blunt and penetrating injury as well as burns.

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Assess scene safety: evaluate for hazards to EMS personnel, patient, bystanders
   a. Determine number of patients
   b. Determine mechanism of injury
   c. Request additional resources if needed. Weigh the benefits of waiting for additional resources against rapid transport to definitive care.
   d. Consider declaration of mass casualty incident if needed
2. Use appropriate personal protective equipment
3. Primary survey
   a. Airway
      i. Assess airway patency, ask patient to talk to assess stridor and ease of air movement
      ii. Look for injuries that may lead to airway obstruction including unstable facial fractures, expanding neck hematoma, blood or vomitus in the airway, facial burns/inhalation injury
      iii. Evaluate mental status for ability to protect airway (GCS< 8 likely to require airway protection)
   b. Breathing
      i. Assess respiratory rate and pattern
      ii. Listen bilaterally on lateral chest wall for breath sounds
   c. Circulation
      i. Look for evidence of external hemorrhage
      ii. Assess blood pressure and heart rate
      iii. Signs of hemorrhagic shock include: tachycardia, pale, cool clammy skin, capillary refill > 2 sec
   d. Disability
i. Assess level of consciousness / mental status (GCS or AVPU)
ii. Assess gross motor movement of extremities
iii. Evaluate for clinical signs of traumatic brain injury with herniation including: unequal pupils, lateralizing motor signs or posturing
e. Exposure
   i. Rapid evaluation of entire body to identify sites of penetrating wounds or other blunt injuries. Be sure to roll patient and view back
   ii. Prevent hypothermia

**Treatment and Interventions**

1. **Airway**
   a. Establish patent airway with cervical spine precautions per Airway Management guideline and Selective Spinal Immobilization guideline.
   b. If respiratory efforts inadequate, assist with bag-mask ventilation, consider airway adjuncts
   c. If impending airway obstruction or altered mental status resulting in inability to maintain airway patency, secure definitive airway

2. **Breathing**
   a. If absent or diminished breath sounds in a hypotensive patient consider tension pneumothorax, perform needle decompression
   b. For open chest wound, place semi-occlusive dressing
   c. Monitor oxygen saturation, provide supplemental oxygen

3. **Circulation**
   a. Control external hemorrhage with direct pressure or a tourniquet for major extremity hemorrhage (see Extremity Trauma / External Hemorrhage Management guideline)
   b. If pelvis unstable, place pelvic binder or sheet to stabilize pelvis
   c. Establish IV/IO access
   d. **Fluid Resuscitation**
      i. **Adults**
         1. If SBP <90 mmHg or HR >120 (or loss of radial pulse), give bolus of 1 liter crystalloid solution and reassess.
         2. For adult patients with penetrating trauma target SBP 90mmHg (or palpable radial pulse).
         3. For adult patients with head injury, target SBP 110-120. Hypotension should be avoided to maintain cerebral perfusion
      ii. **Pediatrics**
         If SBP low for age, provide 20ml/kg crystalloid bolus and reassess

4. **Disability**
   If clinical signs of traumatic brain injury, see Head Injury guideline

5. **Exposure**
   Avoid hypothermia. Remove wet clothing. Cover patient to prevent further heat loss
Note that patients with major hemorrhage, hemodynamic instability, penetrating torso trauma, or signs of traumatic brain injury often require rapid surgical intervention. Minimize scene time (goal 10 minutes or less) and initiate rapid transport to a trauma center.

Decisions regarding destination and transport modality should be based on field triage criteria that includes anatomic, physiologic, and situational components (e.g. the CDC Field Triage Guidelines for Trauma Patients [below]). These field triage criteria risk-stratify injury severity and guide these decisions.

**Secondary Assessment, Treatment and Interventions**

1. Assessment
   a. Obtain medical history from patient or family including:
      i. Allergies
      ii. Medications
      iii. Past medical and surgical history
      iv. Events leading up to the injury
   b. Secondary Survey: Head to toe physical exam
      i. Head
         1. Palpate head and scalp and face and evaluate for soft tissue injury or bony crepitus
         2. Assess pupils
      ii. Neck
         1. Check for:
            a. Contusions
            b. Abrasions
            c. Hematomas
            d. JVD
         2. Palpate for crepitus
         3. Evaluate for spinal tenderness
      iii. Chest
         1. Palpate for instability/crepitus
         2. Listen to breath sounds
         3. Inspect for penetrating or soft tissue injuries
      iv. Abdomen
         1. Palpate for tenderness
         2. Inspect for penetrating or soft tissue injuries
      v. Pelvis
         1. Inspect for penetrating or soft tissue injuries
         2. Palpate once for instability by gentle AP pressure with the heels of the hands on the symphysis pubis and then medial pressure at the iliac crests bilaterally
      vi. Back
         1. Log roll patient to maintain spinal alignment
2. Inspect for penetrating or soft tissue injuries
3. Palpate for spinal tenderness

vii. Neurologic exam
1. Serial assessment of mental status
2. Gross exam of motor strength all four extremities

viii. Extremities
1. Assess for fracture/deformity
2. Assess peripheral pulses/capillary refill

c. Additional treatment considerations
i. Maintain spine precautions as per Selective Spinal Immobilization guideline
ii. Splint obvious extremity fractures as per Extremity Trauma/External Hemorrhage Management guideline
iii. Assess for pain and consider provision of pain medication for all patients with acute traumatic pain regardless of transport interval
1. Use an age-appropriate pain scale to assess pain
   a. < 4 years: Observational scale [e.g. Faces, Arms, Legs, Cry, Consolability (FLACC) or Children’s Hospital of Eastern Ontario Pain Scale (CHEOPS)]
   b. 4-12 years: Self-report scale (e.g. Wong Baker Faces, Faces Pain Scale (FPS), Faces Pain Scale Revised (FPS-R))
   c. > 12 years: Self-report scale [Numeric Rating Scale (NRS)]
2. Administer narcotic analgesia for moderate to severe pain
   a. Morphine sulfate IV 0.1 mg/kg
   b. Fentanyl IV or IN 1.0 µg/kg
   c. Cautions and relative contraindications to morphine or fentanyl administration include
      i. GCS <15
      ii. Hypotension
      iii. Allergy to morphine and/or fentanyl
      iv. Hypoxia (SpO2 <90%) after maximal supplemental oxygen therapy
      v. Signs of hypoventilation
      vi. Condition preventing the administration of medications (e.g. blocked nose, no IV or IO access)
3. Reassess pain every 5 minutes using an age-appropriate pain scale following analgesia administration
4. Administer half the initial dose of analgesic for significant persistent pain
5. Defer additional administration of analgesic if the patient exhibits evidence of sedation or other serious adverse effects (e.g. hypotension, hypoxia, anaphylaxis)

Patient Safety Considerations
1. Life threatening injuries identified on primary survey should be managed immediately and rapidly transported to a trauma center. Secondary survey should be performed while en route.
2. Monitor patient for deterioration over time with serial vital signs and repeat mental status evaluation.
   a. Patients with compensated shock may not manifest hypotension until severe blood loss has occurred
   b. Patients with traumatic brain injury may deteriorate as intracranial swelling and hemorrhage increase
3. Anticipate potential for progressive airway compromise in patients with trauma to head and neck

**Notes/Educational Pearls:**

**Key Considerations**
1. Optimal trauma care requires a structured approach to the patient, emphasizing ABCDE
2. Target scene time < 10 minutes for unstable patients or those likely to need surgical intervention
3. Provider training should include the CDC Guidelines for Field Triage
4. Safety and timely transport is always a goal
   a. Air medical transport to an appropriate trauma center may be considered for patients meeting appropriate physiologic and anatomic criteria for serious injury if there will be a significant time-savings over ground transport
   b. Consultation with online medical direction should be not required for EMS providers to active air medical transport for trauma patients who meet appropriate physiologic and anatomic criteria for serious injury
   c. For all other trauma patients, consultation with online medical direction for determination of transport mode should never result in a significant delay
5. Frequent reassessment of the patient is important
   a. If patient develops difficulty with ventilation, reassess breath sounds for development of tension pneumothorax
   b. If extremity hemorrhage is controlled with pressure dressing or tourniquet, reassess for evidence of continued hemorrhage
   c. If mental status declines, reassess ABCs

**Quality Improvement:**

**Key Documentation Elements**
1. Serial vital signs and mental status evaluations
2. Scene time
3. Procedures performed and patient response

**Performance Measures (Process, Structure, and Outcomes)**
1. Monitor scene time for unstable patients
2. Monitor appropriateness of procedures
3. Monitor appropriate airway management
References:
1. Prehospital Trauma Life Support, 6th Ed

Version/Revision Dates:
March 16, 2014
2011 Guidelines for Field Triage of Injured Patients

1. Measure vital signs and level of consciousness

- Glasgow Coma Scale: ≤12
- Systolic Blood Pressure (mmHg): <90
- Respiratory Rate: ≤10 or >25 breaths per minute or need for ventilatory support

   NO
   
   Assess anatomy of injury

   - All penetrating injuries to head, neck, torso, and extremities proximal to elbow or knee
   - Chest wall instability or deformity (e.g., flail chest)
   - Two or more proximal long-bone fractures
   - Crushed, deformed, mangled, or pulseless extremity
   - Amputation proximal to wrist or ankle
   - Pelvic fractures
   - Open or depressed skull fracture
   - Paralysis

   NO
   
   Assess mechanism of injury and evidence of high-energy impact

   - Falls
     - Adults: ≥20 feet (one story is equal to 10 feet)
     - Children: ≥10 feet or two or three times the height of the child
   - High-risk auto crash
     - Intrusion, including roof: >12 inches occupant side; >18 inches any side
     - Ejection (partial or complete) from automobile
     - Death in same passenger compartment
     - Vehicle telemetry data consistent with a high risk of injury
     - Auto vs. pedestrian/bicyclist thrown, run over, or with significant (≥20 mph) impact
     - Motorcycle crash ≥20 mph

   NO
   
   Assess special patient or system considerations

   - Older Adults
     - Risk of injury/death increases after age 65 years
     - SBP ≤110 may represent shock after age 65
     - Low impact mechanisms (e.g., ground level falls) may result in severe injury
   - Children
     - Should be triaged preferentially to pediatric capable trauma centers
   - Anticoagulants and bleeding disorders
     - Patients with head injury are at high risk for rapid deterioration
   - Burns
     - Without other trauma mechanism: triage to burn facility
     - With trauma mechanism: triage to trauma center
   - Pregnancy ≥20 weeks
   - EMS provider judgment

   NO
   
   Transport according to protocol

2. Transport to a trauma center. Steps 1 and 2 attempt to identify the most seriously injured patients. These patients should be transported preferentially to the highest level of care within the defined trauma system.

3. Transport to a trauma center, which, depending upon the defined trauma system, need not be the highest level trauma center.

4. Transport to a trauma center or hospital capable of timely and thorough evaluation and initial management of potentially serious injuries. Consider consultation with medical control.

When in doubt, transport to a trauma center.

Find the plan to save lives, at www.cdc.gov/fieldtriage

National Center for Injury Prevention and Control
Division of Injury Response

150
Blast Injuries

**Patient Care Goals:**
1. Maintain patient and provider safety by identifying ongoing threats at the scene of an explosion
2. Identify multi-system injuries which may result from a blast, including possible toxic contamination
3. Prioritize treatment of multi-system injuries to minimize patient morbidity

**Patient Presentation:**

**Inclusion Criteria**
Patients exposed to explosive force (injuries may include any or all of the following: blunt and/or penetrating trauma, burns, pressure-related injuries (barotrauma), and toxic chemical contamination

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Airway
   a. Assess airway patency
   b. Consider possible thermal or chemical burns to airway
2. Breathing
   a. Evaluate adequacy of:
      i. Respiratory effort
      ii. Oxygenation
      iii. Quality of lung sounds
      iv. Chest wall integrity.
   b. Consider possible pneumothorax or tension pneumothorax (as a result of penetrating/blunt trauma or barotrauma)
3. Circulation
   a. Look for evidence of external hemorrhage
   b. Assess:
      i. BP
      ii. Pulse
      iii. Skin color/character
      iv. Distal capillary refill for signs of shock.
4. Disability
   a. Assess patient responsiveness (AVPU) and level of consciousness (GCS)
   b. Assess pupils
   c. Assess gross motor movement of extremities
5. Exposure
   Rapid evaluation of entire skin surface, including back (log roll), to identify blunt or penetrating injuries
Treatment and Interventions

1. **Airway**
   a. Secure airway, as necessary, utilizing airway maneuvers, airway adjuncts, supraglottic device, or endotracheal tube (see *Prehospital Airway Management/Confirmation/Ostruction/Failed Airway* guideline)
   b. If thermal or chemical burn to airway is suspected, early airway control is vital.

2. **Breathing**
   a. Provide supplemental oxygen to maintain O₂ saturation of 90-95%
   b. Assist respirations as needed.
   c. Cover any open chest wounds with semi-occlusive dressing
   d. If patient has evidence of tension pneumothorax (decreased or absent breath sounds and signs of shock), perform needle decompression.

3. **Circulation**
   a. Control any external hemorrhage (see *Extremity Trauma/External Hemorrhage* guideline)
   b. Establish IV access with two large bore IVs or IOs.
   c. Administer NS or LR as per *General Trauma* guideline.
   d. If patient is burned, administer NS or LR as per *Burn* guideline.

4. **Disability**
   a. If evidence of head injury, treat as per *Head Injury* guideline.
   b. Apply spinal precautions as per *Selective Spinal Immobilization* guideline.
   c. Monitor GCS during transport to assess for changes

5. **Exposure**
   - Keep patient warm to prevent hypothermia

Patient Safety Considerations

1. Ensuring scene safety is especially important at the scene of an explosion. Consider possibility of subsequent explosions, and other factors such as structural safety, possible toxic chemical contamination, or the presence of noxious gases. In a possible terrorist event, consider the possibility of secondary explosive devices.

2. Remove patient from the scene as soon as is practical and safe.

3. If the patient has sustained burns (thermal, chemical, or airway), consider transport to specialized burn center (see *Burn* guideline).

Notes/Educational Pearls:

**Key Considerations**

1. Scene safety is of paramount importance when responding to an explosion or blast injury

2. Patients sustaining blast injury may sustain complex, multi-system injuries including: blunt and penetrating trauma, shrapnel, barotrauma, burns, and toxic chemical exposure

3. Consideration of airway injury, particularly airway burns, should prompt early and aggressive airway management

4. Minimize IV fluid resuscitation in patients without signs of shock; use *Burn* guideline as a guide to fluid administration for patients with burns

5. Consider injuries due to barotrauma
a. Tension pneumothorax
b. Tympanic membrane perforation resulting in deafness. This may complicate the evaluation of their mental status and their ability to follow commands.

6. Children are smaller and at higher risk for multi-system trauma and increased susceptibility to severe injury in blast events

7. Pediatric patients with signs of shock:
   a. Refer to BP cutoffs in General Trauma guideline for definition of shock
   b. IVF resuscitation should begin with 20mL/kg of NS; reassess and repeat as necessary to reverse signs of shock
   c. Monitor BP, capillary refill, pulse quality, and rate closely

**Pertinent Assessment Findings**

1. Evidence of:
   a. Multi-system trauma
   b. Especially airway injury/burn
   c. Barotrauma to lungs
   d. Toxic chemical contamination

**Quality Improvement:**

**Key Documentation Elements**

1. Documentation of scene safety
2. Airway status and intervention
3. Breathing status: quality of breath sounds (equal bilaterally), adequacy of respiratory effort, and oxygenation
4. Documentation of burns
5. Documentation of possible toxic chemical contamination

**Performance Measures (Process, Structure, and Outcomes)**

1. Airway assessment and early and aggressive management
2. Appropriate IV fluid management
3. Transport to trauma or burn center

**References:**


**Version/Revision Dates:**

March 16, 2014
Burns

Patient Care Goals:
Minimize tissue damage and patient morbidity from burn

Patient Presentation:

Inclusion Criteria
Patients sustaining thermal burns

Exclusion Criteria
Electrical, chemical, and radiation burns (see Toxins and Environmental section guidelines)

Patient Management:

Assessment
1. Scene Management - Assure crew safety:
   a. power off
   b. electrical lines secure
   c. gas off
   d. no secondary devices
   e. hazmat determination
   f. proper protective equipment (breathing apparatus)
2. Observe and document:
   a. Airway (stridor, hoarse voice)
   b. Mouth and Nares (redness, blisters, soot, singed hairs)
   c. Breathing (rapid, shallow, rales, wheezes)
   d. Estimate Total Body Surface Area (TBSA) of 2\textsuperscript{nd} and 3\textsuperscript{rd} degree burns
   e. Evaluate circumstances of event for:
      i. associated trauma (blast, fall, assault)
      ii. toxic inhalation exposures (carbon monoxide, cyanide)
      iii. pediatric or elder abuse

Treatment and Interventions
1. Stop the burning:
   a. Powder chemical residues should be brushed off skin before flushing skin with water
   b. Soak clothing and skin with water if burning or smoldering, then remove clothing if not stuck to patient
   c. Remove jewelry. It may be hot
   d. Leave blisters intact
2. If evidence of airway burn, consider aggressive airway management to secure airway
3. Administer high flow oxygen
4. Obtain IV access, avoiding burned tissue if possible
5. Minimize burn wound contamination. Cover burns with dry dressing or clean sheet
6. Vital signs including SPO2, consider SPCO2 and ETCO2 if available.
7. Establish IV/IO access, avoid placement through burned skin.
8. Evaluate distal circulation in circumferentially burned extremities
6. Consider early management of pain and nausea/vomiting.
7. Initiate fluid resuscitation: Use lactated ringers or normal saline
   a. If patient in shock, give fluid per Shock guideline
   b. If patient not in shock: Begin fluids based on estimated TBSA using Parkland Formula (see Initial Fluid Rate Chart for Burns). For children, use length-based tape for weight estimate.
   c. As an alternative, initial fluid rate can also be calculated as: body weight (kg) X TBSA = ml of fluid to be given in first two hours (Alfred Formula)
9. Special transport considerations:
   i. If possible, transport directly to burn center if TBSA > 20% (> 10% for pediatric patients), BSA > 10% full thickness involvement of hands/feet, genitalia, face; circumferential burns
   ii. If burn center not available, transport to most appropriate trauma center for initial evaluation and stabilization

Notes/Educational Pearls:
1. Onset of stridor and change in voice are sentinel signs of potentially significant airway burns which may rapidly lead to airway obstruction or respiratory failure
2. Excess fluid may be harmful. If patient is not in shock, initial fluid rates (as recommended above) will adequately restore and maintain patient’s fluid volume
3. Pain management is critical in acute burns
4. Burn TBSA may be calculated using the “Rule of Nines” (see chart below) or by using the patient’s hand (including fingers) as a measure of 1% of body surface area. TBSA is only calculated on 2nd and 3rd degree portions of the burn.
5. Special treatment considerations:
   a. If blast mechanism, see Blast Injury guideline
   b. Have a high index of suspicion for cyanide poisoning in a patient with depressed GCS, respiratory difficulty and cardiovascular collapse in the setting of an enclosed-space fire.
   c. For specific chemical exposures (cyanide, hydrofluoric acid, other acids and alkali) see Toxins and Environmental section guidelines

Quality Improvement:

Key Documentation Elements
1. Airway status
2. Total body surface area (TBSA) estimate of 2nd and 3rd degree burns
3. Initial fluid resuscitation rates
4. Mechanism of burn injury
5. Pulse and capillary refill exam distally on any circumferentially burned extremity
6. Pain scale documentation and pain management

Performance Measures (Process, Structure, and Outcomes)
1. Patient transported to most appropriate hospital, preferably a burn center
2. Pain scale documented and pain appropriately managed
3. Airway assessment and management appropriately documented
4. Proper initial fluid resuscitation rates

Patient’s hand = 1%
Total Body Surface Area
### Initial Fluid Infusion Rate > 30kg

**Burn Injury Guidelines for Care**

*Fluid of choice LR/NS. DO NOT use dextrose containing fluids*

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*Patients with traumatic injuries may require additional fluids*
Initial Fluid Infusion Rate < 30kg

Burn Injury Guidelines for Care

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References:

2. Fluid Rate charts (based on Parkland formula) and TBSA diagrams courtesy of the University of Utah Burn Center; 2014.

**Version/Revision Dates:**
March 10, 2014
Extremity Trauma / External Hemorrhage Management

**Patient Care Goals:**
1. Minimize blood loss from extremity hemorrhage
2. Avoid hemorrhagic shock as a result of extremity hemorrhage
3. Minimize pain and secondary injury as a result of potential fractures or dislocations

**Patient Presentation:**

**Inclusion Criteria**
1. Traumatic extremity hemorrhage (external hemorrhage)
2. Potential extremity fractures or dislocations

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Evaluate for significant extremity hemorrhage
2. Evaluate for obvious deformity, shortening, rotation, or instability
3. Neurologic status of extremity
   a. Sensation to light touch
   b. Distal movement of extremity
4. Vascular status of extremity
   a. Pallor
   b. Pulse
   c. Capillary refill
   d. Degree/color of bleeding and note if it is pulsatile

**Treatment and Interventions**
1. Manage bleeding
   a. Apply direct pressure to bleeding site, followed by pressure dressing.
   b. If direct pressure/pressure dressing is ineffective or impractical:
      i. If the bleeding site is amenable to tourniquet placement, apply tourniquet to extremity
      ii. If the bleeding site is not amenable to tourniquet placement (i.e. junctional injury), apply a topical hemostatic agent with direct pressure
2. Manage pain
   a. Pain management should be strongly considered for patients with suspected fractures
   b. If a tourniquet is placed, an alert patient will likely require pain medication to manage tourniquet pain.
3. Stabilize suspected fractures/dislocations
   a. If distal vascular function is compromised, gently attempt to restore normal anatomic position. Strongly consider pain management before attempting to manipulate a suspected fracture.
b. Use splints as appropriate to limit movement of suspected fracture
   i. Reassess distal neurovascular status after any manipulation or splinting of fractures/dislocations

c. Elevate extremity fractures above heart level whenever possible to limit swelling
d. Apply ice/cool packs to limit swelling in suspected fractures or soft tissue injury. Do not apply ice directly to skin

**Patient Safety Considerations**

1. If tourniquet used, ensure that it is sufficiently tight to occlude the distal pulse, in order to avoid compartment syndrome
2. If tourniquet used, ensure that it is well marked and visible and that all subsequent providers are aware of the presence of the tourniquet. Do not cover with clothing or dressings.
3. Time of tourniquet placement should be prominently marked on the patient
4. If pressure dressing or tourniquet used, frequently reassess to determine if bleeding has restarted. Check for blood soaking through the dressing or continued bleeding distal to the tourniquet. Do not remove tourniquet or dressing in order to assess bleeding.

**Notes/Educational Pearls:**

**Key Considerations**

1. Tourniquets
   a. Use a commercially-produced, windlass, pneumatic, or ratcheting tourniquet that has been demonstrated to occlude arterial flow
   b. Avoid use of narrow, elastic, or bungee-type devices
   c. Improvised tourniquets should be applied only if no commercial tourniquet is available
   d. A tourniquet which has been properly applied should be left in place until the patient has reached definitive care, unless otherwise instructed by medical control
   e. Tourniquet should be placed 2-3 cm proximal to wound, not over a joint
   f. For thigh wounds, consider placement of two tourniquets, side-by-side, and tighten sequentially to eliminate distal pulse

2. Hemostatic Gauze
   a. To maximize effectiveness, hemostatic gauze should be packed firmly into the wound and continuous direct pressure applied.
3. Survival is markedly improved when a tourniquet is placed before shock ensues
4. Compression of arterial pressure points is not an effective hemorrhage control technique

**Quality Improvement:**

**Key Documentation Elements**

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

**Performance Measures (Process, Structure, and Outcomes)**

1. Proper placement of tourniquet (location, elimination of distal pulse)
2. Proper marking and timing of tourniquet placement and notification of subsequent providers of tourniquet placement
3. Appropriate splinting of fractures

References:

Version/Revision Dates
March 10, 2014
Facial Trauma

Patient Care Goals:
1. Minimize pain and morbidity
2. Preservation of a patent airway
3. Preservation of vision
4. Preservation of dentition

Patient Presentation:
Inclusion Criteria
Isolated facial injury, including trauma to the eyes, nose, ears, midface, mandible, mouth and oral contents (teeth, tongue, oral mucosa)

Exclusion Criteria
1. General Trauma (see General Trauma guideline)
2. Burn trauma (see Burn guideline)

Patient Management:
Assessment
1. ABCs with particular focus on ability to keep airway patent
   a. Stable midface
   b. Stable mandible
   c. Stable dentition: poorly anchored teeth require vigilance for possible complete avulsion and aspiration
2. Bleeding (which may be severe and compromise airway )
3. Cervical spine pain or tenderness (see Selective Spinal Immobilization guideline)
4. Mental status assessment for possible traumatic brain injury (see Head Injury guideline)
5. Gross vision assessment
6. Dental avulsions

Treatment and Interventions
1. Oxygen supplementation to maintain O2 saturation 94-95%
2. IV/IO access, as needed for fluid or medication administration
3. Pain medication as per Pain Management guideline
4. Avulsed tooth: place recovered tooth in patient’s mouth (if alert), or in milk or saline for transport with patient
5. Eye shield for any globe trauma
6. If mandible unstable: patient may have difficulty managing secretions, have suction readily available. Transport sitting up, if possible
7. Epistaxis: Squeeze nose (or have patient do so) for 10 – 15 minutes continuously. If oxymetazoline or neosynephrine is carried, it can be applied intra-nasally prior applying nasal pressure
8. Nose/ear avulsion: tissue should be placed in damp gauze and brought to the ED

Patient Safety Considerations
1. Frequent reassessment of airway
2. Transport sitting up, if possible, for difficulty with bleeding, swallowing, or handling secretions
3. Cervical spine protection as per Selective Spinal Immobilization guideline

Notes/Educational Pearls:

Key Considerations
1. Airway may be compromised because of fractures or bleeding
2. Avulsed teeth may be successfully re-implanted if done so in a very short period after injury
3. After nasal fractures, epistaxis may be posterior and may not respond to direct pressure over the nares. This may result in bleeding running down posterior pharynx, potentially compromising airway

Quality Improvement:

Key Documentation Elements
1. Airway patency and reassessment
2. Degree and location of hemorrhage
3. Mental status (GCS or AVPU)
4. Technique used to transport tissue or teeth
5. Eye and vision exam documented, when applicable

Performance Measures (Process, Structure, and Outcomes)
1. Appropriate airway management
2. Bleeding was properly addressed
3. Hemorrhage control measure
4. Ocular protection

References:
None

Version/Revision Dates:
March 10, 2014
Head Injury

**Patient Care Goals:**
To limit disability and mortality from head injury by:
1. Promoting adequate oxygenation
2. Promoting adequate cerebral perfusion
3. Limiting development of increased intracranial pressure
4. Limiting secondary brain injury

**Patient Presentation:**

**Inclusion Criteria**
Adult or pediatric patient with blunt or penetrating head injury
(LOC or amnesia not required):
1. Mild head injury: GCS 14-15
2. Moderate head injury: GCS 9-13
3. Severe head injury: GCS 3-8

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Maintain cervical stabilization
2. Primary survey: Use “Approach to Injured Patient”
3. Monitoring:
   a. Continuous pulse oximetry
   b. Frequent systolic and diastolic blood pressure measurement
   c. Initial GCS and reassessment with any change in mentation
   d. Moderate/severe head injury: apply continuous waveform ETCO2 if available
4. Secondary survey pertinent to isolated head injury:
   a. Head:
      Gently palpate skull to evaluate for depressed or open skull fracture
   b. Eyes:
      i. Evaluate pupil size and reaction to light to establish baseline
      ii. Reassess if decrease in mentation
   c. Nose/mouth/ears:
      Evaluate for blood/food drainage
   d. Face:
      Evaluate for bony stability
   e. Neck:
      Palpate for cervical spine step-off
   f. Neurologic:
      i. Evaluate GCS
      ii. Evaluate for focal neurologic deficit: motor and sensory
**Treatment and Interventions:** Note that these are not necessarily the order they are to be done, but are grouped by areas for conceptual reasons

1. **Airway:**
   a. Oxygen: prevent any desaturation < 90%
   b. If patient unable to maintain airway, consider oral airway (nasal airway should not be used with significant facial injury or possible basal skull fracture).
   c. Oral endotracheal intubation: use only if BVM ventilation ineffective in maintaining oxygenation or if airway is continually compromised. Nasal intubation should not be used in patients with head injury.

2. **Breathing:**
   a. Moderate / severe head injury: Continuous waveform capnography and ETCO2 measurement if available
   b. Supraglottic airway / endotracheal intubation only if BVM ventilation inadequate to maintain adequate oxygenation. Target ETCO2 35-40 mmHg
   c. Severe head injury with signs of herniation: Hyperventilation to target ETCO2 30-35 mmHg. This is a short-term option, and is ONLY for severe head injury (GCS ≤ 8) with signs of herniation.

3. **Circulation:**
   a. Wound care:
      i. Control bleeding with direct pressure if no suspected open skull injury.
      ii. Moist sterile dressing to any potential open skull wound
   b. Moderate / severe closed head injury:
      i. Blood pressure: avoid hypotension
         1. Adult (age > 10 years): maintain SBP ≥ 110 mmHg
         2. Pediatric: maintain SBP:
            a. < 1 month: > 60 mmHg
            b. 1-12 months: > 70 mmHg
            c. 1-10 years: > 70 + 2x age in years
   c. Closed head injury: Consider administering NS/LR fluid bolus to maintain blood pressure to above numbers and maintain cerebral perfusion.
   d. Do not delay transport to initiate IV access

4. **Disability:**
   a. Evaluate for other causes of altered mental status:
      i. Evaluate blood glucose if indicated
   b. Spinal stabilization
   c. Evaluate and trend GCS (moderate / severe: ≤13)
      i. Early signs of deterioration:
         1. Confusion
         2. Agitation
         3. Drowsiness
         4. Vomiting
         5. Severe headache
      ii. Monitor for signs of herniation
   d. Severe head injury: Elevate head of bed 30 degrees

5. **Transport destination specific to head trauma**
a. Preferential transport to highest level of care within trauma system:
   i. GCS ≤ 13
   ii. Penetrating head trauma
   iii. Open or depressed skull fracture

Patient Safety Considerations
1. Do not hyperventilate patient unless signs of herniation
2. Assume concomitant cervical spine injury in patients with moderate/severe head injury

Notes/Educational Pearls:

Key Considerations
1. Important that providers be specifically trained in accurate use of GCS:
   a. Mild head injury: GCS 14-15
   b. Moderate head injury: GCS 9-13
   c. Severe head injury: GCS 3-8

2. If endotracheal intubation or invasive airways are used, continuous waveform capnography is required to document proper tube placement and assure proper ventilation rate.

3. Signs of herniation
   a. Decreasing mental status
   b. Abnormal respiratory pattern
   c. Asymmetric/unreactive pupils
   d. Decorticate posturing
   e. Cushing’s response (bradycardia and hypertension)

4. Be alert for deterioration in patients with risk factors for potentially significant mild head injury:
   a. GCS < 15 at 2 hours post-injury
   b. Age > 55 years
   c. Deterioration in GCS
   d. Post-traumatic seizure
   e. Focal neurological deficit
   f. LOC > 5 min
   g. Clinical suspicion of skull fracture
   h. Recurrent vomiting
   i. Known coagulopathy/bleeding disorder/anticoagulant therapy
   j. Persistent severe headache
   k. Persistent post-traumatic amnesia
   l. Multisystem trauma
   m. Large scalp hematoma/abrasion
   n. Dangerous mechanism:
      i. Fall > 20 feet (adult)
      ii. Fall > 10 feet (pediatric)
      iii. High risk auto crash,
iv. Motor vehicle vs. pedestrian or bicyclist

v. Age

5. Do not delay transport for IV access placement
6. A “continually compromised” airway is one where basic airway maneuvers and suction do not protect the patient from significant aspiration.
7. Note that in circulation section, “adult” designation was used at age ≥ 10 because at 10, the formula for pediatric SBP target = SBP 90 which is the same target as adult. These numbers are taken from 2010 AHA Guidelines, Part 14 (PALS) - Kleinman citation in glossary.
Glasgow Coma Score

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<td>4</td>
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<td>4</td>
<td>Cries but consolable, inappropriate interactions</td>
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<tr>
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Pertinent Assessment Findings
None

Quality Improvement:

Key Documentation Elements
1. Mechanism of injury documented
2. At least one full set of vital signs documented: SBP/DBP, P, R, SAO2, GCS
3. Pupil exam documented for moderate/severe head injury
4. EtCO2 monitored and documented for moderate/severe head injury

Performance Measures (Process, Structure, and Outcomes)
1. No oxygen desaturation < 90%
2. No hypotension < 90 mmHg
3. No EtCO2 lower than 35 for mild head injury, 30 if severe head injury with signs of herniation
4. Appropriate triage to trauma center

References


**Version/Revision Dates:**
March 16, 2014
Selective Spinal Immobilization

**Patient Care Goals:**
1. Select patients for whom spinal immobilization is indicated
2. Minimize secondary injury to spine in patients who have, or may have, an unstable spinal injury
3. Minimize patient morbidity from immobilization procedures

**Patient Presentation:**

**Inclusion criteria**
- Traumatic mechanism of injury

**Exclusion criteria**
- Penetrating trauma with no evidence of neurologic deficits

**Patient Management:**

**Assessment**
1. Assess for mental status, neurologic deficits, spinal pain or tenderness, any evidence of intoxication, or other severe injuries
2. Patient should be “log rolled”, with maintenance of spinal alignment, for examination of spine for tenderness or deformities

**Treatment and Interventions**
1. Immobilize patient with cervical collar if:
   a. Patient complains of neck or spine pain
   b. Any neck or spinal tenderness
   c. Any abnormal mental status or GCS <15
   d. Any evidence of alcohol or drug intoxication
   e. There are other severe or painful injuries present

**Patient Safety Considerations**
1. Be aware of potential airway compromise or aspiration in immobilized patient with nausea/vomiting, or with facial/oral bleeding
2. Excessively tight immobilization straps can limit chest excursion and cause hypoventilation
3. Prolonged immobilization on spine board can lead to ischemic pressure injuries to skin
4. Prolonged immobilization on spine board can be very uncomfortable for patient
5. Children are abdominal breathers, so immobilization straps should go across chest and pelvis and not across the abdomen, when possible
6. Children have disproportionately larger heads. When securing pediatric patients to a spine board, the board should have a recess for the head, or the body should be elevated approximately 1-2 cm to accommodate the larger head size and avoid neck flexion when immobilized

**Notes/Educational Pearls:**

**Key considerations**
1. Spinal immobilization should be considered a treatment or preventive therapy
2. Patients who are likely to benefit from immobilization should undergo this treatment
3. Patients who are not likely to benefit from immobilization, who have a low likelihood of spinal injury, should not be immobilized
4. Ambulatory patients may be safely immobilized on gurney with cervical collar and straps and will not generally require a spine board
5. Long spine board should be reserved for patient movement in non-ambulatory patients who meet immobilization criteria and should be removed as soon as is practical

**Pertinent Assessment Findings**
1. Mental status
2. Normal neurologic examination
3. Evidence of intoxication
4. Evidence of multiple trauma with other severely painful injuries

**Quality Improvement:**

**Key Documentation Elements**
1. Patient complaint of neck or spine pain
2. Spinal tenderness
3. Mental status/GCS
4. Neurologic examination
5. Evidence of intoxication
6. Documentation of multiple trauma

**Performance Measures (Process, Structure, and Outcomes)**
1. Immobilized patients meet appropriate criteria
2. Documentation of criteria for immobilization

**References:**

**Version/Revision Dates:**
February 28, 2014
Toxins and Environmental

Hypothermia/Cold Exposure

**Patient Care Goals:**
1. Maintain hemodynamic stability
2. Prevent further heat loss
3. Aggressive management of cardiac arrest
4. Prevent loss of limb

**Patient Presentation:**
Patients may suffer from hypothermia from exposure to a cold environment (increased heat loss) or may suffer from a primary illness or injury that, in combination with cold exposure (heat loss in combination with decreased heat production), leads to hypothermia. Patients may suffer systemic effects from cold (hypothermia) or localized effects, such as in frostbite. Patients with mild hypothermia will have normal mental status and shivering with variations in vital signs (early tachycardia and hypertension followed by bradycardia and hypotension) while patients with moderate to severe hypothermia will manifest mental status changes, eventual loss of shivering and progressive bradycardia, hypotension, and decreased respiratory status. Patients with frostbite will develop pain involving the affected body part along with a “clumsy” feeling and with areas of blanched skin. Later findings include a “woody” sensation, decreased or loss of sensation, bruising or blister formation, or a white and waxy appearance to affected tissue.

**Inclusion Criteria**
Patients suffering systemic or localized cold injuries

**Exclusion Criteria**
Patients without cold exposure, or patients with cold exposure but no symptoms referable to hypothermia or frostbite.

**Patient Management:**

**Assessment**
1. Patient assessment should begin with attention to the primary survey, looking for evidence of circulatory collapse and ensuring effective respirations. Recall, the patient suffering from hypothermia may have severe alterations in vital signs including weak and extremely slow pulses, profound hypotension and decreased respirations. The rescuer may need to evaluate the hypothermic patient for longer than the normothermic patient (up to 45-120 seconds), however, if the hypothermia patient shows evidence of lifelessness, initiate resuscitation immediately.
2. History – Along with standard SAMPLE-type history, additional patient history should include attention to any associated injury or illness, duration of cold exposure, ambient temperature, and treatments initiated before EMS arrival.

**Treatment and Interventions**
1. Maintain patient and rescuer safety. Recall, the patient has fallen victim of cold injury and rescuers have likely had to enter the same environment. Maintain rescuer safety by preventing cold injury to rescuers

2. Manage airway as indicated

3. Initiate warm humidified Oxygen

4. Mild Hypothermia (see below):
   a. Remove the patient from the environment and prevent further heat loss by removing wet cloths and drying skin, insulate from the ground, shelter the patient from wind and wet conditions and insulate the patient with dry clothing or a hypothermia wrap/blankets
   b. Obtain core temperature. Rectal temperatures are the most reliable means to measure and follow core temperature in the field
   c. Provide warm beverages containing glucose if feasible and patient is awake and able to manage airway independently
   d. Consider placement of heat packs to the groin, axilla and neck
   e. Monitor frequently. If temperature or level of consciousness decreases refer to severe hypothermia protocol
   f. Establish IV access and consider administration of warmed IV fluids
   g. If alterations in mental status, consider measuring finger stick blood glucose and treat as indicated (follow Diabetic guideline)
   h. Transport to a hospital capable of rewarming the patient

5. Moderate or Severe Hypothermia (see below):
   a. Perform ABCs. If pulselessness or no signs of life, initiate resuscitation
   b. Manage airway and ventilate with 100% warm humidified oxygen
   c. Stop heat loss using the above methods
   d. Handle the patient gently. Move the patient only when necessary such as to remove the patient from the elements
   e. Apply cardiac monitor
   f. Establish IV and provide warmed IV Bolus. Repeat as necessary and once resuscitation complete, provide IV fluids at 125 ml/hour
   g. If alterations in mental status, consider measuring finger stick blood glucose and treat as indicated (Follow Diabetic Emergencies/Hypoglycemia Guideline)
   h. Transport ASAP to a hospital capable of aggressive resuscitation. If cardiac arrest develops consider transport to a center capable of bypass re-warming (if feasible)

6. Frostbite: If the patient has evidence of frostbite, and ambulation/travel is necessary for evacuation or safety, avoid rewarming of extremities until definitive treatment is possible. Additive injury occurs when the area of frostbite is rewarmed then inadvertently refrozen. Only initiate rewarming if refreezing is absolutely preventable
   a. If rewarming is feasible and refreezing can be prevented use circulating warm water (102-104° F) to rewarm effected body part, thawing injury completely. If warm water is not available, rewarm frostbitten parts by contact with non-affected body surfaces. DO NOT rub or cause physical trauma
   b. After rewarming, cover injured body parts with loose sterile dressing. If blisters are present, leave intact. Do not allow injured body parts to refreeze.
   c. Consider pain control. Follow the pain management guidance in Trauma guideline
Patient Safety Considerations
Given the additive effects of additional cold stress, the patient should be removed from the cold environment as soon as operationally feasible.

Notes/Educational Pearls:
Key Considerations
1. There are several means to categorize the severity of hypothermia based on either core body temperature readings or clinical evaluation. If possible and reliable, EMS providers should perform core body temperature measurements and categorize patients into one of the three follow levels of hypothermia:
   a. Mild – normal body temperature -32.1° C/89.8°F
   b. Moderate - 32°-28°C – 89.7°-82.5°F
   c. Severe - 28°-22° C – 82.4°- 68.1° F
   d. Profound – less than 20° C or 68 ° F
2. Equally important is the patient’s clinical presentation and the signs or symptoms the patient is experiencing. The above temperature based categorization should be balanced against these clinical findings.
   a. Mild- variations in vital signs (early tachycardia/hypertension, followed by mild bradycardia/hypotension), normal mental status, shivering is preserved. Body maintains ability to control temperature.
   b. Moderate/Severe/Profound – progressive bradycardia, hypotension and decreased respirations, alterations in mental status with eventual coma, loss of shivering reflex, and general slowing of bodily functions. The body loses ability to thermo-regulate.
3. Considerations in cardiac arrest:
   a. The mainstay of therapy in severe hypothermia and cardiac arrest should be effective chest compressions and attempts at rewarming.
   b. The temperature at which defibrillation should first be attempted in the severely hypothermic cardiac arrest victim and the number of defibrillation attempts is unclear. If the patient has a shockable rhythm (VF/VT), defibrillation should be attempted. It is reasonable to continue defibrillation attempts per AHA protocols concurrently with rewarming strategies.
   c. Manage the airway per standard care in cardiac arrest victims. (see cardiac arrest guideline)
   d. There is little evidence to guide use of medications in severe hypothermia with cardiac arrest, however 2010 AHA updates to advanced cardiac life support recommend use of vasopressors according to standard ACLS protocols
   e. Upon ROSC, the hypothermic patients should NOT be rewarmed above 32-34° C in an effort to maintain therapeutic hypothermia.
   f. Patients with severe hypothermia and arrest may benefit from resuscitation even after prolonged downtime and survival with intact neurologic function has been observed even after prolonged resuscitation. Patients should not be considered deceased until aggressive rewarming has been attempted.
**Pertinent Assessment Findings**
Along with decreased body temperature, the patient may manifest any of the following findings, based on the degree of hypothermia:
1. **Mild Hypothermia** - variations in vital signs (early tachycardia/hypertension, followed by mild bradycardia/hypotension), normal mental status, shivering is preserved. Body maintains ability to control temperature.
2. **Moderate/Severe/Profound Hypothermia** – progressive bradycardia, hypotension and decreased respirations, alterations in mental status with eventual coma, loss of shivering reflex, and general slowing of bodily functions. The body loses ability to thermo-regulate.

**Quality Improvement:**

**Key Documentation Elements**
1. **Standard Elements**
   a. Patient demographic information – patient name, gender, DOB
   b. Run Information – date and time of service, location of call, run report number if known
   c. EMS Service and Provider(s) names
   d. Patient Information
      i. Brief history – including chief complaint and mechanism of injury
      ii. Allergies
      iii. Medication
      iv. Past medical history
      v. Exam – including vital signs and trends of vital signs, pertinent exam findings (including rhythm, 12-lead ECG findings, etc.).
   e. Procedures performed or medications provided and changes in patient’s condition based on these procedures or medications
2. **Elements specific to hypothermia**
   a. Duration of cold exposure
   b. Ambient temperature and recent range of temperatures
   c. Rewarming attempts or other therapies performed prior to EMS arrival

**Performance Measures (Process, Structure, and Outcomes)**
Compliance with Guideline

**References:**
   [http://www.portal.state.pa.us/portal/server.pt/community/emergency_medical_services/14138/ems_statewide_protocols/625966](http://www.portal.state.pa.us/portal/server.pt/community/emergency_medical_services/14138/ems_statewide_protocols/625966)

Version/Revision Dates:
March 15, 2014
Drowning

**Patient Care Goals:**
1. Rapid assessment and management of life-threatening injuries
2. Rescue from the water-based environment
3. Transport all patients suffering from drowning for hospital evaluation

**Patient Presentation:**

**Inclusion Criteria**
Patients suffering from drowning or drowning events independent of presence or absence of symptoms.

**Exclusion Criteria**
Patients without history of drowning.

**Patient Management:**

**Assessment**
1. Follow general patient care guideline
2. History should include circumstances leading to the submersion, details of mechanism of injury, time under water, and water temperature (if available).
3. Primary survey should include aggressive airway management and restoration of adequate oxygenation and ventilation. Unlike the CAB strategy used in standard cardiac arrest, patients suffering cardiac arrest from drowning require an ABC approach with prompt airway management and supplemental breathing.
4. History, mechanism of injury and exam should include consideration of possible c-spine injury. If evaluation suggests injury to the cervical spine, manage c-spine.
5. Assess for other associated injury such as injury to the head or dive related emergency.

**Treatment and Interventions**
1. Ensure scene safety for patient and rescuers. Remove patient from water as soon as possible. Practice the safest water rescue technique possible given circumstances on scene. Evacuate to land or a water craft as soon as possible. If there is a delay to accessing shore or a rescue boat, initiate in-water basic life support consisting of ventilation only.
2. Manage airway as indicated
3. Follow cardiac arrest guideline as indicated with consideration of ABC strategy for drowning victims in cardiac arrest. Initiate 5 rescue breaths followed by 30 chest compressions. After the initial 5 breaths, use a 2 breaths to 30 compression ratio
4. If mechanism or history suggest cervical spine injury, manage c-spine
5. Monitor vital signs including oxygen saturations
6. If O₂ saturations are less than 92%, provide supplemental oxygen to maintain saturations between above 92% and less than 100%. Consider positive pressure ventilation in patients with signs or symptoms of respiratory difficulty
7. Consider hypothermia and treat per [Hypothermia](#) guideline
8. If the victim was involved in underwater diving with diving equipment and uncertainty exists regarding the most appropriate therapy, consider contacting medical direction and discussing need for hyperbaric treatment. Include discussion regarding:
   a. Submersion time
   b. Greatest depth achieved
   c. Ascent rate
9. Establish IV access
10. Fluid bolus as indicated
11. Advanced airway management as indicated. Consider CPAP in awake patients with respiratory distress
12. Cardiac monitor

**Patient Safety Considerations**
1. Avoidance of hyperoxegenation of the drowning victim
2. Rescuer safety considerations

**Notes/Educational Pearls:**

**Key Considerations**
1. The World Health Organization definition of drowning is “the process of experiencing respiratory impairment from submersion/immersion in liquid”
2. Drowning is further defined in the following categories:
   a. Non-fatal drowning – patients rescued from drowning
   b. Fatal drowning – any death, acutely or sub-acutely, resultant from drowning
3. Submersion refers to situations in which the patient’s airway is underwater. Immersion refers to situations in which the patient’s body is in water but the patient’s airway remains out of the water.
4. Drowning is a common cause of death in children. Risk factors for drowning include male gender, age less than 14 years old, alcohol use, lack of supervision, and risky behavior.
5. Rescue efforts should be coordinated between all responding agencies to ensure patient is rapidly accessed and removed from the water.
6. Initiation of in-water ventilations may increase survival. In-water chest compressions are futile.
7. The European Resuscitation Council recommends 5 initial breaths be provided to the drowning victim. The initial ventilations may be more difficult to achieve as water in the airways may impede alveolar expansion. After the initial 5 breaths and 30 compressions, the standard ration of 2 breaths to 30 compressions may be resumed.
8. Active efforts to expel water from the airway (by abdominal thrusts or other means) should be avoided as they delay resuscitative efforts and increase the potential for vomiting and aspiration.
9. Longstanding teaching has suggested that rescuers should always assume C-spine injury in victims of drowning. The 2010 American Heart Association update on special circumstances in cardiac arrest notes that routine C-spine precautions in all victims of drowning is likely unnecessary unless the mechanism or injury, history or physical exam suggests a cervical spine injury. Mechanisms of injury highly suggestive of cervical spine injury include diving, water skiing, surfing or watercraft accidents.
10. Uncertainty exists regarding survival in cold water drowning, however, recent literature suggests the following:
   a. If water temperature is less than 43° F (6° C) and the patient is submerged with evidence of cardiac arrest:
      i. Survival is possible for submersion time less than 90 minutes and resuscitative efforts should be initiated
      ii. Survival is not likely for submersion time greater than 90 minutes and providers may consider not initiating resuscitation or termination of resuscitation on scene
   b. If water temperature is greater than 43° F (6° C) and the patient is submerged with evidence of cardiac arrest:
      i. Survival is possible for submersion time less than 30 minutes and resuscitative efforts should be initiated
      ii. Survival is not likely for submersion time greater than 30 minutes and providers may consider not initiating resuscitation or termination of resuscitation on scene

11. Patients may develop sub-acute respiratory difficulty after drowning and therefore all victims of drowning should be transported for observation

**Quality Improvement:**

**Key Documentation Elements**

1. **Standard Elements**
   a. Patient demographic information – patient name, gender, DOB
   b. Run information – date and time of service, location of call, run report number if known
   c. EMS service and provider names
   d. **Patient Information**
      i. Brief history – including chief complaint and mechanism of injury
      ii. Allergies
      iii. Medication
      iv. Past medical history
      v. Physical examination including vital signs and trends of vital signs, pertinent exam findings (including cardiac rhythm, 12-lead ECG findings).
   e. Procedures performed, medications provided, and changes in patient’s condition based on these procedures or medications

2. **Elements specific to drowning**
   a. Mechanism of injury or history suggesting cervical spine injury
   b. Submersion time
   c. Water temperature
   d. Activities leading to drowning
   e. Consider a standardized data collection metrics such as the Utstein drowning data reporting elements

**Performance Measures (Process, Structure and Outcomes)**

Compliance with Guideline

**References:**

1. Olshaker, J “Submersion” in Emerg Med Clin N Am, 2004

Version/Revision Dates:
March 10, 2014
SCUBA Injury/Accidents

**Patient Care Goals:**
1. Rapid Assessment and management of life-threatening injuries
2. Rescue from the water-based environment
3. Transport patients suffering from SCUBA diving injury/illness for hospital evaluation and consideration of repressurization/hyperbaric oxygen therapy (HBOT)

**Patient Presentation:**

**Inclusion Criteria**
Patients with recent history of SCUBA diving exhibiting potential signs and/or symptoms of dive related illness/injury, regardless of dive table compliance

**Exclusion criteria**
Patients without history of recent SCUBA diving exposure

**Patient Management:**

**Assessment**
1. Follow Universal Care guideline
2. History should include circumstances leading to the submersion, details of mechanism of injury, time under water, and water temperature (if available).
3. Assess for other associated injury such as injury to the head or spine, if mechanism and symptoms suggest
4. See Drowning guideline if SCUBA accident includes associated drowning/near-drowning

**Treatment and Interventions**
1. Manage airway as indicated.
2. Monitor vital signs including oxygen saturations
3. If O₂ saturations are less than 92%, provide supplemental oxygen to maintain saturations >92%. Use positive pressure ventilation (e.g. CPAP) carefully in patients with whom pulmonary barotrauma is a consideration.
4. Patients with symptoms suspicious for decompression illness (DCI), should be placed on supplemental oxygen regardless of saturations to enhance washout of inert gas(es)
5. Consider hypothermia and treat per Hypothermia guideline
6. Consider contacting medical direction and discussing need for hyperbaric treatment and primary transport to facility with HBOT capability. Include discussion regarding
   a. Submersion time
   b. Greatest depth achieved
   c. Ascent rate
7. Establish IV access
8. Fluid bolus as indicated
9. Advanced airway management as indicated.
10. Cardiac monitor
Patient Safety Considerations
None

Notes/Educational Pearls:

Key Considerations
1. Rescue efforts should be coordinated between all responding agencies to ensure patient is rapidly accessed and removed from the water if diver unable to do so himself/herself.
2. If air medical transport necessary, patient should be transported in cabin pressurized to lowest possible altitude. If transported in unpressurized aircraft (e.g. most helicopter (HEMS) services), patient should be flown at the lowest safe altitude possible.

Pertinent Assessment Findings
None

Quality improvement:

Key documentation elements
1. Standard elements
   a. Patient demographic information – patient name, gender, DOB
   b. Run Information – date and time of service, location of call, run report number if known
   c. EMS Service and Provider(s) names
   d. Patient Information
      I. Brief history – including chief complaint and mechanism of injury
      II. Allergies
      III. Medication
      IV. Past medical history
      V. Physical examination including vital signs and trends of vital signs, pertinent exam findings (including cardiac rhythm, 12-lead ECG findings)
2. Elements specific to SCUBA
   a. Water temperature, if available
   b. Dive history
      I. Number of dives in recent history (days)
      II. "Bottom time" in dives
      III. Dive profiles
      IV. Maximum depth
      V. Rate of ascent
      VI. Safety stops utilized, if any
      VII. Dive gas (e.g. air vs. mixed gases such as nitrox, heliox or trimix)
   c. Timing of onset of symptoms
   d. History of altitude exposure after diving

Performance Measures (Process, Structure, and Outcomes)
None
References:


11. R.D. Vann, RD, Gerth, PJ, Denoble, CF, Pieper and Thalmann, ED. Experimental trials to assess the risks of decompression sickness in flying after diving. *Divers Alert Network, Department of Anesthesiology, Duke University Medical Center, Durham, NC; Center for Hyperbaric Medicine and Environmental Physiology, Department of Anesthesiology, Duke University Medical Center, Durham, NC; U.S. Navy Experimental Diving Unit, Panama City, FL; Center for Aging, Division of Biostatistics, Department of Community and Family Medicine, Duke University Medical Center, Durham, NC*
Conducted Electrical Weapon (e.g. TASER®)

**Patient Care Goals:**

1. Manage the condition that triggered the application of the conducted electrical weapon with special attention to patients meeting criterion for excited delirium
2. Make sure patient is appropriately secured or restrained with assistance of law enforcement to protect the patient and staff
3. Perform comprehensive trauma and medical assessment as patients who have received conducted electrical weapon may have already been involved in physical confrontation
4. Conducted electrical weapon can be discharged in two fashions; direct contact without the use of the darts or from a distance up to 35 feet with two darts. The device delivers 19 pulses per second with an average current per pulse of 2.1 milliamps which in combination with toxins/drugs, patient’s underlying diseases, excessive physical exertion, and trauma may precipitate arrhythmias, thus consider ECG monitoring and 12-lead ECG assessment
5. If discharged from a distance, two single barbed darts (13mm length) need to be located. Do not remove barbed dart from sensitive areas (head, neck, hands, feet or genital)

**Patient Presentation:**

**Inclusion Criteria**

1. Patient received either the direct contact discharge or the distance two barbed dart discharge of the conducted electrical weapon
2. Patient may have sustained fall or physical confrontation trauma
3. Patient may be under the influence of toxic substances and or may have underlying medical or psychiatric disorder

**Exclusion Criteria**

None

**Patient Management:**

**Assessment**

1. Once patient has been appropriately secured or restrained with assistance of law enforcement, perform primary and secondary assessment including 3-lead ECG, pulse oximeter, and consider 12-lead ECG
2. Evaluate patient for evidence of excited delirium manifested by varied combination of agitation, reduced pain sensitivity, elevated temperature, persistent struggling, or hallucinosis

**Treatment and Interventions**

1. Make sure patient is appropriately secured or restrained with assistance of law enforcement to protect the patient and staff. Consider chemical sedation if patient struggling against physical restraints and may harm themselves or others.
2. Conservative programs treat all barbed darts as a foreign body and leave them for physician removal while more progressive programs allow EMS or law enforcement to remove barbed darts except for sensitive areas (head, neck, hands, feet or genitals)
3. Treat medical and traumatic injury

Patient Safety Considerations
Before removal of the barbed dart, make sure the cartridge has been removed from the conducted electrical weapon.

Notes/Educational Pearls:
Key Considerations
None

Pertinent Assessment Findings
None

Quality Improvement:
Key Documentation Elements
If darts removed, document the removal location in the patience care report

Performance Measures (Process, Structure, and Outcomes)

References:
2. Excited delirium National American College of Emergency Physicians position paper, accessed as of March 3, 2014 http://www.acepnews.com/single-view/d257135701cb06fa0c94609c1eb6e67e.html?tx_ttnews%5Btt_news%5D=1345

Version/Revision Dates:
March 15, 2014
Altitude Illness

**Patient Care Goals:**
1. Improve oxygenation through a combination of decent and supplemental O₂
2. Safe but rapid transport from the high altitude environment to a lower altitude environment

**Patient Presentation:**

**Inclusion Criteria**
Patients suffering from altitude illness, including
1. Acute mountain sickness
2. High altitude pulmonary edema
3. High altitude cerebral edema

**Exclusion Criteria**
Patients who have not been exposed to altitude

**Patient Management:**

**Assessment**
1. The definition of altitude illnesses are as follows:
   a. **Acute mountain sickness (AMS)** – Headache plus one or more of the following: anorexia, nausea or vomiting, fatigue or weakness, dizziness or lightheadedness or difficulty sleeping. These symptoms must occur in the setting of recent arrival to high altitude (generally considered greater than 5000 – 7000 feet)
   b. **High altitude pulmonary edema (HAPE)** – Progressive dyspnea, cough, hypoxia, and weakness in high altitude environments (considered 8000 feet or greater). Patients may or may not exhibit symptoms if AMS preceding symptoms of HAPE.
   c. **High altitude cerebral edema (HACE)** – Heralded by mental status changes in patients with symptoms of AMS including altered mentation, ataxia, or stupor and progressing to coma. Typically seen in high altitude environments (greater than 8000 feet)
2. Assessment should target the signs and symptoms of altitude illness but should also consider alternate causes of these symptoms.

**Treatment and Interventions**
1. Ensure scene safety for rescuers
2. Stop Ascent
   Patients with AMS only may remain at their current altitude and initiate symptomatic therapy. Patients with HACE or HAPE should initiate descent
3. Perform ABCs and manage airway as necessary
4. Administer supplemental oxygen with goal to keep oxygen saturations > 90%
5. Descend to lower altitude. Descent is the mainstay of therapy and is the definitive therapy for all altitude related illnesses. Descent should be initiated as soon as scene conditions permit
   a. If severe respiratory distress is present and pulmonary edema is found on exam, provider positive pressure ventilation
   b. Establish IV and perform fluid bolus with goal to maintain systolic BP > 90 mm Hg
c. Monitor cardiac rhythm

**Patient Safety Considerations**
1. The high altitude environment is inherently dangerous. Rescuers must balance patient needs with patient safety and safety for the responders.
2. Rapid descent by a minimum of 500-1000 feet is a priority, however rapidity of descent must be balanced by current environmental conditions and other safety considerations.

**Notes/Educational Pearls**

**Key Considerations**
1. Remember, the patients suffering from altitude illness have exposed themselves to a dangerous environment. By entering the same environment, providers are exposing themselves to the same altitude exposure. Be vigilant is looking for symptoms of altitude illness amongst rescuers.
2. Descent of 500-1000 feet is often enough to see improvements in patient conditions
3. Patients with HAPE are suffering from non-cardiogenic pulmonary edema and may benefit from positive pressure ventilation via either bag assisted ventilation, CPAP or other means of positive pressure ventilation.
4. Patients suffering from altitude illness are commonly dehydrated and require IV fluids. Once resuscitation is complete and the patient requires no further fluid boluses, maintain IV fluids at 125 ml/hr.
5. HAPE is the most lethal of all altitude illnesses.
6. Consider alternate causes of symptoms of AMS. The symptoms of AMS may be caused by alternate etiologies such as carbon monoxide poisoning (in patients cooking within enclosed areas), dehydration, exhaustion, hypoglycemia, hyponatremia.
7. Descent should always be the primary treatment strategy for patients suffering from altitude illness, especially patients suffering from HACE and HAPE. If decent is not possible, or if local medical direction permits, the EMS provider may consider the following possible therapies:
   a. Portable hyperbaric chambers are effective for the management of severe altitude illness, however should not be used in lieu of decent, only as an alternative should descent be unfeasible.
   b. AMS
      i. Ibuprofen or Tylenol for pain
      ii. Ondansetron 4 mg IV, PO, or sublingual every 6 hours for vomiting
      iii. Acetazolamide – up to 250 PO mg twice a day.
         1. Pediatric dosing is 2.5 mg/kg up to a max of 250 mg twice a day
            a. Acetazolamide speeds acclimatization and therefore helps in treating AMS
      iv. Dexamethasone – 8 mg IM, IV, or PO followed by 4 mg IM, IV, or PO every 6 hours until symptoms resolve
         1. Pediatric dosing is 0.15 mg/kg IM, IV, or PO every 6 hours
            a. Dexamethasone helps treat the symptoms of AMS and may be used as an adjunctive therapy in severe AMS when the above measures alone do not ameliorate the symptoms of AMS. In
these circumstances, patients should also initiate descent, as dexamethasone does not facilitate acclimatization.

c. HACE – All below listed therapies should be considered as adjunctive to descent. Descent should always be the primary treatment modality.
   i. Dexamethasone – at above adult and pediatric doses.
      1. Dexamethasone helps treat the symptoms of HACE and should be initiated in HACE. In these circumstances, patients should also initiate descent.
   ii. Consider use of acetazolamide at the above dosing.

d. HAPE All below listed therapies should be considered as adjunctive to descent. Descent should always be the primary treatment modality.
   i. Nifedipine SR 60 mg PO once a day may be added to the patient’s regimen
   ii. Tadalafil (20-40 mg PO once daily) or sildenafil (20 mg PO three times a day) may be used if nifedipine is not available. Multiple pulmonary vasodilators should not be used concurrently.

**Pertinent Assessment Findings**
1. Consider airway management needs in the patient with severe alteration in mental status.
2. HAPE will present with increasing respiratory distress and rales on exam.
3. HACE will present with mental status changes, ataxia, and progressing to coma.

**Quality Improvement:**

**Key Documentation Elements**

1. Standard Elements
   a. Patient demographic information – patient name, gender, DOB
   b. Run Information – date and time of service, location of call, run report number if known
   c. EMS Service and Provider(s) names
   d. Patient Information
      i. Brief history – including chief complaint and mechanism of injury
      ii. Allergies
      iii. Medication
      iv. Past medical history
      v. Physical examination including vital signs and trends of vital signs, pertinent exam findings (including cardiac rhythm, 12-lead ECG findings).
   e. Procedures performed, medications provided, and changes in patient’s condition based on these procedures or medications

2. Elements specific to Altitude
   a. Patient’s itinerary, including starting altitude, highest altitude gained and rate of ascent.
   b. Presence (or absence) of prophylaxis against altitude (including medications such as acetazolamide, sildenafil (Viagra®))
   c. Total altitude descended.

**Performance Measures (Process, Structure, and Outcomes)**
None
References:
1. Luks, A et al “Wilderness Medical Society Consensus Guidelines for the Prevention and Treatment of Acute Altitude Illness” Wilderness and Environmental Medicine, 2010
2. Imray, C et al “Acute Mountain Sickness: Pathophysiology, Prevention and Treatment” Progress in Cardiovascular Diseases, 2010

Version/Revision Dates:
March 10, 2014
Electrical Injuries

**Patient Care Goals:**
1. Prevent additional harm to patient
2. Identify life threatening issues such as dysrhythmias and cardiac arrest
3. Identify characteristics of electrical source to communicate to receiving facility (voltage, amperage, AC vs. DC)
4. Understand that deep tissue injury can be far greater than external appearance
5. Have high index of suspicion for associated trauma due to patient being thrown
6. Determine most appropriate disposition for the patient as many will require burn center care and some may require trauma center care

**Patient Presentation:**

**Inclusion Criteria**
Exposure to electrical current (AC or DC)

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Verify scene is secure. The electrical source must be disabled prior to assessment
2. Assess primary survey with specific focus on dysrhythmias or cardiac arrest. Apply a cardiac monitor
3. Identify all sites of burn injury. If the patient became part of the circuit, there will be an additional site near the contact with ground
   a. Electrical burns are often full thickness and involve significant deep tissue damage
4. Assess for potential associated trauma and note if the patient was thrown from contact point.
   a. If patients have altered mental status, assume trauma was involved and treat accordingly
5. Assess for potential compartment syndrome from significant extremity tissue damage
6. Determine characteristics of source if possible – AC or DC, voltage, amperage and also time of injury

**Treatment and Interventions**
1. Identify dysrhythmias or cardiac arrest – even patients who appear dead (particularly dilated pupils) may have good outcomes with prompt intervention – see appropriate protocol for additional information
2. Immobilize if associated trauma suspected. See Trauma guideline
3. Apply dry dressing to any wounds
4. Remove constricting clothing and jewelry since additional swelling is possible
5. Administer fluid resuscitation per burn protocol
   a. Remember that external appearance will underestimate the degree of tissue injury
6. Electrical injury patients should be taken to a burn center whenever possible since these injuries can involve considerable tissue damage
   a. When there is significant associated trauma this takes priority if local trauma resources and burn resources are not in the same facility

**Patient Safety Considerations**
1. Verify no additional threat to patient
2. Shut off electrical power
3. Move patient to shelter if electrical storm activity still in area

**Notes/Educational Pearls:**

**Key Considerations**
1. Electrical current causes injury through three main mechanisms:
   a. Direct tissue damage, altering cell membrane resting potential, and eliciting tetany in skeletal and/or cardiac muscles
   b. Conversion of electrical energy into thermal energy, causing massive tissue destruction and coagulative necrosis.
   c. Mechanical injury with direct trauma resulting from falls or violent muscle contraction.
2. Anticipate atrial and/or ventricular dysrhythmias as well as cardiac arrest
3. The mortality related to electrical injuries is impacted by several factors:
   a. Route current takes through the body – current traversing the heart has higher mortality
   b. Type of current: AC vs. DC
      i. AC is more likely to cause cardiac dysrhythmias while DC is more likely to cause deep tissue burns however either type of current can cause any injury
      ii. DC typically causes one muscle contraction while AC can cause repeated contractions
      iii. Both types of current can cause involuntary muscle contractions that do not allow the victim to let go of the electrical source
      iv. AC is more likely to cause ventricular fibrillation while DC is more likely to cause asystole
   c. The amount of current impacts mortality more than the voltage

<table>
<thead>
<tr>
<th>Current level (Milliamperes)</th>
<th>Probable Effect on Human Body of 120 V, 60 Hz AC for 1 second</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mA</td>
<td>Perception level. Slight tingling sensation. Still dangerous if wet conditions.</td>
</tr>
<tr>
<td>5mA</td>
<td>Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range may lead to injuries.</td>
</tr>
<tr>
<td>6mA - 16mA</td>
<td>Painful shock, begin to lose muscular control. Commonly referred to as the freezing current or &quot;let-go&quot; range.</td>
</tr>
</tbody>
</table>
### Pertinent Assessment Findings
None

### Quality Improvement:

#### Key Documentation Elements:
- Characteristics of electrical current
- Downtime if found in cardiac arrest
- Positioning of the patient with respect to the electrical source
- Accurate description of external injuries
- Document presence or absence of associated trauma

### Performance Measures (Process, Structure, and Outcomes)
None

### References:

### Version/Revision Dates:
March 10, 2014
Hyperthermia/Heat Emergency

**Patient Care Goals:**
1. Goal is cooling and rehydration.
2. High risk for decompensation.
3. High risk for agitation and uncooperative behavior

**Patient Presentation:**

**Inclusion Criteria**
1. Heat cramps
2. Heat exhaustion
3. Heat stroke
4. Stimulant drug abuse
5. Excited delirium (see also Agitated or Violent Patient/Behavioral Emergency guideline)

**Exclusion Criteria**
1. Fever from infectious or inflammatory conditions
2. Malignant hyperthermia
3. Neuroleptic malignant syndrome

**Patient Management:**

**Assessment**
1. Patient assessment:
   a. Age
   b. Oral intake
   c. Medications
   d. Alcohol
   e. Illicit drugs
   f. Overdose
   g. Withdrawal risk
2. Environmental assessment:
   a. Ambient temperature and humidity
   b. Exertional level
   c. Length of time at risk
   d. Attire (clothing worn).
   e. Children left in cars with evidence of altered mental status and elevated body temperature are likely suffering from hyperthermia.
3. Associated symptoms:
   a. Cramps
   b. Headache
   c. Orthostatic symptoms
   d. Nausea
   e. Weakness
4. Vital signs:
Temperature: usually 104 degrees Fahrenheit or greater (if thermometer available)

5. Mental status:
   a. Confusion
   b. Coma
   c. Seizures
   d. Psychosis

6. Skin:
   a.Flushed and hot
   b. Dry or sweaty
   c. Signs of first or second degree burns from sun exposure

7. Other signs of poor perfusion/shock

**Treatment and Interventions**

1. Airway
2. Breathing
   Apply O₂ when needed
3. Circulation
   a. Consider orthostatic vital signs
   b. Transport with legs elevated
4. Move victim to a cool area and shield from the sun or any external heat source
5. Remove as much clothing as is practical and loosen any restrictive garments
6. If alert and oriented, give small sips of cool liquids
7. If altered mental status, check blood glucose level
8. Maintain airway vigilance for emesis, seizure
9. Place on cardiac monitor and record ongoing vital signs and level of consciousness
10. If temperature is >104 degrees F (40 degrees C) or if altered mental status is present, begin active cooling by:
    a. Continually misting the exposed skin with tepid water while fanning the victim (most effective)
    b. Truncal ice packs may be used, but are less effective than evaporation
    c. Shivering should be treated as soon as possible
11. Establish IV/IO access for heat stroke
12. Give cool fluids at 20 ml/kg boluses and reduce to 10 ml/kg/hr boluses when vitals at stable
13. Monitor for shivering and seizures; treat as below

14. Adult:
    Consider 500 ml normal saline IV fluid bolus for dehydration even if vital signs are normal. If uncontrolled shivering occurs during cooling:
    a. Midazolam 2.5mg IV/IN, may repeat once in 5 minutes or; 5mg IM may repeat once in 10 minutes
    b. Lorazepam 1mg IV, may repeat once in 5 minutes or; 2mg IM, may repeat once in 10 minutes
    c. Diazepam 2mg IV, may repeat once in 5 minutes

15. Pediatric
    Consider 10 – 20ml/kg normal saline IV fluid bolus for dehydration even if vital signs are normal. If uncontrolled shivering occurs during cooling:
a. Midazolam 0.1mg/kg IV/IM or 0.2mg/kg IN (single maximum dose 1mg); Note: a 5mg/ml concentration is recommended for IN administration),
b. Lorazepam 0.1mg/kg IV/IM (single maximum dose 1mg),
c. Diazepam 0.2mg/kg IV or 0.5mg/kg PR (single maximum dose 2mg IV or 4mg PR)

16. Monitor for arrhythmia and cardiovascular collapse, (see Arrhythmia and Cardiac Arrest)

**Patient Safety Considerations**

Be savvy when it comes to transporting the patient with hyperthermia and agitation. Use soft restraints, consider chemical restraints, and protect your IV/IO access sites.

**Notes/Educational Pearls:**

**Key Considerations**

1. Patients at risk for heat emergencies include neonates, infants, geriatric patients, and patients with mental illness.
2. Contributory risk factors may come from:
   a. Prescription and over-the-counter herbal supplements
   b. Cold medications
   c. Heart medications
   d. Diuretics
   e. Psychiatric medications
   f. Drug abuse
   g. Accidental or intentional drug overdose
3. Heat exposure can occur either due to increased environmental temperatures or prolonged exercise or a combination of both. Environments with temperature > 90° F and humidity > 60% present the most risk
4. **Heat cramps** are minor muscle cramps usual in the legs and abdominal wall. Temperature is normal
5. **Heat exhaustion** has both salt and water depletion usually of a gradual onset. As it progresses tachycardia, hypotension, elevated temperature, and very painful cramps occur. Symptoms of headache, nausea and vomiting occur. Heat exhaustion can progress to heat stroke
6. **Heat stroke** occurs when the cooling mechanism of the body (sweating) ceases due to temperature overload and/or electrolyte imbalances. When no thermometer is available, it is distinguished from heat exhaustion by altered level of consciousness. Do not forget to look for other causes of altered mental status like low blood glucose level
7. **Heat stroke** is associated with cardiac arrhythmias independent of drug ingestion/overdose. Heat stroke has also been associated with cerebral edema
8. **Controversy:** Shivering is thought to worsen outcomes in treating heat stroke. It is controversial about whether to stop active cooling if shivering occurs and ALS care with IV/IO access and anti-shivering drugs are not available. Risk of shivering versus risk of stopping active cooling must be weighed by the team
9. Hyperthermia not from environmental factors has a differential that includes the following:
   a. Fever and delirium
   b. Hyperthyroid storm
   c. Delirium tremens (DT’s)
d. CNS lesion or tumor  
e. Adverse drug event: neuroleptic malignant syndrome, malignant hyperthermia

10. In Treatments and Interventions sections 14 and 15, research does not demonstrate the value of one benzodiazepine over another in shivering patients.

**Pertinent Assessment Findings**  
Warning signs: fever, altered mental status

**Quality improvement:**  
**Key Documentation Elements**  
1. Patient assessment includes all types of medication/drug use  
2. Environmental assessment done.  
3. Transition from BLS to ALS care  
4. Decision-making regarding restraints  
5. Decision-making regarding monitoring ABCs

**Performance Measures (Process, Structure, and Outcomes)**  
1. Blood glucose level done for altered mental status  
2. Fluids given for hypotension  
3. All decompensations during EMS care reviewed

**References**  

**Version/Revision Dates:**  
February 28, 2014
Lightning/Lightning Strike Injury

**Patient Care Goals:**
1. Identify patient(s) as lightning strike victim(s)
2. Move to safe area
3. Initiate immediate resuscitation on cardiac arrest victim(s), within limits of mass casualty care
4. Cardiac monitoring during transport
5. Treat associated traumatic injuries

**Patient Presentation:**

**Inclusion Criteria**
Patients of all ages who have been the victim of lightning strike injury

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. **Cardiac**
   a. Asystole
   b. Atrial fibrillation
   c. Sinus tachycardia
   d. Transient hypertension
2. **Respiratory:**
   a. Apnea
   b. Agonal respirations
   c. Respiratory paralysis
3. **Neuro:**
   a. Seizures
   b. Confusion
   c. Paralysis
   d. Paraplegia
   e. Vertigo/dizziness
   f. Parasthesias
   g. Amnesia
   h. Memory deficits
   i. Anxiety
4. **EENT:** Fixed/dilated pupils possible (autonomic dysfunction)
5. **Skin:**
   a. Ferning or fern-like superficial skin burn (“Lichtenberg figures”)
   b. Vascular instability may result in cool, mottled extremities
   c. Frequent 1st and/or 2nd degree burns
   d. 3rd degree burns less common
6. Patient may be in full cardio-respiratory arrest or have only respiratory arrest, as injury is a result of DC current
7. May have stroke-like findings as a result of neurologic insult
8. May have secondary traumatic injury as a result of overpressurization, blast or missile injury. Fixed/dilated pupils may be a sign of neurologic insult, rather than a sign of death/impending death. Should not be used as a solitary, independent sign of death for the purpose of discontinuing resuscitation in this patient population

**Treatment and Interventions**
None

**Patient safety considerations**
1. Recognize that repeat strike is a risk. Patient and rescuer safety is paramount
2. Victims do not carry or discharge a current, so the patient is safe to touch and treat

**Notes/Educational Pearls:**
1. Lightning strike cardiopulmonary arrest patients have a high rate of successful resuscitation, if initiated early, in contrast to general cardiac arrest statistics.
2. There may be multiple victims
3. If multiple victims, reverse triage may be appropriate, with cardiac arrest patients treated first and aggressively
4. It may not be immediately apparent that the patient is a lightning strike victim
5. Injury pattern and secondary physical exam findings may be key in identifying patient as a victim of lightning strike
6. Lightning strike is a result of very high voltage, very short duration DC current exposure

**Key consideration**
None

**Pertinent assessment findings**
None

**Quality Improvement:**

**Key documentation elements**
None

**Performance Measures (Process, Structure, and Outcomes)**
None

**References:**


23. Kaliszian, Michal, Karol Karnecki, and Zbigniew Jankowski. “[A case of fatal lightning stroke at an unusual site--the city center].” *Archiwum medycyny sądowej i kryminologii* 62, no. 3 (September 2012): 208–212.


**Version/Revision Dates:**
March 10, 2014
Poisoning Universal Care

**Patient Care Goals:**
1. Remove patient from hazardous material environment/decontaminate to remove continued sources of absorption, ingestion, inhalation, or injection
2. Identify intoxicating agent by toxidrome or appropriate environmental testing
3. Assess risk for organ impairments (heart, brain, kidney)
4. Identify antidote or mitigating agent
5. Treat signs and symptoms in effort to stabilize patient

**Patient Presentation:**

**Inclusion Criteria**
Presentation may vary depending on the concentration and duration of exposure. Signs and symptoms may include, but are not limited to, the following:

1. Absorption:
   a. Nausea
   b. Vomiting
   c. Diarrhea
   d. Altered mental status
   e. Abdominal pain
   f. Rapid heart rate
   g. Dyspnea
   h. Seizures
   i. Arrhythmias
   j. Respiratory depression
   k. Sweating
   l. Tearing
   m. Defecation
   n. Constricted/dilated pupils
   o. Rash
   p. Burns to the skin.

2. Ingestion:
   a. Nausea
   b. Vomiting
   c. Diarrhea
   d. Altered mental status
   e. Abdominal pain
   f. Rapid or slow heart rate
   g. Dyspnea
   h. Seizures
   i. Arrhythmias
   j. Respiratory depression
   k. Chemical burns around or inside the mouth
I. Abnormal breath odors

3. Inhalation:
   a. Nausea
   b. Vomiting
   c. Diarrhea
   d. Altered mental status
   e. Abnormal skin color
   f. Dyspnea
   g. Seizures
   h. Burns to the respiratory tract
   i. Stridor
   j. Sooty sputum
   k. Known exposure to toxic or irritating gas
   l. Respiratory depression
   m. Sweating
   n. Tearing
   o. Constricted/ dilated pupils,
   p. Dizziness.

4. Injection:
   a. Local pain
   b. Puncture wounds
   c. Reddening skin
   d. Local edema
   e. Numbness
   f. Tingling
   g. Nausea
   h. Vomiting
   i. Diarrhea
   j. Altered mental status
   k. Abdominal pain
   l. Seizures
   m. Muscle twitching
   n. Hypoperfusion
   o. Respiratory depression
   p. Metallic or rubbery taste.

Exclusion Criteria
None

Patient Management:
Assessment
1. Make sure the scene is safe
2. Consider Body Substance Isolation (BSI) or appropriate personal protective equipment (PPE)
3. Assess ABCD and if indicated expose and then cover to assure retention of body heat
4. Vital signs which include temperature
5. Put on cardiac monitor and examine rhythm strip for arrhythmia potentials (consider 12-lead ECG)
6. Check blood glucose Level
7. Monitor pulse oximetry and ETCO2 for respiratory decompensation
8. Identify specific medication taken (including immediate release vs sustain release) time of ingestion, and quantity
9. Pertinent cardiovascular history or other prescribed medications for underlying disease
10. Check for needle marks, paraphernalia, bites, bottles or evidence of agent involved, self-inflicted injury, or trauma
11. Law enforcement should have checked for weapons and drugs but you may decide to re-check
12. Patient pertinent history
13. Patient physical examination

**Treatment and Interventions**

1. Assure a patent airway
2. Administer oxygen and if hypoventilation, toxic inhalation or desaturation noted, support breathing
3. Initiate IV/IO access for infusion of lactated ringers or normal saline and obtain blood samples if EMS management might change value (e.g. glucose, lactate, cyanide)
4. Fluid bolus (20 ml/kg) if evidence of hypoperfusion and appropriately position patient
5. Administration of appropriate antidote or mitigating medication
   a. Aspirin overdose:
      i. Consider Activated Charcoal without sorbitol (1 gm/kg) PO.
      ii. If risk of rapid decreasing mental status, do not administer oral agents.
      iii. As aspirin is erratically absorbed, charcoal is highly recommended to be administered early.
   b. Symptomatic beta blocker overdose:
      i. Consider atropine sulfate for symptomatic bradycardia
         1. Adult: 1 mg IV q 5 minutes to max of 3 mg
         2. Pediatric: 0.02 mg/kg (0.5 mg max) q 5 minutes, max total dose 1 mg
      ii. Consider glucagon
         1. Adult: glucagon 1 mg every 5 minutes IVP (may require 6 mg to see effect)
         2. Pediatric: glucagon
            a. 1 mg IVP (25-40 kg); every 5 minutes as necessary
            b. 0.5 mg IVP (less than 25 kg); every 5 minutes as necessary
      iii. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient
         1. Norepinephrine (start 2 mcg/min and titrate)
         2. Dopamine (start 2 mcg/kg/min and titrate)
   c. Symptomatic calcium channel blocker overdose:
      i. Consider atropine sulfate for symptomatic bradycardia
1. Adult: 1 mg IV q 5 minutes to max of 3 mg
2. Pediatric: 0.02 mg/kg (0.5 mg max) q 5 minutes, max total dose 1 mg

ii. Consider calcium chloride;
   1. Adult: 0.5 - 1 gm slow IVP (50 mg/min)
   2. Pediatric: 20 mg/kg (0.2 mL/kg) slow IVP/IO (50 mg/mL) to a maximum dose of 1 gram or 10 mL

iii. Consider glucagon
   3. Adult: glucagon 1 mg every 5 minutes IVP (may require 6 mg to see effect)
   4. Pediatric: glucagon
      a. 1 mg IVP (25-40 kg); every 5 minutes as necessary
      b. 0.5 mg IVP (less than 25 kg); every 5 minutes as necessary

iv. Consider glucagon for symptomatic bradycardia patient
   5. Adult: 1 mg every 5 minutes IVP (may require 5-15 mg to see effect)
   6. Pediatric:
      a. 1 mg IVP (25-40 kg); every 5 minutes as necessary
      b. 0.5 mg IVP (less than 25 kg); every 5 minutes as necessary

v. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient
   7. Norepinephrine (start 2 mcg/min and titrate)
   8. Dopamine (start 2 mcg/kg/min and titrate)

d. Carbon monoxide exposure
   i. Consider 100% oxygen administration
   ii. Consider hyperbaric therapy for the patient with unconsciousness or severe altered mental status

e. Cyanide exposure
   i. Consider hydroxocobalamin
   ii. Adult: Initial dose is 5 g administered over 15 minutes slow IV. Each 5 gm vial of hydroxocobalamin for injection is to be reconstituted with 200 mL of LR (25 mg/mL) and administered at 10 - 15 mL/minute. An additional 5 gm dose may be administered with medical consultation
   iii. Pediatric: 70 mg/kg (reconstitute concentration is 25 mg/mL). Each 5 gm vial of hydroxocobalamin for injection is to be reconstituted with 200 mL (25 mg/mL) of LR and administered at 10 - 15 mL/minute. Maximum single dose is 5 grams
   iv. Alternative medications in cyanide exposure without associated carbon monoxide poisoning include amyl nitrite, sodium nitrite, and sodium thiosulfate

d. Ingestion of Caustic Substances (acids and alkali),
   i. In the few minutes immediately after ingestion, consider administration of water or milk if available (maximum of 250 mL)
   ii. Symptomatic dystonia, extrapyramidal signs or symptoms, or mild allergic reactions Consider administration of diphenhydramine
      1. Adult: 25 mg IV or IM
      2. Pediatric: 1 mg/kg IVP/IO or IM (maximum single dose of 25 mg)

e. Symptomatic monoamine oxidase inhibitor (MAOI) overdose
i. Consider administration of midazolam (benzodiazepine of choice) and temperature control
ii. Adult and Pediatric: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
f. Symptomatic opioid overdose
   i. Consider administration of naloxone
      1. Adult: 0.4 - 2 mg SLOW IVP/IO/IM/intranasal (with IN atomizer - divide administration of the dose equally between the nostrils to a maximum of 1 mL per nostril). Titrate to adequate respiratory effort.
      2. Pediatric: 0.1 mg/kg SLOW IVP/IO/IM/intranasal (with IN atomizer - divide administration of the dose equally between the nostrils to a maximum of 1 mL per nostril). Titrate to adequate respiratory effort.
g. Oral ingestion poisoning:
   i. Consider administration of activated charcoal without sorbitol (1 gm/kg) PO particularly if it is within the first 2 hour after ingestion (including acetaminophen).
   ii. Patient who have ingested medications with extended release or delayed absorption should also get activated charcoal.
   iii. If there is a risk of rapidly decreasing mental status or for petroleum-based ingestions, do not administer oral agents.
h. Symptomatic organophosphate or nerve agent exposure
   i. Consider atropine and pralidoxime as the primary treatment along with benzodiazepines in the event of seizures
      i. Adult:
         1. Atropine 2 to 6 mg (based on severity) initial dose IV/IM with 2 mg every 5 minutes until secretions dry (2 mg auto-injector)
         2. Pralidoxime 1 gram IV or 600 mg to 1.8 grams IM (600 mg auto-injector)
         3. Midazolam 5 mg IV/IM/IN
      ii. Pediatric:
         1. Atropine 0.02 mg/kg IVP/IO or IM every 5-10 minutes (auto-injectors are 0.5 mg and 1 mg per device)
         2. Pralidoxime 50 mg/kg IV to max of 1 gram, or 15 mg/kg IM to 1.8 grams IM (600 mg autoinjector)
         3. Midazolam 0.05 mg/kg IV/IM/IN
i. Symptomatic stimulant (e.g. cocaine, amphetamine) overdose
   i. Consider benzodiazepine administration
      a. Adult: Midazolam 5 mg IV/IM/IN
      b. Pediatric: Midazolam 0.1 mg/kg IV/IM/ or 0.2 mg/kg IN
j. Symptomatic tricyclic antidepressant overdose
   i. Sodium bicarbonate
      1. Adult: 1 mEq/kg IVP bolus initially with 0.5 mEq/kg at 10 minute intervals
      2. Pediatric: 1 mEq/kg diluted 1:1 slow IVP/IO
   ii. Vasopressors after adequate fluid resuscitation for the hypotensive patient
      1. Norepinephrine (start 2 mcg/min and titrate
2. Dopamine (start 2 mcg/kg/min and titrate)

**Patient Safety Considerations**
1. Scene/environmental safety patient and provider
2. Monitor patient airway, breathing, pulse oximetry, ETCO2 for adequate ventilation as they will change over time
3. Repeat vital signs
4. Monitor level of consciousness
5. Monitor ECG with special attention to rate, rhythm, QRS and QT duration
6. Maintain or normalize patient temperature
7. Poison center should be engaged as early as reasonably possible to add in appropriate therapy and to track patient outcomes to improve knowledge of toxic effects. The national 24-hour toll-free telephone number to poison control centers is (800) 222-1222, and it is resource for free, private expert advice from anywhere in the United States

**Notes/Educational Pearls**

**Key Considerations**
1. Each toxin or overdose has unique characteristics which must be considered in individual protocol
2. Activated charcoal is still a useful adjunct in the serious agent or extended release agent poisoning as long as the patient does not have the potential for rapid alteration of mental status or airway/aspiration risk
3. Ipecac is no longer recommended for any poisoning or toxic ingestion. The manufacturer has stopped production of this medication

**Pertinent Assessment Findings**
Each toxin or overdose has unique characteristics which must be considered in individual protocol

**Quality Improvement:**

**Key Documentation Elements**
1. Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
2. Identification of possible etiology of poisoning
3. Initiating measures on scene to prevent exposure of bystanders when appropriate/indicated
4. Time of symptoms onset and time of initiation of exposure-specific treatments

**Performance Measures (Process, Structure, and Outcomes)**
None

**References:**

Versions and Revision Dates:
March 15, 2014
Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates)

**Patient Care Goals:**
Rapid recognition of the signs and symptoms of confirmed or suspected acetylcholinesterase inhibitor (AChEI) agents such as carbamates, nerve agents, or organophosphates exposure followed by expeditious and repeated administration of atropine, the primary antidote.

**Patient Presentation:**

**Inclusion Criteria**

*DUMBELS* is a mnemonic used to describe the signs and symptoms of AChEI agent poisoning. All patient age groups are included where the signs and symptoms exhibited are consistent with the toxidrome of DUMBELS.

- D Diarrhea
- U Urination
- M Miosis/Muscle weakness
- B Bronchospasm/Bronchorrhea
- E Emesis
- L Lacrimation
- S Salivation/Sweating

**Exclusion Criteria**
None

**Patient Management:**
1. Don the appropriate personal protective equipment (PPE)
2. Remove the patient’s clothing and wash the skin with soap and water
   a. AChEI agents can be absorbed through the skin
   b. Contaminated clothing can provide a source of continued exposure to the toxin
3. Rapidly assess the patient’s respiratory status, mental status, and pupillary status
4. Administer oxygen
5. Establish intravenous access (if possible)
6. Apply a cardiac monitor (if available)
7. The heart rate may be normal, bradycardic, or tachycardic
8. Clinical improvement should be based upon the drying of secretions and easing of respiratory effort rather than heart rate or pupillary response
9. Continuous and ongoing patient reassessment is critical

**Assessment**
1. The patient will develop:
   a. Miosis (pinpoint pupils)
   b. Bronchospasm
   c. Vomiting
   d. Excessive secretions in the form of:
      i. Tearing
ii. Salivation
iii. Rhinorrhea
iv. Diarrhea
v. Urination

2. Penetration of an AChEI agent into the central nervous system (CNS) will cause:
   a. Headache
   b. Confusion
   c. Generalized muscle weakness
   d. Seizures
   e. Lethargy or unresponsiveness

3. Onset of symptoms can be immediate with an exposure to a large amount of the AChEI

4. Patients with low-dose chronic exposures may have a more delayed presentation of symptoms

5. Identify:
   a. Specific agent taken (if possible)
   b. Time of exposure
   c. Quantity
   d. Pertinent cardiovascular history or other prescribed medications for underlying disease

6. AChEI agents are highly toxic chemical agents and can rapidly be fatal

7. The patient can manifest any or all of the signs and symptoms of the toxidrome based on the route of exposure, agent involved, and concentration of the agent:
   a. Vapor exposures will have a direct effect on the eyes and pupils causing miosis
   b. Patients with isolated skin exposures will have normally reactive pupils
   c. Certain AChEI agents can place the patient at risk for both a vapor and skin exposure

8. Signs and symptoms with large AChEI agent exposures (regardless of route)
   a. Sudden loss of consciousness
   b. Seizures
   c. Copious secretions
   d. Apnea
   e. Death
      i. There is usually an asymptomatic interval of minutes after liquid exposure before these symptoms occur
      ii. Effects from vapor exposure occur almost immediately

9. Antidotes (atropine and pralidoxime) are effective if administered before circulation fails

**Treatment and Interventions**

**Medications:**

1. Atropine
   Atropine is the primary antidote for organophosphate, carbamate, or nerve agent exposures, and repeated doses should be administered liberally to patients who exhibit signs and symptoms of exposure or toxicity.
   a. Atropine may be provided in multi-dose vials, pre-filled syringes, or auto-injectors
   b. Commercially available atropine auto-injectors include:
      i. Atro-Pen® 1 mg of atropine (dark red container)
      ii. Atro-Pen® 2 mg of atropine (green container)
iii. Pediatric Atro-Pen® 0.25 mg of atropine (yellow container)
iv. Pediatric Atro-Pen® 0.5 mg of atropine (blue container)

2. Pralidoxime Chloride (2-PAM)
Pralidoxime chloride is a secondary treatment and should be given concurrently in an effort to reactivate the acetylcholinesterase.
   a. Pralidoxime chloride may be provided in a single dose vial, pre-filled syringes, or auto- injectors
   b. Auto-injectors contain 600 mg of pralidoxime chloride
   c. In order to be beneficial to the victim, a dose of pralidoxime chloride should be administered shortly after the nerve agent or organophosphate poisoning as it has minimal clinical effect if administration is delayed

3. Benzodiazepines
Benzodiazepines are administered as an anticonvulsant for those patients who exhibit seizure activity (see the Seizures guideline for doses and routes of administration)
   a. Lorazepam (Ativan®), diazepam (Valium®), and midazolam (Versed®) are the most frequently used benzodiazepines in the prehospital setting
   b. In the scenario of an AChEI agent exposure, the administration of diazepam or midazolam is preferable due to their more rapid onset of action
   c. Benzodiazepines may be provided in multi-dose or single-dose vials, pre-filled syringes, or auto-injectors
   d. Cana® is a commercially available auto-injector of diazepam

4. MARK I® KITS
   a. A commercially available kit of nerve agent/organophosphate antidote auto-injectors
   b. A Mark I® kit consists of one auto-injector containing 2 milligrams of atropine and a second auto-injector containing 600 milligrams of pralidoxime chloride

5. DUODOTE®
   a. A commercially available auto-injector of nerve agent/organophosphate antidote
   b. Duodote® is one auto-injector that contains 2.1 milligrams of atropine and 600 milligrams of pralidoxime chloride

Medication Administration:
1. Atropine in extremely large, and potentially multiple, doses is the antidote for an AChEI agent poisoning
2. Atropine should be administered immediately followed by repeated doses until the patient’s secretions resolve
3. Pralidoxime chloride (2-PAM) is a secondary treatment and, when possible, should be administered concurrently with atropine
4. The stock of atropine and pralidoxime chloride available to EMS providers is usually not sufficient to fully treat the victim of an AChEI agent exposure; however, EMS providers should initiate the administration of atropine and, if available, pralidoxime chloride
5. Seizures should be treated with benzodiazepines
   a. There is some emerging evidence that, for midazolam, the intranasal route of administration may be preferable than the intramuscular route
6. The patient should be emergently transported to the closest appropriate medical facility as directed by medical direction
Recommended Doses

1. **Atropine**
   a. Adult and older child: 2-6 mg IV or IM every 5 minutes until excessive secretions diminish
   b. Infant and young child: 0.05 mg/kg IV or IM every 5 minutes until excessive secretions diminish

2. **Pralidoxime chloride**
   a. Adult and older child: 1 gm IV or 600 mg to 1.8 gm IM (600 mg auto-injector IM)
   b. Infant and young child: 25 mg/kg IV or IM

3. The above dosing is consistent with the following use of a Mark I® kit or Duodote® auto-injector:
   a. Mild signs and symptoms: Administer one Mark I® kit or Duodote®
   b. Moderate signs and symptoms: Administer two Mark I® kits or Duodote® auto injectors
   c. Severe (respiratory or neurologic) signs and symptoms: Administer three Mark I® kits or Duodote® auto-injectors

**NOTE:** Particularly in the severe AChEI agent exposure, the required dose of atropine necessary to dry secretions and improve the respiratory status is likely to exceed 20 mg. Since the antidotes in the Mark I® kit are in two separate vials, the atropine auto-injector in the kit can be administered to the patient in the event that Atro-Pen® auto-injectors are not available and intravenous atropine is not an immediate option. Due to the fact that Duodote® auto-injectors contain pralidoxime chloride, they cannot be used for additional dosing of atropine beyond the recommended administered dose of pralidoxime chloride

**Patient Safety Considerations**

1. Continuous and ongoing patient reassessment is critical
2. Clinical response to treatment is demonstrated by the drying of secretion and the easing of respiratory effort
3. Initiation of and ongoing treatment should not be based upon heart rate or pupillary response
4. Precautions for pralidoxime chloride administration:
   Although Duodote® contains atropine, the primary antidote for an AChEI agent poisoning, the inclusion of pralidoxime chloride in the auto-injector can present challenges if additional doses of atropine are warranted by the patient condition and other formulations of atropine are unavailable:
   a. In the pediatric population, an overdose of pralidoxime chloride may cause profound neuromuscular weakness and subsequent respiratory depression
   b. In the adult population, especially for the geriatric victim, excessive doses of pralidoxime chloride may cause severe systolic and diastolic hypertension, neuromuscular weakness, headache, tachycardia, and visual impairment
   c. For the geriatric victim who may have underlying medical conditions, particularly impaired kidney function or hypertension, the EMS provider should consider administering the lower recommended adult dose of intravenous pralidoxime chloride.
5. Considerations during the use of auto-injectors
   a. If an auto-injector is administered, a dose calculation prior to administration is not necessary.
   b. For atropine, additional auto-injectors should be administered until secretions diminish.
   c. Mark I™ kits and Duodote™ have not been approved for pediatric use by the Food and Drug Administration (FDA), but they can be considered for the initial treatment for children of any age with severe symptoms of an AChEI agent poisoning especially if other formulations of atropine are unavailable.
   d. Pediatric AtroPen® Auto-injectors:

<table>
<thead>
<tr>
<th>Severity of AChEI exposure</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 15 pounds / 7kg</td>
<td>0.25 mg auto-injector (yellow)</td>
<td>0.5 mg</td>
<td>0.75 mg</td>
</tr>
<tr>
<td>15-40 pounds / 7-20 kg</td>
<td>0.5 mg auto-injector (red)</td>
<td>1 mg</td>
<td>1.5 mg</td>
</tr>
<tr>
<td>40-90 pounds / 20-40 kg</td>
<td>1 mg auto-injector (blue)</td>
<td>2 mg</td>
<td>3 mg</td>
</tr>
<tr>
<td>Adults or large child</td>
<td>2 mg auto-injector (green)</td>
<td>4 mg</td>
<td>6 mg</td>
</tr>
</tbody>
</table>

   Notes/Educational Pearls:
   Key Considerations
   1. Clinical Effects of AChEI Agents
      a. The clinical effects are caused by the inhibition of the enzyme acetylcholinesterase which allows excess acetylcholine to accumulate in the nervous system.
      b. The excess accumulated acetylcholine causes hyperactivity in muscles, glands, and nerves.
   2. Organophosphates
      a. Can be legally purchased by the general public.
   3. Toxic chemicals that are readily available for purchase by the general public as pesticides penetrate tissues and bind to the patient’s body fat producing a prolonged period of illness and ongoing toxicity even during aggressive treatment.
   4. Nerve agents
      a. Traditionally classified as weapon of mass destruction (WMD).
      b. Not readily accessible to the general public.
      c. Extremely toxic and rapidly fatal with any route of exposure.
      d. GA (tabun), GB (sarin), GD (soman), GF, and VX are types of nerve agents and are WMDs.

   Pertinent Assessment Findings
   The signs and symptoms exhibited with the toxidrome of DUMBELS. (See Patient Presentation: Inclusion Criteria listed above)

   Quality Improvement:
   Key Documentation Elements
   1. Time to recognize initial signs and symptoms.
   2. Number of repeated doses of atropine required for the secretions diminish and respirations to improve.
   3. Patient reassessments.
   4. Patient responses to therapeutic interventions.
5. Measures taken to decontaminate the patient
6. Measures taken to protect clean environments from contamination

**Performance Measures (Process, Structure, and Outcomes)**
1. Ability of the EMS system to rapidly locate additional and adequate antidote assets
2. Ability of the EMS system to rapidly deploy additional and adequate antidote assets
3. Survival rates of victims
4. Complication rates from the toxin
5. Complication rates from the antidotes
6. Long-term clinical sequelae of the victims

**References:**

**Versions/Revision Dates:**
March 9, 2014
Radiation

Patient Care Goals:
To identify the patient with a confirmed or suspected radiation exposure or radioactive contamination, minimize the resultant mortality and morbidity, and to prevent ongoing or additional contamination

Patient Presentation:

Inclusion criteria
All ages are included particularly patients exhibiting the signs and symptom of acute radiation toxicity:
1. Nausea
2. Vomiting
3. Petechiae
4. External bleeding
5. Suspected internal bleeding
6. Dizziness
7. Headache
8. Altered mental status)

Exclusion criteria
None

Patient Management:
1. Don personal protective equipment (PPE)
2. Exercise universal precautions at all times
3. Place contaminated towels, waste water, and body fluids in secured containers denoted for radioactive waste materials
4. Place all body fluids released from vomiting, urination, salivation, and defecation in plastic bags and secure them in containers denoted for radioactive waste materials

Assessment
Radiation does not produce any immediate symptoms unless the exposure is severe. Most patients with radiation will be asymptomatic initially.

Treatment and Interventions
1. Confirmed or suspected skin exposures
   a. Wash all exposed areas repeatedly with soap and water
   b. Continue irrigation of the skin dosimetry readings decrease to an acceptable level
2. Confirmed or suspected inhalation contamination
   a. Administer oxygen
   b. Maintain the airway and, if necessary, perform intubation
   c. Support respirations and consider administration of albuterol aerosols if necessary
3. Confirmed or suspected radioactive ingestions
   a. Gastric emptying will not provide significant benefit
   b. Do not administer ipecac
4. Inform personnel at the receiving facility of a confirmed or suspected radioactive inhalation and/or ingestion as bronchopulmonary lavage and/or urgent administration of chelating or blocking agents may be indicated to minimize tissue damage.

5. Potassium iodide (KI) may protect the thyroid in the rare event where radioactive iodine is released. If deemed necessary, the public health agency with jurisdictional authority will direct the distribution and administration of potassium iodide to the appropriate patient and emergency responder populations.

**Patient Safety Considerations**

1. Monitor patient dosimetry readings frequently
2. Monitor EMS provider dosimetry readings frequently
3. For persons with high levels of radiation or an increasing trend in dosimetry readings:
   a. Remove from the scene
   b. Perform decontamination
   c. Move to a cold zone

**Notes/Educational Pearls:**

**Key Considerations**

1. Sources of radiation
   a. Legal
      i. Industrial plants
      ii. Healthcare facilities that provide radiologic services
      iii. Nuclear power plants
   b. Illegal
      i. Weapons of mass destruction
      ii. “Dirty bomb” design to contaminate widespread areas

2. Physiology of Radiation Poisoning
   a. Contamination – Poisoning from direct exposure to a radioactive source, contaminated debris, liquids, or clothing where radiation continues to be emitted from particles on surface
   b. Exposure – Poisoning from radioactivity, in the form of ionizing rays, penetrating through the bodily tissues of the patient

3. Common types of radioactivity that cause poisoning
   a. Gamma rays
      i. Highest frequency of ionizing rays
      ii. Penetrates the skin deeply
      iii. Causes the most severe radiation toxicity
   b. Beta rays
      Can penetrate up to 1 cm of the skin’s thickness
   c. Radioactive daughters
      i. Products of decay of the original radioactive substance
      ii. Can produce gamma and beta rays (e.g. uranium decays into a series of radon daughters)

**Pertinent Assessment Findings**
1. Earliest symptoms  
   a. Tissues with rapid cell growth produce initial signs and symptoms  
   b. Gastrointestinal tract elicited as nausea and vomiting  
   c. Skin burns with direct contact with radioactive source  
2. Delayed symptoms (days to weeks after exposure or contamination)  
   a. Skin burns or erythema from ionizing rays  
   b. Fever  
   c. Bone marrow suppression presenting as:  
      i. Immunosuppression  
      ii. Petechiae  
      iii. Spontaneous internal and external bleeding  

Quality Improvement:  

Key Documentation Elements  
1. Proper decontamination methods  
2. Proper management of contaminated objects and substances  
3. Appropriate treatment of patient’s signs and symptoms  
4. Serial dosimetry readings  

Performance Measures (Process, Structure, and Outcomes)  
1. Ability to acquire and distribute adequate numbers of dosimeters  
2. Ability to acquire adequate assets and containers for decontamination  
3. Mortality and morbidity rates of patients with early symptoms of radiation toxicity  
4. Mortality and morbidity rates of patient with late symptoms of radiation toxicity  
5. Established response plans to interface and coordinate with public health  
6. Incidence of long-term sequelae in survivors  
7. Incidence of long-term sequelae in EMS providers  

References:  

Version/Revision Dates:  
March 9, 2014
Topical Chemical Burn

**Patient Care Goals:**
Rapid recognition of a topical chemical burn and the initiation of emergent and appropriate intervention and patient transport.

**Patient Presentation:**

**Inclusion Criteria**
Patients of all ages who have sustained an exposure to a chemical that can cause a topical burn in a delayed clinical presentation

**Exclusion Criteria**
None

**Patient Management:**
1. Don the appropriate protective personal equipment (PPE)
2. Remove the patient’s clothing, if necessary
3. Contaminated clothing should be preferentially placed in bags
4. If deemed necessary and manpower resources permit, the patient should be transported by EMS providers who did not participate in the decontamination process and in an emergency response vehicle that has not been exposed to the chemical
5. Information regarding the chemical should be gathered while on scene
6. Communicate all data regarding the chemical to the receiving facility

**Assessment**
1. Clinical effects and severity of a topical chemical burn is dependent upon:
   a. Type of burn
   b. Concentration of the chemical
   c. pH of the chemical
   d. Onset of burn
      i. Immediate
      ii. Delayed (e.g. hydrofluoric acid)
2. Calculate the estimated total body surface area that is involved
3. Prevent further contamination

**Treatment and Interventions**
1. Carefully brush off solid chemical prior to flushing the site as the irrigating solution may activate a chemical reaction
2. Flush the patient’s skin (and eyes if involved) with copious amounts of water or normal saline
3. Provide adequate analgesia via the pain management protocol provided by EMS medical direction
4. Consider the use of topical anesthetic eye drops (e.g. tetracaine) for chemical burns of the eye
5. Consider the use of a Morgan lens to facilitate continuous flushing of chemical burns of the eye
6. Take measures to minimize hypothermia
7. Initiate intravenous fluid resuscitation if necessary to obtain hemodynamic stability

**Hydrofluoric acid**

Hydrofluoric acid (HF) is a highly corrosive substance that is primarily used for automotive cleaning products, rust removal, porcelain cleaners, etching glass, cleaning cement or brick, or as a pickling agent to remove impurities from various forms of steel. Patients who are initially exposed to low concentration HF are pain-free. However, as HF penetrates and binds to the proteins in the skin, significant tissue damage and necrosis results hours after the initial exposure.

For all patients in whom a hydrofluoric acid exposure is confirmed or suspected:
1. Vigorously irrigate all affected areas with water or normal saline
2. Apply a cardiac monitor for significant HF exposures as hypocalcemia may occur
3. Apply Calcium preparation:
   a. Calcium prevents tissue damage from hydrofluoric acid
   b. Calcium gluconate is preferred over calcium chloride as it is less irritating
   c. Topical calcium preparations:
      i. Commercially manufactured calcium gluconate gel
      ii. If commercially manufactured calcium gluconate gel is not available, a topical calcium gluconate gel preparation can be made by combining 25 mL of calcium gluconate 10% solution in 75-150 mL of a sterile water soluble gel (e.g. Surgilube® or KY® jelly)
      iii. If calcium gluconate is not available, 10 mL of calcium chloride 10% solution in 75-150 mL in sterile water soluble gel (e.g. Surgilube® or KY® jelly)
      iv. Apply generous amounts of calcium gluconate gel to the exposed skin sites to neutralize the cutaneous effects of the hydrofluoric acid and to prevent tissue damage and necrosis
      v. If fingers are involved, apply the calcium gel to the hand, squirt additional calcium gel into a surgical glove, and then insert the affected hand into the glove.
      vi. For patients who have sustained a significant exposure to hydrofluoric acid and are exhibiting clinically significant signs and symptoms of hypocalcemia, calcium chloride 10% solution should be administered intravenously.

**Patient safety considerations**
1. Don PPE
2. Take measures to prevent the patient from further contamination through decontamination
3. Take measures to protect the EMS provider and others from contamination
4. Do not attempt to neutralize an acid with an alkali or an alkali with an acid as a serious exothermic reaction will occur and cause serious harm to the patient
5. Expeditious transport or transfer to a designated burn center should be considered for burns that involve a significant percentage of total body surface area or burns that involved the eyes, face, hands, feet or genitals.
Notes/Educational Pearls:

1. **Parkland Formula**
   a. For patients who require fluid resuscitation, consider use of the Parkland formula to calculate the volume of normal saline or Lactated Ringer’s solution that should be administered intravenously to ensure hemodynamic stability.
      
      i. Volume of Intravenous Fluid required in the first 24 hours (in mL) = 
         $$(4 \times \text{patient weight in kg}) \times (\text{Percentage of total body surface area burned})$$
      
      ii. The first half of the volume of fluid should be administered over the first 8 hours following the burn with the remaining fluid administered over the following 16 hours.
   
   b. For pediatric patients, a weight-based assessment tool (length-based tape or other system) should be used to provide a more accurate estimate of the patient’s weight. Likewise, the total body surface area (BSA) estimates are different for pediatric patients compared to adults due to larger head and trunk size. For children, the palmar surface of the hand (not including the fingers is approximately equal to 1% BSA. The guidelines listed below will provide assistance during the estimation of the percentage of total body surface area burned for patients of various ages and body habitus.

2. **Percentage of Total Body Surface Area by Age, Anatomic Structure, and Body Habitus**

   **Adult**

<table>
<thead>
<tr>
<th>Anatomic structure</th>
<th>Surface area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior head</td>
<td>4.5%</td>
</tr>
<tr>
<td>Posterior head</td>
<td>4.5%</td>
</tr>
<tr>
<td>Anterior torso</td>
<td>18%</td>
</tr>
<tr>
<td>Posterior torso</td>
<td>18%</td>
</tr>
<tr>
<td>Anterior leg, each</td>
<td>9%</td>
</tr>
<tr>
<td>Posterior leg, each</td>
<td>9%</td>
</tr>
<tr>
<td>Anterior arm, each</td>
<td>4.5%</td>
</tr>
<tr>
<td>Posterior arm, each</td>
<td>4.5%</td>
</tr>
<tr>
<td>Genitalia, perineum</td>
<td>1%</td>
</tr>
</tbody>
</table>

   **Child**

<table>
<thead>
<tr>
<th>Anatomic structure</th>
<th>Surface area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior head</td>
<td>9%</td>
</tr>
<tr>
<td>Posterior head</td>
<td>9%</td>
</tr>
<tr>
<td>Anterior torso</td>
<td>18%</td>
</tr>
<tr>
<td>Posterior torso</td>
<td>18%</td>
</tr>
<tr>
<td>Anterior leg, each</td>
<td>6.75%</td>
</tr>
<tr>
<td>Posterior leg, each</td>
<td>6.75%</td>
</tr>
<tr>
<td>Anterior arm, each</td>
<td>4.5%</td>
</tr>
<tr>
<td>Posterior arm, each</td>
<td>4.5%</td>
</tr>
<tr>
<td>Genitalia/perineum</td>
<td>1%</td>
</tr>
</tbody>
</table>

   **Adult, obese >80 kg**

<table>
<thead>
<tr>
<th>Anatomic structure</th>
<th>Surface area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>2%</td>
</tr>
<tr>
<td>Anterior torso</td>
<td>25%</td>
</tr>
<tr>
<td>Posterior torso</td>
<td>25%</td>
</tr>
<tr>
<td>Leg, each</td>
<td>20%</td>
</tr>
<tr>
<td>Arm, each</td>
<td>5%</td>
</tr>
<tr>
<td>Genitalia/perineum</td>
<td>0%</td>
</tr>
</tbody>
</table>

   **Infant <10 kg**

<table>
<thead>
<tr>
<th>Anatomic structure</th>
<th>Surface area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>20%</td>
</tr>
<tr>
<td>Anterior torso</td>
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</tr>
<tr>
<td>Posterior torso</td>
<td>16%</td>
</tr>
<tr>
<td>Leg, each</td>
<td>16%</td>
</tr>
<tr>
<td>Arm, each</td>
<td>8%</td>
</tr>
<tr>
<td>Genitalia/perineum</td>
<td>1%</td>
</tr>
</tbody>
</table>
**Key Considerations**

1. Since the severity of topical chemical burns is largely dependent upon the type, concentration, and pH of the chemical involved as well as the body site and surface area involved, it is imperative to obtain as much information as possible while on scene about the chemical substance by which the patient was exposed. The information gathering process will often include:
   a. Transport of the container of the chemical to the receiving facility
   b. Transport of the original or a copy of the Material Safety Data Sheet (MSDS) of the substance to the receiving facility
   c. Contacting the reference agency to identify the chemical agent and assist in management (e.g. CHEMTREC®)

2. Decontamination from chemicals with a low pH (acids) is more easily accomplished than chemicals with a high pH (alkalis) because alkalis tend to penetrate and bind to deeper tissues

3. Some chemicals will also manifest local and systemic signs, symptoms, and bodily damage

**Pertinent Assessment Findings**

1. An estimate of the total body surface area that is involved
2. Patient response to therapeutic interventions
3. Patient response to fluid resuscitation
4. Patient response to analgesia

**Quality Improvement:**

**Key Documentation Elements**

1. Burn site
2. Body surface area involved
3. Identification of the chemical
4. Reported or measured pH of the chemical
5. Acquisition and transfer of MSDS, chemical container, or other pertinent substance information to the receiving the facility

**Performance Measures (Process, Structure, and Outcomes)**
1. Overtriage/undertriage of patients to designated burn centers
2. Early recognition of a topical burn with appropriate treatment
3. Early recognition of hydrofluoric acid burns followed by expeditious initiation of treatment with calcium gluconate and/or calcium chloride
4. Measures taken to prevent further contamination

**References:**

**Version/Revision Dates:**
March 16, 2014
Stimulant Poisoning/Overdose

**Patient Care Goals:**
1. Identify intoxicating agent
2. Protect organs at risk for injury such as heart, brain, liver, kidney
3. Determine if there is an antidote
4. Treat the symptoms which may include anxiety, hallucinations, chest pain, seizure, arrhythmia, excited delirium

**Patient Presentation:**

**Inclusion Criteria**
1. Cocaine
2. Amphetamines
3. Phencyclidine (PCP)
4. Derivatives
   a. Ecstasy
   b. Methamphetamine
   c. Bath salts

**Exclusion Criteria**
None

**Patient Management:**
Begin with the ABCDs:
1. Airway is patent
2. Breathing is oxygenating
3. Circulation is perfusing
4. Mental status is coherent
5. Treat any compromise of these parameters

**Assessment**
1. Vital signs including temperature
2. Apply a cardiac monitor and examine rhythm strip for arrhythmias
3. Check blood glucose level
4. Monitor ETCO2 for respiratory decompensation
5. Check for trauma, self-inflicted injury
6. Law enforcement should have checked for weapons and drugs, but you may decide to repeat the inspection

**Treatment and Interventions**
1. Need IV/IO access for any fluids and meds
2. Give fluids for poor perfusion; cool fluids for hyperthermia
3. Consider soft restraints especially if law enforcement has been involved in getting patient to cooperate
4. Consider medications to reduce stimulation and anxiety, and to improve behavior and compliance. (See Agitated or Violent Patient/Behavioral Emergency guideline for individual medications as benzodiazepines, anti-psychotics, ketamine)

5. Consider prophylactic use of anti-emetic: ondansetron. Do not use promethazine if haloperidol or droperidol are to be or have been given

6. As a last resort consider diphenhydramine to induce drowsiness

7. If hyperthermia suspected, begin external cooling

Patient Safety Considerations
Apply soft restraints if necessary. Explain to the patient that they ensure his/her safety and they ensure the ambulance gets everybody to the hospital safely

Notes/Educational Pearls:
If law enforcement has placed the patient in handcuffs, this patient needs physical restraint for safe transport. Chemical restraint is an adjunct. Please see the Agitated or Violent Patient/Behavioral Emergency guideline for the management of patients in handcuffs and the recommendations for physical and chemical restraints.

Key Considerations
Maintaining IV/IO access, cardiac monitor, and SPO2/ETCO2 monitors are key to being able to catch and intervene decompensations in a timely manner. Restrain the patient to facilitate patient assessment and displacement of monitoring devices.

Pertinent Assessment Findings
1. History is as important as the physical examination.
2. If the patient on psychiatric medication, but has failed to be compliant, this fact alone puts the patient at higher risk for excited delirium.
3. If the patient is found naked, this may elevate the suspicion for stimulant use or abuse and increase the risk for excited delirium.
4. If polypharmacy is suspected, hypertension and tachycardia are expected hemodynamic findings secondary to increased dopamine release. Stimulus reduction from benzodiazepines, anti-psychotics, and ketamine will improve patient’s vital signs and behavior
5. Be prepared for the potential of cardiovascular collapse as well as respiratory arrest.
6. If a vasopressor is needed, epinephrine or norepinephrine is recommended over dopamine

Quality Improvement:
Key Documentation Elements
1. Reason for restraints and neurologic/circulatory exams with restraint use
2. Reason for medications selected
3. Documentation of QT interval when haloperidol or droperidol is used

Performance Measures (Process, Structure, and Outcomes)
1. Recognition of need for monitoring cardiovascular and respiratory status of patient with stimulant toxicity
2. Respiratory compromise quickly recognized and treated
3. Cardiovascular compromise quickly recognized and treated

References:

Need citations for the use of chemical and physical restraints and for the roles of ETCO2 and ECG monitoring

Version/Revision Dates:
March 15, 2014
Cyanide

**Patient Care Goals:**
1. Remove patient from toxic environment
2. Assure adequate ventilation, oxygenation and correction of hypoperfusion

**Patient Presentation:**
Cyanide is a colorless, “bitter almond smell” (genetically only 40% of population can smell) gas or white crystal which attaches to tissues at the cellular mitochondria (cytochrome oxidase) level thus preventing the use of oxygen leading to cellular hypoxia.

**Inclusion Criteria**
Depending on its form, cyanide can enter the body through inhalation, ingestion, or absorption through the skin. Cyanide should be suspected in occupational or smoke exposures (i.e. firefighting), industrial accidents, natural catastrophes, suicide and murder attempts, chemical warfare and terrorism (whenever there are multiple casualties of an unclear etiology). Non-specific and early signs of cyanide exposure (inhalation, ingestion, or absorption) include the following signs and symptoms: anxiety, vertigo, weakness, headache, tachypnea, nausea, dyspnea, vomiting, and tachycardia.

High Concentrations of cyanide will produce:
1. Markedly altered level of consciousness
2. Seizure
3. Respiratory depression or respiratory arrest
4. Cardiac dysrhythmia (other than sinus tachycardia)

The rapidity of onset is related to the severity of exposure (inhalation or ingestion) and may have dramatic, immediate effects causing early hypertension with subsequent hypotension, sudden cardiovascular collapse or seizure/coma.

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Remove patient from toxic environment
2. Assess ABCDs and, if indicated, expose and then cover the patient to assure retention of body heat
3. Vital signs which include temperature
4. Put on cardiac monitor and examine rhythm strip for arrhythmia potentials (consider 12-lead ECG)
5. Check blood glucose Level
6. Monitor pulse oximetry and ETCO2 for respiratory decompensation.
7. Identify specific agent taken, time of ingestion/ inhalation, and quantity
8. Pertinent cardiovascular history or other prescribed medications for underlying disease
9. Check for needle marks, paraphernalia, bites, bottles or evidence of agent involved, self-inflicted injury, or trauma
10. Law enforcement should have checked for weapons and drugs but you may decide to repeat the inspection
11. Patient pertinent history
12. Patient physical

Treatment and Interventions
There is no widely available, rapid, confirmatory cyanide blood test. Treatment decisions must be made on the basis of clinical history and signs and symptoms of cyanide intoxication. For the patient with an appropriate history and manifesting one or more of high concentrations of cyanide signs or symptoms, treat with:

1. 100% oxygen via non-rebreather mask or bag valve mask
2. Hydroxocobalamin
   a. Collect a pre-treatment blood sample in the appropriate tube for lactate and cyanide levels.
   b. ADULT: Administer hydroxocobalamin. Initial dose is 5 gm administered over 15 minutes slow IV. Each 5 gm vial of hydroxocobalamin for injection is to be reconstituted with 200 mL of LR (25 mg/mL) and administered at 10 - 15 mL/minute. An additional 5 gm dose may be administered with medical consultation.
   c. PEDIATRIC: Administer hydroxocobalamin 70 mg/kg (reconstitute concentration is 25 mg/mL). Each 5 gm vial of hydroxocobalamin for injection is to be reconstituted with 200 mL of LR (25 mg/mL) and administered at 10 - 15 mL/minute. Maximum single dose is 5 gm
3. Amyl nitrite inhaled ampule (do not use in conjunction with carbon monoxide poisoning)
   a. Adult only: one ampule (0.3mL) inhaled
4. Sodium nitrite (do not use in conjunction with carbon monoxide poisoning)
   a. Adult: 300 mg (10 mL of 3%) IV over two to four minutes
   b. Pediatric: 6 mg/kg (0.2 mL/kg of 3%) [This dosing strategy has been established as safe in children with a hemoglobin concentration of ≥7 g/dL]
5. Sodium thiosulfate
   a. Adult: 12.5 gm IV (50 mL of 25% solution)
   b. Pediatric: 0.5 gm/kg IV (2 mL/kg of 25% solution)
6. If seizure, consider midazolam (benzodiazepine of choice)
   a. Adult: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
   b. Pediatric: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg or 0.2 mg/kg IN to max dose of 4 mg

Patient Safety Considerations
1. In the event of multiple casualties, be sure to wear appropriate PPE during rescue evacuation from the toxic environment
2. If patient has ingested cyanide liquid or crystals, the cyanide will react with the stomach acids to generate hydrogen cyanide gas which may be released into provider breathing air with belching, vomiting or gastric lavage.

3. Do not use nitrates in conjunction with suspected carbon monoxide poisoning as it worsens the hemoglobin oxygen carrying capacity even more than CO.

**Notes/Educational Pearls:**

**Key Considerations**

1. Pulse oximetry accurately reflects serum levels of oxygen but does not accurately reflect tissue oxygen levels therefore should not be relied upon.

2. After hydroxocobalamin has been administered, pulse oximetry levels are no longer accurate.

3. If the patient has taken an oral ingestion of cyanide salt, the cyanide salt will react to the acids in the stomach generating hydrogen cyanide. Be sure to maximize air circulation in closed space (back compartment of ambulance) as the patient’s gastric contents may contain hydrogen cyanide gases when released with vomiting or belching.

**Pertinent Assessment Findings**

None

**Quality Improvement:**

**Key documentation elements**

None

**Performance measures (Process, Structure, and Outcomes)**

None

**References:**


**Versions/Revision Dates:**

March 15, 2014
Beta Blocker Overdose

**Patient Care Goals:**
1. Reduce GI absorption of oral agents with some form of binding
2. Assure adequate ventilation, oxygenation and correction of hypoperfusion

**Patient Presentation:**
Beta blocker or beta adrenergic antagonist medication to reduce the effects of epinephrine/adrenaline

**Inclusion Criteria**
Patients present with:
1. Bradycardia
2. Hypotension
3. Lethargy
4. Weakness
5. Shortness of breath
6. Possible seizures

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Assess ABCDs and if indicated expose and then cover to assure retention of body heat
2. Vital signs which include temperature
3. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead ECG
4. Check blood glucose level
5. Monitor pulse oximetry and ETCO2 for respiratory decompensation.
6. Identify specific medication taken (noting immediate release vs. sustained release formulations), time of ingestion, and quantity
7. Pertinent cardiovascular history or other prescribed medications for underlying disease
8. Check for needle marks, paraphernalia, bites, bottles or evidence of agent involved, self-inflicted injury, or trauma
9. Law enforcement should have checked for weapons and drugs but you may decide to repeat the inspection
10. Patient pertinent history
11. Patient physical

**Treatment and Interventions**
1. Consider activated charcoal without sorbitol (1 gm/kg) PO. If risk of rapid decreasing mental status, do not administer oral agent without adequately protecting the airway.
2. Perform blood glucose determination on all patients but especially on pediatric patients as beta blockers can cause hypoglycemia in pediatric population.
3. Consider atropine sulfate for symptomatic bradycardia
   a. Adult: 1 mg IV q 5 minutes to max of 3 mg
   b. Pediatric: 0.02 mg/kg (0.5 mg max) q 5 minutes, max total dose 1 mg
4. Consider fluid challenge (20 ml/kg) for hypotension with associated bradycardia
5. Consider glucagon for symptomatic patient
   a. Adult: 1 mg every 5 minutes IVP (may require 6 mg to see clinical effects)
   b. Pediatric:
      i. 1 mg IVP (25-40 kg); every 5 minutes as necessary
      ii. 0.5 mg IVP (less than 25 kg); every 5 minutes as necessary
6. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient
   a. Norepinephrine (start 2 mcg/min and titrate)
   b. Dopamine (start 2 mcg/kg/min and titrate)
7. If seizure, consider midazolam (benzodiazepine of choice)
   a. Adult: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
   b. Pediatric: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg or 0.2 mg/kg IN to max dose of 4 mg

**Patient Safety Considerations**
Ipecac is contraindicated

**Notes/Educational Pearls:**

**Key Considerations**
1. Pediatric patient may develop hypoglycemia from beta blocker overdose therefore it is important to perform glucose evaluation
2. Glucagon has a side effect of increased vomiting
3. Atropine may have little or no effect (likely to be more helpful in mild overdoses)

**Pertinent Assessment Findings**
1. Certain beta blockers, such as acebutolol and propranolol may increase QRS duration
2. Certain beta blockers such as acebutolol and pindolol may produce tachycardia and hypertension
3. Sotalol can produce increase in QTc interval and ventricular dysrhythmia

**Quality Improvement:**

**Key documentation elements**
None

**Performance Measures (Process, Structure, and Outcomes)**
None
References:

Versions/Revision Dates:
February 28, 2014
Bites Envenomation

Patient Care Goals:
Bites, stings, and envenomations can come from a variety of insects, marine and terrestrial animals. There is a spectrum of toxins or envenomations with very limited EMS interventions.
1. Assure adequate ventilation, oxygenation and correction of hypoperfusion
2. Pain control which also includes limited external interventions to reduce pain

Patient Presentation:

Inclusion Criteria
Bites, stings, and envenomations can come from a variety of marine and terrestrial animals and insects causing local or systemic effects. Patients may present with toxin specific reactions which may include:
1. Site pain
2. Swelling
3. Erythema
4. Discoloration
5. Bleeding
6. Nausea
7. Abdominal pain
8. Hypotension
9. Tachycardia
10. Tachypnea
11. Muscle incoordination

There is a spectrum of toxins or envenomations and limited EMS interventions that will have any mitigating effect on the patient in the field. The critical intervention is to get the patient to a hospital that has access to the antivenin if applicable.

Exclusion Criteria
None

Patient Management:

Assessment
1. Assess ABCDs and if indicated expose and then cover to assure retention of body heat
2. Vital signs which include temperature
3. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead ECG
4. Check blood glucose Level
5. Monitor pulse oximetry and ETCO2 for respiratory decompensation
6. Check for needle marks, paraphernalia, bites, bottles or evidence of agent involved, self-inflicted injury, or trauma
7. Law enforcement should have checked for weapons and drugs but you may decide to repeat the inspection.

8. Patient pertinent history

9. Patient physical

**Treatment and Interventions**

1. Consider an IV fluid bolus (normal saline or Ringers Lactate) 20 mL/kg up to 2 liters

2. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient
   a. Dopamine (start 2 mcg/kg/min and titrate)
   b. Norepinephrine (start 2 mcg/min and titrate)

3. If seizure, consider midazolam (benzodiazipine of choice)
   a. Adult: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
   b. Pediatric: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg or 0.2 mg/kg IN to max dose of 4 mg

4. Specific therapy for select bites, stings, or envenomation
   a. Envenomations that are known to have antivenin or antitoxin: e.g. Black Widow Spider, certain scorpions, octopi, fanged snakes and lizards. For these envenomations, transport to hospital that has access to antivenin
   b. Jellyfish (Cnidarians): Scrape off any remaining tentacles or nematocysts, then immerse affected body part in hot water (113 °F/45 °C) or, for non-USA jellyfish, use vinegar (acetic acid) to reduce pain due to deactivation of the nematocysts
   c. Lionfish, scorpionfish, stingray: Immerse affected body part in hot water to reduce the pain associated with the toxin

**Patient Safety Considerations**

1. Do not perform any of the following:
   a. Tourniquets, tight Ace/crepe bandage, or constricting bands above or below the site of the envenomation
   b. Incision and/or suction
   c. Application of cold packs (cryotherapy)

2. EMS providers should not try to capture the offending marine or terrestrial animal or insect

3. If the offending organism has been killed, beware that many dead Insect, marine or fanged animals can continue to bite or sting with venom and should be safely placed in a hard sided and closed container for future identification

**Notes/Educational Pearls**

**Key Considerations**

Vinegar (acetic acid) has potential to increase pain associated jelly fish as it can increase nematocysts discharge. Vinegar use should be avoided within the United States.

**Pertinent Assessment Findings**

None
Quality Improvement:

Key Documentation Elements
1. It is helpful accurately describe the suspect bite or sting source without risking patient or EMS provider
2. Only transport source animal or insect if can be done safely in a hard sided container

Performance Measures (Process, Structure, and Outcomes)

References:
1. American College of Medical Toxicology; American Academy of Clinical Toxicology; American Association of Poison Control Centers; European Association of Poison Control Centres and Clinical Toxicologists; International Society on Toxicology; Asia Pacific Association of Medical Toxicology. Pressure immobilization after North American Crotalinae snake envenomation. Clin Toxicol (Phila). 2011 Dec;49(10):881-2

Versions/Revision Dates:
March 15, 2014
Calcium Channel Overdose

**Patient Care Goals:**
1. Reduce GI absorption of oral agents with some form of binding agent (activated charcoal) especially for extended release
2. Early airway protection is required as patients may have rapid mental status deterioration
3. Assure adequate ventilation, oxygenation and correction of hypoperfusion

**Patient Presentation:**
Calcium channel blocker medication interrupts the movement of calcium across cell membranes. Calcium channel blockers are used to manage hypertension, certain rate-related arrhythmias, prevent cerebral vasospasm, and angina pectoris.

**Inclusion Criteria**
Patients present with:
1. Bradycardia
2. Hypotension
3. Decreased AV Nodal conduction

**Exclusion criteria**
None

**Patient Management:**
**Assessment**
1. Assess ABCDs and, if indicated, expose and then cover to assure retention of body heat
2. Vital signs including temperature
3. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead ECG
4. Check blood glucose Level
5. Monitor pulse oximetry and ETCO2 for respiratory decompensation
6. Identify specific medication taken (noting immediate release vs. sustained release formulations), time of ingestion, and quantity
7. Pertinent cardiovascular history or other prescribed medications for underlying disease
8. Check for needle marks, paraphernalia, bites, bottles or evidence of agent involved, self-inflicted injury, or trauma
9. Law enforcement should have checked for weapons and drugs but you may decide to repeat the inspection
10. Patient pertinent history
11. Patient physical

**Treatment and Interventions**
1. Consider activated charcoal without sorbitol (1 gm/kg) PO. If risk of rapid decreasing mental status, do not administer oral agent without adequately protecting the airway.
2. Consider atropine sulfate for symptomatic bradycardia
   a. Adult: 1 mg IV q 5 minutes to max of 3 mg
   b. Pediatric: 0.02 mg/kg (0.5 mg max) q 5 minutes, max total dose 1 mg
3. Consider calcium chloride or calcium gluconate
   a. Calcium Chloride
      i. Adult: 0.5 - 1 gm slow IVP (50 mg/min)
      ii. Pediatric: 20 mg/kg (0.2 mL/kg) slow IVP/IO (50 mg/ml) Maximum dose 1 gm or 10 mL
   b. Calcium gluconate
      i. Adult: 2-6 gm slow IVP over 10 minutes
      ii. Pediatric: 60 mg/kg IV over 10 minutes
4. Consider glucagon for symptomatic bradycardia patient
   a. Adult: 1 mg every 5 minutes IVP (may require 5-15 mg to see effect)
   b. Pediatric:
      i. 1 mg IVP (25-40 kg); every 5 minutes as necessary
      ii. 0.5 mg IVP (less than 25 kg); every 5 minutes as necessary
5. Consider IV fluid bolus (normal saline or Ringers Lactate) 20 mL/kg up to 2 liters
6. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient
   a. Norepinephrine (start 2 mcg/min and titrate)
   b. Dopamine (start 2 mcg/kg/min and titrate)
7. If seizure, consider midazolam (benzodiazepine of choice)
   a. Adult: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
   b. Pediatric: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg or 0.2 mg/kg IN to max dose of 4 mg

**Patient Safety Considerations**
Ipecac is contraindicated

**Notes/Educational Pearls**

**Key Considerations**
1. Certain calcium channel blockers generate a variety of dysrythmias. Especially concerning are:
   a. Bradycardia
   b. Torsade de pointes
2. The avoidance of administering calcium chloride or calcium gluconate to a patient on cardiac glycosides (e.g. digoxin) as this may precipitate toxicity and associate fatal arrhythmias is felt to be a historical belief and not supported
3. Glucagon has a side effect of increased vomiting

**Pertinent Assessment Findings**
None

**Quality Improvement:**
Key Documentation Elements
None

Performance Measures (Process, Structure and Outcomes):
1. Early airway management in the rapidly deteriorating patient
2. Documentation and transport of medications or suspected toxic agent

References:
7. Olsen, Kent. Calcium Channel Blocker Ingestion: An Evidence-Based Consensus Guideline for Out-of-Hospital Management, Clinical Toxicology,43:797-822, 2005

Version/Revision Dates:
March 15, 2014
Carbon Monoxide

**Patient Care Goals:**
1. Remove patient from toxic environment
2. Assure adequate ventilation, oxygenation and correction of hypoperfusion

**Patient Presentation:**
Carbon monoxide is a colorless, odorless gas which has a high affinity for binding to red cell hemoglobin thus preventing the binding of oxygen to the hemoglobin leading to hypoxia. A significant reduction in oxygen delivery to tissues and organs occurs with carbon monoxide poisoning. With any form of combustion [fire/smoke, combustion engines (e.g. generators, lawn mowers, motor vehicles, home heating systems)], carbon monoxide will be generated.

**Inclusion Criteria**
Patients present with a spectrum of symptoms:
1. Mild intoxication:
   a. Nausea
   b. Fatigue
   c. Headache
   d. Vertigo
   e. Lightheadedness
2. Moderate to severe:
   a. Altered mental status
   b. Tachypnea
   c. Tachycardia
   d. Convulsion
   e. Cardiopulmonary arrest

**Exclusion Criteria**
None

**Patient Management:**

**Assessment**
1. Remove patient from toxic environment
2. Assess ABCDs and, if indicated, expose and then cover to assure retention of body heat
3. Vital signs which include temperature
4. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead ECG
5. Check blood glucose level
6. Monitor pulse oximetry and ETCO2 for respiratory decompensation
7. Check for needle marks, paraphernalia, bites, bottles or evidence of agent involved, self-inflicted injury, or trauma
8. Law enforcement should have checked for weapons and drugs but you may decide to repeat the inspection
9. Patient pertinent history
10. Patient physical

**Treatment and Interventions**
1. 100% oxygen via non-rebreather mask or bag valve mask
2. If seizure, consider midazolam (benzodiazepine of choice)
   a. Adult: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
   b. Pediatric: 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg or 0.2 mg/kg IN to max dose of 4 mg
3. Transport to hyperbaric oxygen therapy center is recommended

**Patient Safety Considerations**
1. Consider carbon monoxide detector on equipment bag that is routinely taken into scene
2. Provide instruction to the patient, the patient’s family, and other appropriate bystanders to not enter the environment (e.g. building, car) where the carbon monoxide exposure occurred until the source of the poisoning has been eliminated

**Notes/Educational Pearls**

**Key Considerations**
1. Pulse oximetry is inaccurate due to the carbon monoxide binding with hemoglobin.
2. As maternal carboxyhemoglobin levels do not accurately reflect fetal carboxyhemoglobin levels, pregnant patients are more likely to be treated with hyperbaric oxygen

**Pertinent Assessment Findings**
None

**Quality Improvement:**

**Key Documentation Elements**
None

**Performance Measures (Process, Structure, and Outcomes)**
None

**References:**

**Versions/Revision Dates:**
March 15, 2014
Opioid Poisoning/Overdose

**Patient Care Goals:** Rapid recognition and intervention of a clinically significant opioid poisoning or overdose followed by prevention of respiratory and/or cardiac arrest.

**Patient Presentation:**

*Inclusion criteria*
- Patents of all age groups with access to opioids and known or suspected opioid use or abuse

*Exclusion criteria:*
- Patients with altered mental status exclusively from other causes (head injury, hypoxia, hypoglycemia)

**Patient Management:**

1. Don the appropriate personal protective equipment (PPE)
2. Identify specific medication taken (including immediate release vs sustained release) if possible, time of ingestion, and quantity
3. Obtain and document pertinent cardiovascular history or other prescribed medications for underlying disease
4. Be aware that unsecured hypodermic needles may be on scene if the intravenous route may have been used by the patient
5. Naloxone (Narcan®), an opioid antagonist, should be considered for administration to patients with a confirmed or suspected opioid overdose, especially those that are exhibiting respiratory depression
6. Intravenous naloxone provides the most rapid onset of action
7. Naloxone administration via the intranasal or intramuscular routes or as a nebulized solution provide additional options of medication delivery

**Assessment**

1. Assess the patient’s airway, breathing, circulation, and mental status
2. Support the patient’s airway by positioning, oxygen administration, and ventilator assistance with a bag valve mask if necessary
3. Assess the patient for other etiologies of altered mental status including hypoxia, hypoglycemia, hypotension, and traumatic head injury

**Treatments and interventions**

1. Critical resuscitation (opening and/or maintaining the airway, provision of oxygen, ensuring adequate circulation) should be performed prior to naloxone administration
2. If the patient is symptomatic from a confirmed or suspected opioid overdose, consider naloxone administration. The administration of the initial dose or subsequent doses can be incrementally titrated until respiratory depression is reversed
3. Naloxone can be administered via the IV, IO, IM, IN, or ETT routes with the typical initial adult dose ranging between 0.4-2 mg.
a. For the intranasal route, divide administration of the dose equally between the nostrils to a maximum of 1 mL per nostril.

b. The intranasal administration can also be titrated until adequate respiratory effort is achieved.

c. The pediatric dose of naloxone is 0.1 mg/kg IV, IO, IM, SQ, or ETT with a maximum dose of 2 mg.

**Patient safety considerations**

1. Clinical duration of naloxone
   a. The clinical opioid reversal effect of naloxone is limited and may end within an hour whereas opioids often have a duration of 4 hours or longer
   b. Monitor the patient for recurrent respiratory depression and decreased mental status

2. Opioid withdrawal
   a. Patients with altered mental status secondary to an opioid overdose may become agitated or violent following naloxone administration due to opioid withdrawal
   b. Be prepared for this potential scenario and take the appropriate measures in advance to ensure and maintain scene safety

**Notes /Educational Pearls:**

**Key Considerations**

1. The essential feature of opioid overdose requiring EMS intervention is respiratory depression or apnea

2. Overuse and abuse of prescribed and illegal opioids has led to an increase in accidental and intentional opioid overdoses

3. DEA and opioids:
   a. Opioids, most of which are controlled under the Drug Enforcement Administration (DEA), have a high potential for abuse, but have an accepted medical use in patient treatment and can be prescribed by a physician
   b. Frequent legally prescribed opioids include codeine, fentanyl, hydrocodone, morphine, hydromorphone, methadone, morphine, oxycodone, and oxymorphone
   c. Opioids derivatives, such as heroin, are illegal in the United States

4. Opioid combinations:
   a. Some opioids are manufactured as a combination of analgesics with acetaminophen (Tylenol®), acetylsalicylic acid (aspirin), or other substances
   b. In the scenario of an overdose, there is a potential for multiple drug toxicities
   c. Examples of opioid combination analgesics:
      i. Vicodin® is a combination of acetaminophen and hydrocodone
      ii. Percocet® is a combination of acetaminophen and oxycodone
      iii. Percodan® is a combination of aspirin and oxycodone
      iv. Suboxone® which is a combination of buprenorphine and naloxone

**Pertinent assessment findings**

1. The primary clinical indication for the use of opioid medications is analgesia

2. In the opioid overdose scenario, signs and symptoms include:
   a. Miosis (pinpoint pupils)
b. Decreased intestinal motility

c. Respiratory depression

d. Decreased mental status

3. Additional assessment precautions:
   a. The risk of respiratory arrest with subsequent cardiac arrest from an opioid overdose as well as hypoxia, hypercarbia, and aspiration may be increased when other substances such as alcohol, benzodiazepines, or other medications have also been taken by the patient
   b. The signs and symptoms of an opioid overdose may also be seen in newborns who have been delivered from a mother with recent or chronic opioid use. Neonates who have been administered naloxone for respiratory depression due to presumed intrauterine opioid exposure should be monitored closely for seizures.

Quality Improvement:

   Key Documentation Elements
   1. Rapid and accurate identification of signs and symptoms of opioid poisoning
   2. Pulse oximetry (oxygen saturation) and, if available, capnography
   3. Blood glucose
   4. Naloxone dose also route of administration
   5. Clinical response to medication administration

Performance Measures (Process, Structure, and Outcomes)
   1. Clinical improvement after prehospital administration of naloxone
   2. Frequency of patients who develop adverse effects or complications (recurrent respiratory depression or decreased mental status, aspiration pneumonia or pulmonary edema)
   3. Number of patients who refuse transport following naloxone administration

References:
   3. United States Department of Justice, Drug Enforcement Administration, United States Code Controlled Substance Act, Title 21, Section 812.

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### Approved Abbreviations

The following is the project’s list of approved medical abbreviations.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAA</td>
<td>abdominal aortic aneurysm</td>
</tr>
<tr>
<td>AAO x 3</td>
<td>awake, alert and oriented to person, place and time</td>
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<tr>
<td>AAO x 4</td>
<td>awake, alert and oriented to person, place, time and event</td>
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<td>ABC</td>
<td>airway, breathing, circulation</td>
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<td>ABD</td>
<td>abdomen (abdominal)</td>
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<tr>
<td>AED</td>
<td>automatic external defibrillator</td>
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<td>atrial fibrillation</td>
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<td>above the knee amputation</td>
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<td>advanced life support</td>
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<td>against medical advice</td>
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<td>altered mental status</td>
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<td>amount</td>
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<td>APPROX</td>
<td>approximately</td>
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<td>associated</td>
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<td>twice daily</td>
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<td>bilateral</td>
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<td>below the knee amputation</td>
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<td>basic life support</td>
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<td>bowel movement</td>
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<td>blood pressure</td>
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<td>beats per minute</td>
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<td>breath sounds</td>
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<td>body surface area</td>
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<td>BSI</td>
<td>body substance isolation</td>
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<td>bag-valve-mask</td>
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<td>complaint of (complains of)</td>
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<td>CP</td>
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<td>CPAP</td>
<td>continuous positive airway pressure</td>
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<td>C-SECTION</td>
<td>caesarean section</td>
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<td>cerebrospinal fluid</td>
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<td>cervical spine</td>
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<td>cat scan, Cardiac Technician</td>
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<td>cardiovascular</td>
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<tr>
<td>CVA</td>
<td>cerebrovascular accident (stroke)</td>
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<td>D5W</td>
<td>5% dextrose in water</td>
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<td>DDNR</td>
<td>durable do not resuscitate</td>
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<td>DKA</td>
<td>diabetic ketoacidosis</td>
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<td>DNR</td>
<td>do not resuscitate</td>
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<td>DOA</td>
<td>dead on arrival</td>
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<td>DT</td>
<td>delirium tremens</td>
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<td>diagnosis</td>
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<td>electrocardiogram</td>
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<td>electroencephalogram</td>
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<td>EENT</td>
<td>eye, ear, nose, and throat</td>
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<td>EMS</td>
<td>emergency medical services</td>
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<td>emergency medical technician</td>
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<tr>
<td>ET</td>
<td>endotracheal</td>
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<tr>
<td>ETA</td>
<td>estimated time of arrival</td>
</tr>
<tr>
<td>ETCO2</td>
<td>end-tidal CO2</td>
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<td>ETOH</td>
<td>ethanol (alcohol)</td>
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<td>endotracheal tube</td>
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<tr>
<td>EXT</td>
<td>external (extension)</td>
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<tr>
<td>F</td>
<td>female</td>
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<tr>
<td>FB</td>
<td>foreign body</td>
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<td>FBAO</td>
<td>foreign body airway obstruction</td>
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<td>FLEX</td>
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<td>fracture</td>
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<td>gram(s)</td>
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<td>gastrointestinal</td>
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<td>GSW</td>
<td>gunshot wound</td>
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<td>gtts</td>
<td>drops</td>
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<tr>
<td>GU</td>
<td>gastrourinary</td>
</tr>
<tr>
<td>GYN</td>
<td>gynecology (gynecological)</td>
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<tr>
<td>H/A</td>
<td>headache</td>
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<tr>
<td>HEENT</td>
<td>head, eyes, ears, nose, throat</td>
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<td>HEME</td>
<td>hematologic, hematology</td>
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<tr>
<td>HR</td>
<td>heart rate (hour)</td>
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<td>HHN</td>
<td>hand-held nebulizer</td>
</tr>
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<td>HS</td>
<td>hour of sleep (bedtime), heart sounds</td>
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<td>HTN</td>
<td>hypertension</td>
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<td>Hx</td>
<td>history</td>
</tr>
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<td>ICP</td>
<td>intracranial pressure</td>
</tr>
<tr>
<td>ICU</td>
<td>intensive care unit</td>
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<td>IM</td>
<td>intramuscular</td>
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<td>INT</td>
<td>intermittent infusion device</td>
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<td>IO</td>
<td>intraosseous</td>
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<td>IV</td>
<td>Intravenous</td>
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<td>IVP</td>
<td>intravenous push</td>
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<td>J</td>
<td>joules</td>
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<td>JVD</td>
<td>jugular vein distension</td>
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<td>kg</td>
<td>kilogram</td>
</tr>
<tr>
<td>KVO</td>
<td>keep vein open</td>
</tr>
<tr>
<td>L</td>
<td>left</td>
</tr>
<tr>
<td>L/S-SPINE</td>
<td>lumbosacral spine</td>
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<tr>
<td>LAT</td>
<td>lateral</td>
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<tr>
<td>lb</td>
<td>pound</td>
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<tr>
<td>LLQ</td>
<td>left lower quadrant</td>
</tr>
<tr>
<td>LMP</td>
<td>last menstrual period</td>
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<tr>
<td>LPM</td>
<td>liters per minutes</td>
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<tr>
<td>LR</td>
<td>lactated ringers</td>
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<td>L-SPINE</td>
<td>lumbar spine</td>
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<td>LUQ</td>
<td>left upper quadrant</td>
</tr>
<tr>
<td>M</td>
<td>male</td>
</tr>
<tr>
<td>MAST</td>
<td>military anti-shock trousers</td>
</tr>
<tr>
<td>MAT</td>
<td>multifocal atrial tachycardia</td>
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<tr>
<td>mcg</td>
<td>microgram(s)</td>
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<td>MED</td>
<td>medicine</td>
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<tr>
<td>mg</td>
<td>milligram(s)</td>
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<tr>
<td>MI</td>
<td>myocardial infarction (heart attack)</td>
</tr>
<tr>
<td>min</td>
<td>minimum / minute</td>
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<td>MS</td>
<td>mental status</td>
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<td>MVC</td>
<td>motor vehicle crash</td>
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<tr>
<td>N/V</td>
<td>nausea/vomiting</td>
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<tr>
<td>N/V/D</td>
<td>nausea/vomiting/diarrhea</td>
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<tr>
<td>NAD</td>
<td>no apparent distress</td>
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<td>NC</td>
<td>nasal cannula</td>
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<tr>
<td>NEB</td>
<td>nebulizer</td>
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<tr>
<td>NKDA</td>
<td>no known drug allergies</td>
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<tr>
<td>NRB</td>
<td>non-rebreather</td>
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<td>NS</td>
<td>normal saline</td>
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<td>NSR</td>
<td>normal sinus rhythm</td>
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<td>PAC</td>
<td>premature atrial contraction</td>
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<td>PALP</td>
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<td>pneumatic anti-shock garment</td>
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<td>pulmonary embolus</td>
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<td>PEA</td>
<td>pulseless electrical activity</td>
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<td>PEARL</td>
<td>pupils equal and reactive to light</td>
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<td>PMHx</td>
<td>past medical history</td>
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<td>PO</td>
<td>orally</td>
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<td>PPE</td>
<td>personal protection equipment</td>
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<td>as needed</td>
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<td>PVC</td>
<td>premature ventricular contraction</td>
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<tr>
<td>QID</td>
<td>four times daily</td>
</tr>
<tr>
<td>R</td>
<td>right</td>
</tr>
<tr>
<td>RLQ</td>
<td>right lower quadrant</td>
</tr>
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<td>RUQ</td>
<td>right upper quadrant</td>
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<td>Rx</td>
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<td>reaction</td>
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<td>symptom</td>
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<td>T</td>
<td>temperature</td>
</tr>
<tr>
<td>TIA</td>
<td>transient ischemic attack</td>
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<tr>
<td>TID</td>
<td>three times a day</td>
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<tr>
<td>TKO</td>
<td>to keep open (refers to IV’s – same as KVO)</td>
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<td>T-SPINE</td>
<td>thoracic spine</td>
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<td>Tx</td>
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<td>upon our arrival</td>
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<td>URI</td>
<td>upper respiratory infection</td>
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<td>UTI</td>
<td>urinary tract infection</td>
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<td>WAP</td>
<td>wandering atrial pacemaker</td>
</tr>
<tr>
<td>WNL</td>
<td>within normal limits</td>
</tr>
<tr>
<td>YO (YOA)</td>
<td>years old (years of age)</td>
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