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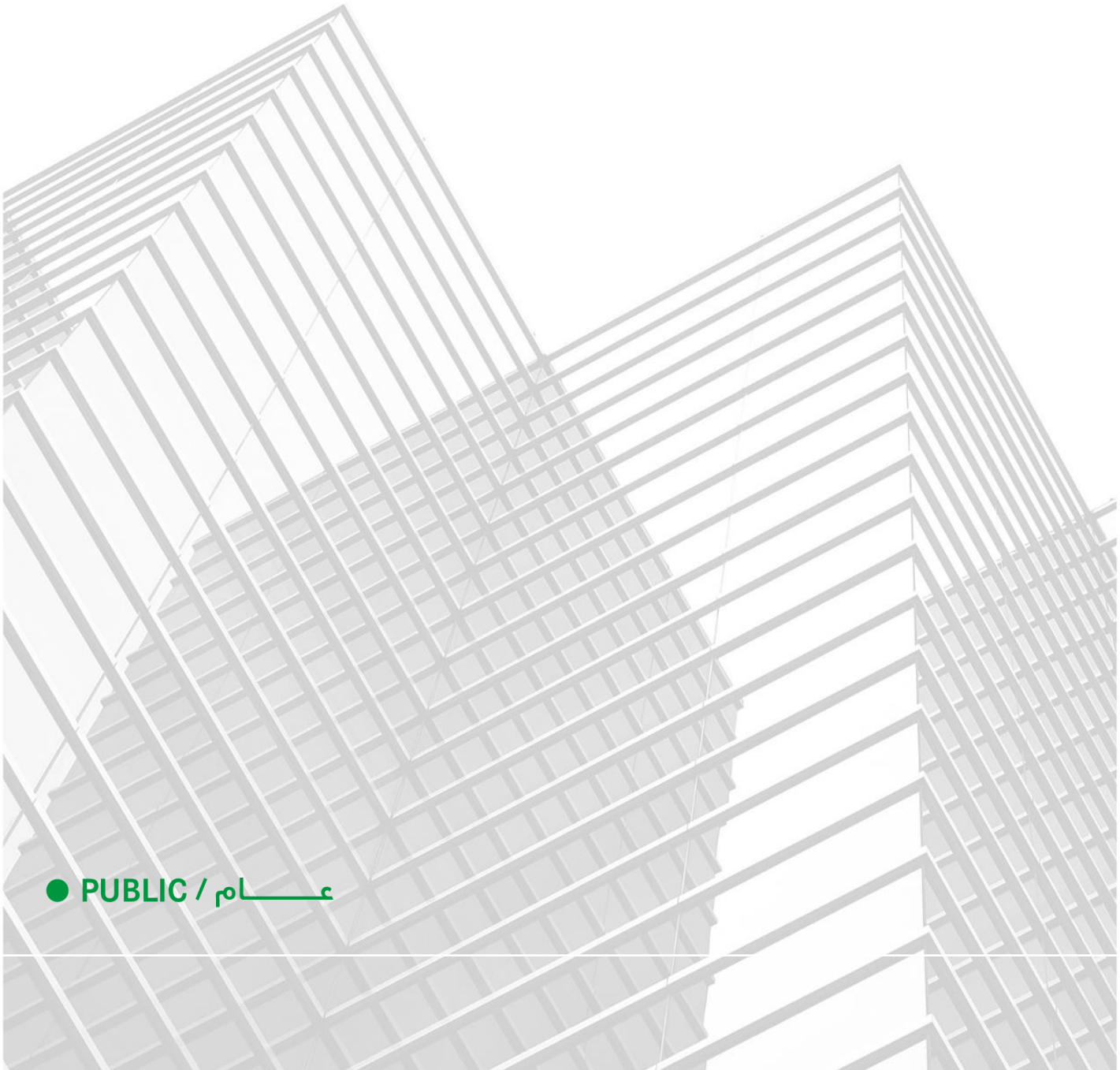
DEPARTMENT OF HEALTH

ANNEXURES- EMS Clinical Protocols



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ANNEX 1: Universal Care

Aliases

1. Patient assessment
2. Primary survey
3. Patient history
4. Physical assessment Secondary survey

Patient Care Goals

Facilitate appropriate initial assessment and management of any EMS patient and link to appropriate specific Protocols as dictated by the findings within the Universal Care Protocol

Patient Presentation

Inclusion Criteria

All patients encounters with and care delivered by EMS personnel.

Exclusion Criteria

None

Patient Management

Assessment

1- Assess scene safety.
   a. Evaluate hazards to EMS personnel, patients, bystanders.
   b. Safely remove patient from hazards prior to beginning medical care.
   c. Determine number of patients
   d. Determine mechanism of injury or potential source of illness
   e. Request additional resources if needed and weigh the benefits of waiting for additional resources against rapid transport to definitive care. MCI declarations when appropriate.
2- Use appropriate personal protective equipment (PPE)
   a. Consider suspected or confirmed hazards on scene.
   b. Consider suspected or confirmed highly contagious infectious disease (e.g., contact [bodily fluids], droplet, airborne)
3- Wear high-visibility, retro-reflective apparel when deemed appropriate (e.g., operations at night or in darkness, on or near roadways)
4- Consider cervical spine stabilization and/or spinal care if traumatic injury is suspected. [See Spine Care Protocol]
5- Primary survey:
   (**A**irway, **B**reathing, **C**irculation (**ABC**) is cited below; although there are specific circumstances where **C**irculation, **A**irway, **B**reathing (**CAB**) may be indicated, such as for cardiac arrest, or Massive hemorrhage, **A**irway, **R**espirations, **C**irculation, **H**ypothermia and head injury (**MARCH**) may be indicated for trauma or major arterial bleeding
   a. Airway (assess for patency and open the airway as indicated) – go to Airway Management Protocol:
   Patient is unable to maintain airway patency—open airway.
      I. Head tilt/chin lift
      II. Jaw thrust.
      III. Suction.
      IV. Consider use of the appropriate airway management adjuncts and devices: oral airway, nasal airway, supraglottic airway device or endotracheal tube.

V. For patients with laryngectomies or tracheostomies, remove all objects or clothing that may obstruct the opening of these devices, maintain the flow of prescribed oxygen, and reposition the head and/or neck.

b. Breathing
   I. Evaluate rate, breath sounds, accessory muscle use, retractions, patient positioning, oxygen saturation.
   II. Provide supplemental oxygen as appropriate to achieve the target of 94–98% oxygen saturation (SPO2) based upon clinical presentation and assessment of ventilation (e.g., EtCO2).
   III. Apnea (not breathing) – go to Airway Management Protocol

c. Circulation.
   I. Control any major external bleeding [See General Trauma Management Protocol and/or Extremity Trauma/External Hemorrhage Management Protocol] .
   II. Assess pulse:
      ♦ If none – go to Resuscitation Section
      ♦ Assess the rate and quality of carotid and radial pulses.
   III. Evaluate perfusion by assessing skin color and temperature 1. Evaluate capillary refill.

d. Disability
   I. Evaluate patient responsiveness: AVPU (Alert, Verbal, Painful, Unresponsive)
   II. Evaluate gross motor and sensory function in all extremities.
   III. Check blood glucose in patients with altered mental status (AMS) or suspected stroke. If blood glucose is less than 60 mg/dL – go to Hypoglycemia Protocol.
   IV. If acute stroke suspected – go to Suspected Stroke/Transient Ischemic Attack Protocol

e. Expose patient for exam as appropriate to complaint.
   I. Be considerate of patient modesty.
   II. Keep patient warm.

6- Assess the urgency of transport.

7- 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
   II. Ears
   III. Naso-orophraynx
   IV. Skull and scalp

b. Neck:
   I. Jugular venous distension
   II. Tracheal position
   III. Spinal tenderness

c. Chest:
   I. Retractions
   II. Breath sounds
   III. Chest wall tenderness, deformity, crepitus, and excursion
   IV. Respiratory pattern, symmetry of chest movement with respiration

d. Abdomen/Back:
   I. Tenderness or bruising

II. Abdominal distension, rebound, or guarding.
III. Spinal tenderness, crepitus, or step-offs
IV. Pelvic stability or tenderness

e. Extremities:
I. Pulses
II. Edema
III. Deformity/crepitus

f. Neurologic:
I. Mental status/orientation
II. Motor/sensory

g. Evaluate for medical equipment (e.g., pacemaker/defibrillator, left ventricular assist device (LVAD), insulin pump, dialysis fistula)

8- Obtain baseline vital signs (an initial full set of vital signs is required: pulse, blood pressure, respiratory rate, neurologic status assessment and obtain pulse oximetry if indicated)

A. Neurologic status assessment [See Footnote III. Neurologic Status Assessment] involves establishing a baseline and then trending any change in patient neurologic status:
I. Glasgow Coma Score (GCS) is frequently used, but there are often errors in applying and calculating this score. With this in consideration, a simpler field approach may be as valid as GCS. Either AVPU or only the motor component of the GCS may more effectively serve in this capacity
II. Sternal rub as a stimulus is discouraged.

B. Patients with cardiac or respiratory complaints
I. Pulse oximetry
II. 12-lead electrocardiogram (EKG) should be obtained promptly in patients with cardiac or suspected cardiac complaints
III. Continuous cardiac monitoring, if available
IV. Consider waveform capnography for patients with respiratory complaints (essential for critical patients and those patients who require invasive airway management)

C. Patient with altered mental status
I. Check blood glucose. If low, go to Hypoglycemia Protocol
II. Consider waveform capnography (essential for critical patients and those patients who require invasive airway management) or digital capnometry.

D. Stable patients should have at least two sets of pertinent vital signs. Ideally, one set should be taken shortly before arrival at the receiving facility.

E. Critical patients should have pertinent vital signs frequently monitored.

9- Obtain **OPQRST** history:

a. **O**nset of symptoms
b. **P**rovocation: location; any exacerbating or alleviating factors
c. **Q**uality of pain
d. **R**adiation of pain
e. **S**everity of symptoms: pain scale
f. **T**ime of onset and circumstances around onset

10- Obtain **SAMPLE** history:

a. **S**ymptoms
b. **A**llergies: medication, environmental, and foods
c. **M**edications: prescription and over the counter; bring containers to ED if possible
d. **P**ast 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)
III. For females of childbearing age, inquire of potential or recent pregnancy.

e. **L**ast oral intake
f. **E**vents leading up to the 911 call.

In patients with syncope, seizure, altered mental status, or acute stroke, consider bringing the witness to the hospital or obtaining their contact phone number to provide to ED care team.

Treatment and Interventions

1- Administer oxygen as appropriate with a target of achieving 94–98% saturation and select the appropriate method of oxygen delivery to mitigate or treat hypercarbia associated with hypoventilation.
2- Place appropriate monitoring equipment as dictated by assessment; these may include:
   A. Continuous pulse oximetry
   B. Cardiac rhythm monitoring
   C. Waveform capnography or digital capnometry
   D. Carbon monoxide assessment
3- Establish vascular access if indicated or in patients who are at risk for clinical deterioration.
   A. If IO is to be used for a conscious patient, consider the use of 0.5 mg/kg of lidocaine 0.1 mg/mL with slow push through IO needle to a maximum of 40 mg to mitigate pain from IO medication administration.
4- Monitor pain scale if appropriate.
5- Monitor agitation-sedation scale if appropriate.
6- Reassess patient.

Transfer of Care

1- The content and quality of information provided during the transfer of patient care to another party is critical for seamless patient care and maintenance of patient safety.
2- Ideally, a completed electronic or written medical record should be provided to the next caregiver at the time of transfer of care.
3- If provision of the completed medical record is not possible at the time of transfer of care, a verbal report and an abbreviated written run report should be provided to the next caregiver.
4- The information provided during the transfer of care should include, but is not limited to:
   A. Patient's full name
   B. Age
   C. Chief complaint
   D. History of present illness/Mechanism of injury
   E. Past medical history
   F. Medications
   G. Allergies
   H. Vital signs with documented times
   I. Patient assessment and interventions along with the timing of any medication or intervention and the patient's response to such interventions
5- The verbal or abbreviated written run report provided at the time of transfer of care does not take the place of or negate the requirement for the provision of a complete electronic or written medical record of the care provided by EMS personnel.

Patient Safety Considerations

1. Routine use of lights and sirens is not warranted.
2. Even when lights and sirens are in use, always limit speeds to a level that is safe for the emergency vehicle being driven and road conditions on which it is being operated.
3. 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)
4. Be aware of potential need to adjust management based on patient age and comorbidities, including medication dosages.
5. The maximum weight-based dose of medication administered to a pediatric patient should not exceed the maximum adult dose except where specifically stated in a patient care Protocol.
6. Medical direction should be contacted when mandated or as needed. If uncertain, err on the side of contacting medical direction.
7. Consider air medical transport, if available, for patients with time-critical conditions where ground transport time exceeds 30 minutes.

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

   I. Although the defined age varies, the pediatric population is generally defined by those patients who weigh up to 40 kg or up to 14 years of age, whichever comes first.
   II. Consider using the pediatric assessment triangle (appearance, work of breathing, circulation) when first approaching a child to help with assessment.

2- Geriatrics: although the defined age varies, the geriatric population is generally defined as those patients who are 65 years old or more

   I. In these patients, as well as all adult patients, reduced medication dosages may 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)

3- Co-morbidities: reduced medication dosages may apply to patients with renal disease (i.e., on dialysis or a diagnosis of chronic renal insufficiency), hepatic disease (i.e., severe cirrhosis or end-stage liver disease), or the elderly.

4- Vital Signs:

   A. Oxygen
      I. Administer oxygen as appropriate with a target of achieving 94–98% saturation.
      II. Supplemental oxygen administration is warranted to patients with oxygen saturations below this level and titrated based upon clinical condition, clinical response, and geographic location and altitude.
      III. The method of oxygen delivery should minimize or treat hypercarbia associated with hypoventilation.
   B. Normal vital signs (See Table 1. Normal Vital Signs)
      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.

C. Hypertension. Although abnormal, may be an expected finding in many patients:
I. Unless an intervention is specifically suggested based on the patient's complaint or presentation, the hypertension should be documented, but otherwise, no intervention should be taken acutely to normalize the blood pressure.
II. The occurrence of symptoms (e.g., chest pain, dyspnea, vision change, headache, focal weakness or change in sensation, altered mental status) in patients with hypertension should be considered concerning, and care should be provided appropriate with the patient's complaint or presentation.

5- Secondary Survey: if patient has critical primary survey problems, it may not be possible to complete.
6- Critical Patients: proactive patient management should occur simultaneously with assessment:
A. Ideally, one clinician should be assigned to exclusively monitor and facilitate patient-focused care.
B. Other than lifesaving interventions that prevent deterioration en route, treatment and Interventions should be initiated as soon as practical, but should not impede extrication or delay transport to definitive care.
7- Air Medical Transport: air transport of trauma patients should generally be reserved for higher acuity trauma patients where there is a significant time saved over ground transport, where the appropriate destination is not accessible by ground due to systemic or logistical issues, and for patients who meet anatomic, physiologic, and situational high-acuity triage criteria. In selected circumstances, air medical resources may be helpful for non-trauma care (e.g., stroke, STEMI when geographically constrained or when ground distances would place patient outside of a treatment window).
8- Additional Protective Measures for the EMS Clinician: Due to suspected or confirmed hazards and/or highly infectious contagious diseases, traditional patient treatment and care delivery may be altered due to recommendations by national, local or jurisdictional officials.

Quality Improvement

Key Documentation Elements

- At least two sets of vital signs should be documented for every patient.
- All patient interventions and response to care should be documented.
- All major changes in clinical status including, but not limited to, vital signs and data from monitoring equipment, should be documented.

Performance Measures

- Abnormal vital signs should be addressed and reassessed.
- Response to therapy provided should be documented including pain scale, improvement or deterioration in patient clinical status, or agitation-sedation scale (e.g., Richmond Agitation-Sedation Scale (RASS)) reassessment if appropriate.
- Limit scene time for patients with time-critical illness or injury unless clinically indicated.
- Appropriate utilization of air medical services
- Blood glucose level obtained when indicated.
- Appropriate triage and transport to designated centers (e.g. trauma, STEMI) when indicated
- Compliance with provision of critical information during patient transfer of care

Table 1. Normal Vital Signs

Age	Pulse-Awake (beats/minute)	Pulse-Sleeping (beats/minute)	Respiratory Rate (breaths/minute)	Systolic BP (mmHg)
Preterm less than 1 kg	120–160		30–60	39–59
Preterm 1–3 kg	120–160		30–60	60–76
Newborn	100–205	85–160	30–60	67–84
Up to 1 year	100–190	90–160	30–60	72–104
1–2 years	100–190	90–160	24–40	86–106
2–3 years	98–140	60–120	24–40	86–106
3–4 years	80–140	60–100	24–40	89–112
4–5 years	80–140	60–100	22–34	89–112
5–6 years	75–140	58–90	22–34	89–112
6–10 years	75–140	58–90	18–30	97–115
10–12 years	75–118	58–90	18–30	102–120
12–13 years	60–100	58–90	15–20	110–131
13–15 years	60–100	50–90	15–20	110–131
15 years or older	60–100	50–90	15–20	110–131
Source: Extrapolated from the 2020 American Heart Association Pediatric Advanced Life Support's tables from the Nursing Care of the Critically Ill Child, and from Web Box 1: Existing reference ranges for respiratory rate and heart rate in the Annex of the article by Fleming, et al, published in Lancet				
Note: While many factors affect blood pressure (e.g., pain, activity, hydration), it is imperative to rapidly recognize hypotension, especially in children. For children of the ages 1–10, hypotension is present if the systolic blood pressure is less than 70 mmHg + (child's age in years x 2) mmHg.				

Table 2. Glasgow Coma Scale

ADULT GLASGOW COMA SCALE		PEDIATRIC GLASGOW COMA SCALE	
Eye Opening (4)		**Eye Opening (4)**	
Spontaneous	4	Spontaneous	4
To Speech	3	To Speech	3
To Pain	2	To Pain	2
None	1	None	1
Best Motor Response (6)		**Best Motor Response (6)**	
Obeys Commands	6	Spontaneous Movement	6
Localizes Pain	5	Withdraws to Touch	5
Withdraws from Pain	4	Withdraws from Pain	4
Abnormal Flexion	3	Abnormal Flexion	3
Abnormal Extension	2	Abnormal Extension	2
None	1	None	1
Verbal Response (5)		**Verbal Response (5)**	
Oriented	5	Coos, Babbles	5
Confused	4	Irritable Cry	4
Inappropriate	3	Cries to Pain	3
Incomprehensible	2	Moans to Pain	2
None	1	None	1
Total		**Total**	
Source: https://www.cdc.gov/masstrauma/resources/gcs.pdf			

Functional Needs

Aliases

1. Person of determination
2. Developmental delay
3. Special needs
4. Handicapped
5. Intellectual Disability
6. Disabled

Patient Care Goals

To meet and maintain the additional support required for patients with functional needs (person of determination) 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 have experienced a decrement in health resulting in some degree of disability. This includes, but is not limited to, individuals with physical, sensory, mental health, and cognitive and/or intellectual disabilities affecting their ability to function independently without assistance.

Exclusion Criteria

None noted

Patient Management

Assessment

1. Identify the functional need by means of information from the patient, the patient's family, bystanders, medic alert bracelets or documents, or the patient's adjunct assistance devices
2. The physical examination should not be intentionally abbreviated, although the way the exam is performed may need to be modified to accommodate the specific needs of the patient

Treatment and Interventions

Medical care should not intentionally be reduced or abbreviated during the triage, treatment, and transport of patients with functional needs, although the way the care is provided may need to be modified 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. The family members can be an excellent source of information and the presence of a family member can have a calming influence on some of these patients

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 that of the EMS professional
      iv. Examples of tools to overcome language barriers include:

1. Transport of an individual who is fluent in the patient's language along with the patient to the hospital
2. Medical translation cards
3. Telephone-accessible services with live language interpreters
4. Methods through which the patient augments his/her communication skills (e.g., eye blinking, nodding) should be noted, utilized as able, and communicated to the receiving facility
5. Electronic applications for translation

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

2. Physical Barriers:
   a. Ambulatory impairment (e.g., limb amputation, bariatric)
   b. Neuromuscular impairment
3. Cognitive Barriers:
   a. Mental illness
   b. Developmental challenge or delay

Pertinent Assessment Findings

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

Patient Refusals

Aliases

1. Against medical advice
2. Refusal of treatment
3. Refusal of transport

Patient Care Goals/Patient Presentation (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 clinicians have been called to the scene, clinicians should determine the patient's capacity to make decisions. Competency is generally a legal status of a person's ability to make decisions. One should consult with the respective EMS office of medical director for clarification on legal definitions and patient rights.

Patient Management

Assessment

1. Decision-Making Capacity
   a. An individual who is alert, oriented, and can understand the circumstances surrounding his/her illness or impairment, as well as the possible risks associated

with refusing treatment and/or transport, typically is considered to have decision-making capacity

b. The individual's judgment must also not be significantly impaired by illness, injury, or drugs/alcohol intoxication. Individuals who have attempted suicide, verbalized suicidal intent, or had other factors that lead EMS clinicians to suspect suicidal intent, should not be regarded as having decision-making capacity and may not decline transport to a medical facility

Treatment and Interventions

1. Obtain a complete set of vital signs and complete an initial assessment, paying 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 his/her illness or injury; if the EMS clinician has doubts about whether the individual has the mental capacity to refuse or if the patient lacks capacity, the EMS clinician should contact medical direction
4. If patient has capacity, clearly explain to the individual and all responsible parties the possible risks and overall concerns with regards to refusing care and that they may reengage the EMS system if needed
5. Perform appropriate medical care with the consent of the individual, refusal of transport does not imply the patient is refusing all treatment
6. 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

Notes/Educational Pearls

Key Considerations

1- An adult who has demonstrated possessing sufficient mental capacity for making decisions has the right to determine the course of his/her medical care, including the refusal of care

2- Individuals must be advised of the risks and consequences resulting from refusal of medical care to enable an informed decision regarding consent or refusal of treatment.

3- An individual determined to lack decision-making capacity by EMS clinicians should not be allowed to refuse care against medical advice or to be leased at the scene. Mental illness, drugs, alcohol intoxication, or physical/mental impairment may significantly impair an individual's decision-making capacity. Individuals who have attempted suicide, verbalized suicidal intent, or had other factors that lead EMS clinicians to suspect suicidal intent, should not be regarded as having demonstrated sufficient decision-making capacity.

4- The determination of decision-making capacity may be challenged by communication barriers or cultural differences.

5- EMS clinicians should not put themselves in danger by attempting to treat and/or transport an individual who refuses care. Law enforcement personnel should be requested if needed.

6- Always act in the best interest of the patient. EMS clinicians, with the support of direct medical oversight, must strike a balance between abandoning the patient and forcing care.

7- ***Special Considerations – Minors***

It is preferable for minors to have a parent or legal guardian who can provide consent for treatment on behalf of the child:

Healthcare clinicians may provide emergency treatment when a parent is not available to provide consent. This is known as the emergency exception rule or the doctrine of implied consent. For minors, this doctrine means that the EMS clinician can presume consent and proceed with appropriate treatment and transport if the following six conditions are met:

I. The child is suffering from an emergency condition that places their life or health in danger.
II. The child's legal guardian is unavailable or unable to provide consent for treatment or transport.
III. Treatment or transport cannot be safely delayed until consent can be obtained.
IV. The EMS clinician administers only treatment for emergency conditions that pose an immediate threat to the child.
V. As a rule, when the EMS clinician's authority to act is in doubt, EMS clinicians should always do what they believe to be in the best interest of the minor.
VI. If a minor is injured or ill and no parent contact is possible, the EMS clinician may contact medical direction for additional instructions.

Quality Improvement

Key Documentation Elements

- Document patient capacity with:
    I. Exam fields for "eExam.19—Mental Status" and "eExam.20—Neurological Assessment"
    II. Vitals for level of responsiveness and Glasgow Coma Scale
    III. Alcohol and drug use indicators
    IV. Blood glucose level (as appropriate to situation and patient history)
- Patient Age
- Minors who and adults with a legal guardian: guardian name, contact, and relationship
- Any efforts made to contact guardians if contact could not be made
- What the patient's plan is after refusal of care and/or transport
- Who will be with the patient after EMS departs
- Patient was advised that they can change their mind and EMS can be contacted again at any time.
- Patient was advised of possible risks to their health resulting from refusing care and/or transport.
- Patient voices understanding of risks. A quotation of the patient's actual words, stating they understand, is best
- Reason for patient refusing care. A quotation of the patient's actual words, stating they understand, is best
- Medical direction contact
- Any assessments and treatments performed.

Performance Measures

- Patient decision-making capacity was determined and documented.
- Medical direction was contacted if indicated by EMS agency protocol.
- Guardians contacted or efforts to contact the guardians for minor patients.

ANNEX 2: Cardiovascular

Adult and Pediatric Syncope and Near Syncope

Aliases
Loss of consciousness

Patient Care Goals

1. Stabilize and resuscitate when necessary
2. Initiate monitoring and diagnostic procedures
3. Transfer for further evaluation

Patient Presentation

1. Syncope is heralded by both the loss of consciousness and the loss of postural tone and resolves spontaneously without medical interventions. Syncope typically is abrupt in onset and resolves equally quickly. EMS clinicians may find the patient awake and alert on initial evaluation
2. Near syncope is defined as the prodromal symptoms of syncope. The symptoms that can precede syncope last for seconds to minutes with signs and symptoms that may include pallor, sweating, lightheadedness, visual changes, or weakness. It may be described by the patient as "nearly blacking out" or "nearly fainting". Near syncope should be treated as syncope for the purpose of these Protocols
3. Rapid first aid during the onset may improve symptoms and prevent syncope

Inclusion Criteria

1. Abrupt loss of consciousness with loss of postural tone
2. Prodromal symptoms of syncope

Exclusion Criteria
Conditions other than the above, including:

1. Patients with alternate and obvious cause of loss of consciousness (e.g., trauma – See Head Injury Protocol)
2. Patients with ongoing mental status changes or coma should be treated per the Altered Mental Status Protocol
3. Patients with persistent new neurologic deficit [See Suspected Stroke/Transient Ischemic Attack Protocol]

Patient Management

Assessment

1. Pertinent History
   a. Review the patient's past medical history including a history of:
      I. Cardiovascular disease (e.g., cardiac disease/stroke, valvular disease, hypertrophic cardiomyopathy, mitral valve prolapse)
      II. Seizure
      III. Recent trauma
      IV. Active cancer diagnosis
      V. Dysrhythmias including prior electrophysiology studies/pacemaker and/or implantable cardioverter defibrillator (ICD)
      VI. History of syncope
      VII. History of thrombosis or emboli
   b. History of Present Illness, including:

I. Conditions leading to the event: after transition from recumbent/sitting to standing; occurring with strenuous exercise (notably in the young and seemingly healthy)
II. Syncope that occurs during exercise often indicates an ominous cardiac cause. Patients should be evaluated in the emergency department.
III. Patient complaints before or after the event including prodromal symptoms
IV. History of symptoms described by 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

c. Review of Systems:
I. Current medications (new medications, changes in doses)
II. Fluid losses (nausea/vomiting/diarrhea) and fluid intake iii. Last menstrual period/pregnant
III. Occult blood loss (gastrointestinal (GI)/genitourinary (GU))
IV. Palpitations
V. Unilateral Leg swelling, history of recent travel, prolonged immobilization, malignancy

d. Pertinent Physical Exam including:
I. Attention to vital signs and evaluation for trauma
II. Note overall patient appearance, diaphoresis, pallor
III. Detailed neurologic exam (including stroke screening and mental status)
IV. iv. Heart, lung, abdominal, and extremity exam
V. Additional Evaluation:
a. Cardiac monitoring
b. Oxygen saturation (SPO2)
c. Ongoing vital signs
d. 12-lead EKG
e. Blood glucose level (BGL)

Treatment and Interventions:

1. Should be directed at abnormalities discovered in the physical exam or on additional examination and may include management of cardiac dysrhythmias, cardiac ischemia/infarct, hemorrhage, shock, etc.
a. Manage airway as indicated
b. Oxygen as appropriate
c. Evaluate for hemorrhage and treat for shock if indicated
d. Establish IV access
e. Fluid bolus if appropriate
f. Cardiac monitor
g. 12-lead EKG
h. Monitor for and treat arrhythmias (if present, refer to appropriate Protocol)

Patient Safety Considerations:

1. Patients suffering from syncope due to arrhythmia may experience recurrent arrhythmias and should therefore be placed on a cardiac monitor
2. Geriatric patients suffering falls from standing may sustain significant injury and should be diligently screened for trauma. [General Trauma Management Protocol]

Notes/Educational Pearls

Key Considerations

1. By being most proximate to the scene and to the patient's presentation, EMS clinicians are commonly in a unique position to identify the cause of syncope. Consideration of potential causes, ongoing monitoring of vitals and cardiac rhythm and detailed exam and history are essential pieces of information to pass on to hospital clinicians
2. For patients where a lower risk etiology is suspected, e.g., vasovagal syncope with normal ecg, decisions regarding delayed or non-transport should be made in consultation with medical direction
3. High-risk causes of syncope include, but are not limited to, the following:
    a. Cardiovascular
        I. Myocardial infarction
        II. Aortic stenosis
        III. Hypertrophic cardiomyopathy (consider in young patient with unexplained syncope during exertion)
        IV. Pulmonary embolus
        V. Aortic dissection
        VI. Dysrhythmia
        VII. Mitral valve prolapse is associated with higher risk for sudden death
    b. Neurovascular
        I. Intracranial hemorrhage
        II. Transient ischemic attack or stroke
        III. Vertebral basilar insufficiency
    c. Hemorrhagic
        I. Ruptured ectopic pregnancy
        II. GI bleed
        III. Aortic rupture
4. Consider high-risk 12-lead EKG features including, but not limited to:
    a. Evidence of QT prolongation (generally over 500 msec)
    b. Delta waves
    c. Brugada syndrome (incomplete right bundle branch block (RBBB) pattern in V1/V2 with ST segment elevation)
    d. Hypertrophic obstructive cardiomyopathy

Pertinent Assessment Findings

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

Quality Improvement

Key Documentation Elements

- Presenting cardiac rhythm
- Cardiac rhythm present when patient is symptomatic
- Any cardiac rhythm changes
- Blood pressure
- Pulse

- Blood glucose level (BGL)
- Symptoms immediately preceding event
- Patient status on EMS arrival: recovered or still symptomatic

Performance Measures

- Acquisition of 12-lead EKG
- Application of cardiac monitor

Chest Pain/Acute Coronary Syndrome (ACS)/ST-segment Elevation Myocardial Infarction (STEMI)

Aliases

1. Heart attack
2. Myocardial infarction (MI)

Patient Care Goals

1. Identify ST-elevation myocardial infarction (STEMI) quickly 2. Determine the time of symptom onset
3. Activate hospital-based STEMI system of care
4. Monitor vital signs and cardiac rhythm and be prepared to provide CPR and defibrillation if needed
5. Administer appropriate medications
6. Transport to appropriate facility

Patient Presentation

Inclusion Criteria

1. Chest pain or discomfort in other areas of the body (e.g., arm, jaw, epigastrium) of suspected cardiac origin, shortness of breath, associated or unexplained sweating, nausea, vomiting, or dizziness. Atypical or unusual symptoms are more common in women, the elderly, and diabetic patients. May also present with CHF, syncope, and/or shock
2. Chest pain associated sympathomimetic use (e.g., cocaine, methamphetamine)
3. Some patients will present with likely non-cardiac chest pain and otherwise have a low likelihood of ACS (e.g., blunt trauma to the chest of a child). For these patients, defer the administration of aspirin (ASA) and nitrates per the Pain Management Protocol

Exclusion Criteria

None noted

Patient Management

Assessment, Treatment, and Interventions

a. Signs and symptoms include chest pain, congestive heart failure (CHF), syncope, shock, symptoms similar to a patient's previous MI

2. Assess the patient's cardiac rhythm and immediately address pulseless rhythms, symptomatic tachycardia, or symptomatic bradycardia [See Cardiovascular Section and Resuscitation Section]
3. If the patient is dyspneic, hypoxemic, or has obvious signs of heart failure, EMS clinicians should administer oxygen as appropriate with a target of achieving 94–98% saturation [Refer to Universal Care Protocol]

4. The 12-lead EKG is the primary diagnostic tool that identifies a STEMI; it is imperative that EMS clinicians routinely acquire a 12-lead EKG within 10 minutes for all patients exhibiting signs and symptoms of ACS
    a. The EKG may be transmitted for remote interpretation by a physician or screened for STEMI by properly trained EMS clinicians or other healthcare providers with or without the assistance of computer-interpretation
    b. Advance notification should be provided to the receiving hospital for patients identified as having a STEMI
    c. Performance of serial EKGs is encouraged for symptomatic patients with EKGs initially non-diagnostic for STEMI
    d. All EKGs should be made available to treating personnel at the receiving hospital, whether hand delivered as hard copy or transmitted from the field
5. Administer aspirin; chewable, non-enteric-coated aspirin preferred (162–325 mg)
6. Establish IV access
7. Nitroglycerin 0.4 mg sublingual (SL), can repeat every 3–5 minutes if SBP greater than 100 mmHg
    a. The use of nitrates should be avoided in any patient who has used a phosphodiesterase inhibitor within the past 48 hours
    b. Examples include sildenafil (Viagra®, Revatio®), vardenafil (Levitra®, Staxyn®), tadalafil (Cialis®, Adcirca®) which are used for erectile dysfunction and pulmonary hypertension. Also avoid use in patients receiving intravenous epoprostenol (Flolan®) or treporstenil (Remodulin®) which is used for pulmonary hypertension
    c. Care should always be taken when giving nitroglycerin when the patient's blood pressure is marginal. If used in this setting, the clinician should weigh the risk and benefit of nitrate administration over the administration of an opiate analgesic and be ready to respond to hypotension with fluid bolus
8. The location of the infarct does not preclude the use of nitrates. Right-sided leads are of no additional value if an inferior STEMI has been diagnosed and such findings (presumed RV infarct) do not preclude the use of nitroglycerin: however, continually monitor the patient's hemodynamic status and be prepared to resuscitate if hypotension occurs
9. If the pain is unresponsive to nitrates, opiates are an acceptable alternative. Morphine should be used with caution in unstable angina (UA)/non-STEMI due to an association with increased mortality
10. Transport and destination decisions should be based on local resources and system of care
11. Early notification to receiving facility of any changes in patient condition or serial EKGs

Patient Safety Considerations

a. Observe for signs of clinical deterioration: dysrhythmias, chest pain, shortness of breath, decreased level of consciousness/syncope, or other signs of shock/hypotension

2. Perform serial 12-lead EKGs (especially if clinical changes are noted) 3. Consider placing defibrillator pads on high-risk patients
3. Consider configuring monitor/defibrillator to allow automatic VT/VF alert
4. Consider configuring monitor/defibrillator to allow ST-segment trending if available

Notes/Educational Pearls

Key Considerations

Acute coronary syndrome may present with atypical pain, vague or only generalized complaints.

Ischemic burden time is a risk for morbidity and mortality, EMS can help decrease first medical contact to intervention time/reflow by efficient training and of safely minimizing on scene time

Pertinent Assessment Findings

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

Quality Improvement

Key Documentation Elements

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

Performance Measures

- The time of patient contact by the first medical provider to the time of 12-lead EKG acquisition within 10 minutes
- The time from first diagnostic 12-lead EKG to STEMI notification
- Confirmation patient received ASA (taken prior to EMS arrival, advised by dispatch, given by EMS, or substantiated by other pertinent negatives)
- The time of a STEMI patient's ultimate arrival to a receiving hospital

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

*The time of arrival at the percutaneous coronary intervention (PCI) center to the time of cardiac catheterization (door-to-balloon time) or if patient not transported directly to PCI center, the time of arrival at receiving hospital to thrombolytics

*The time of prehospital 12-lead EKG acquisition to the time of device deployment (formerly EKG-to-balloon time)

Bradycardia

Aliases

1. Heart block
2. Junctional rhythm

Patient Care Goals

1. Maintain adequate perfusion
2. Treat underlying cause:
   a. Hypoxia
   b. Shock
   c. Second- or third-degree atrioventricular (AV) block
   d. Toxin exposure (beta-blocker, calcium channel blocker, organophosphates, digoxin)
   e. Electrolyte disorder
   f. Hypoglycemia
   g. Increased intracranial pressure (ICP)
   h. Other

Patient Presentation

Inclusion Criteria

1. Heart rate less than 60 beats per minute (BPM) with either symptoms (altered mental status (AMS), chest pain (CP), congestive heart failure (CHF), seizure, syncope, shock, pallor, diaphoresis) or evidence of hemodynamic instability
2. The major EKG rhythms classified as bradycardia include:
   a. Sinus bradycardia
   b. Second-degree AV block
      i. Type I-Wenckebach/Mobitz II
      ii. Type II-Mobitz II
   c. Third-degree AV block, complete heart block d. Ventricular escape rhythms
3. See additional inclusion criteria for pediatric patients

Exclusion Criteria None noted

Patient Management

Assessment, Treatment, and Interventions

1. Adult Management

a. Manage airway as necessary
b. Administer oxygen as appropriate with a target of achieving 94–98% saturation
c. Initiate monitoring and perform 12-lead EKG
d. Establish IV access
e. Check blood glucose and treat hypoglycemia per the Hypoglycemia Protocol and Hyperglycemia Protocol
f. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:
   i. Atropine 1 mg IV every 3–5 minutes (maximum total dose of 3 mg)
   ii. Vasopressor medications (in order of preference)
      1. Epinephrine (Adrenaline) IV drip 0.02–0.2 mcg/kg/min titrated to a MAP greater than 65 mmHg **OR**
      2. Epinephrine (Adrenaline) by push dose (dilute boluses): for example, prepare 10 mcg/mL by adding 1 mL of 0.1 mg/mL epinephrine to 9 mL of normal saline, then administer 10–20 mcg boluses (1–2 mL) q 2 minutes titrated MAP greater than 65 mmHg **OR**
      3. Norepinephrine (Noradrenaline) 0.02–0.4 mcg/kg/minute IV titrated to a MAP greater than 65 mmHg

iii. Transcutaneous Pacing – If pacing is performed, consider sedation or pain control

2. Pediatric Management

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

a. For infants and newborns, initiate chest compressions for heart rate less than 60 BPM and signs of poor perfusion (altered mental status, hypoxia, hypotension, weak pulse, delayed capillary refill, cyanosis)

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 clinician is present)

c. Administer oxygen as appropriate with a target of achieving 94–98% saturation

d. Initiate monitoring and perform 12-lead EKG

e. Establish IV access

f. Check blood glucose and treat hypoglycemia per the Hypoglycemia Protocol

g. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:

i. Epinephrine (Adrenaline) by push dose (dilute boluses). For example, prepare 10 mcg/mL by adding 1 mL of 0.1 mg/mL epinephrine to 9 mL of normal saline, then administer 0.01 mg/kg (0.1 mL/kg) maximum single dose 10 mcg (1 mL) q 3–5 minutes titrated to MAP greater than 65 mmHg

ii. Also consider atropine 0.01–0.02 mg/kg IV with minimum dose of 0.1 mg if increased vagal tone or cholinergic drug toxicity to maximum initial dose of 0.5 mg (maximum total dose of 3 mg)

iii. Transcutaneous pacing: If pacing is performed, consider sedation or pain control

iv. Epinephrine (Adrenaline) may be used for bradycardia and poor perfusion unresponsive to ventilation and oxygenation

1. It is reasonable to administer atropine for bradycardia caused by increased vagal tone or cholinergic drug toxicity

Patient Safety Considerations

If pacing is performed, consider sedation or pain control

Notes/Educational Pearls

Key Considerations

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 potential culprit medications including beta-blockers, calcium channel blockers, sodium channel blockers/anti-depressants, digoxin, and clonidine
    a. If medication overdose is considered, refer to appropriate Protocol in the Toxins and Environmental Section
4. The differential diagnosis includes the following: myocardial infarction (MI), hypoxia, pacemaker failure, hypothermia, sinus bradycardia, athletes, head injury with increased intracranial pressure (ICP), stroke, spinal cord lesion, sick sinus syndrome, AV blocks, overdose, cholinergic nerve agents
5. Consider hyperkalemia in the patient with wide complex bradycardia
6. Bradycardia should be managed via 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. Dopamine is not indicated for pediatric patients

c. In cases of impending hemodynamic collapse, proceed directly to transcutaneous pacing d. For shock that is suspected to be from sepsis, norepinephrine is preferred over dopamine due to its reduced risk of arrhythmias and its lower mortality rate

7. Be aware of acute coronary syndrome as a cause of bradycardia in adult patients
8. When dosing medications for pediatric patients, dose should be weight-based for non-obese patients and based on ideal body weight for obese patients

Pertinent Assessment Findings

None noted

Quality Improvement

Key Documentation Elements

- Cardiac rhythm/rate
- Time, dose, and response of medications given
- Pacing: Time started or stopped, rate, joules, capture, and response rate0
- Patient weight
- Pediatric length-based tape color (for pediatrics who fit on tape)
- History of event supporting treatment of underlying causes

Implantable Ventricular Assist Devices

Aliases

1. Biventricular assist device (BiVAD)
2. Right ventricular assist device (RVAD)
3. Left ventricular assist device (LVAD)
4. Ventricular assist device (VAD)

Patient Care Goals

1. Rapid identification of, and interventions for, cardiovascular compromise in patients with VADs 2. Rapid identification of, and interventions for, VAD-related malfunctions or complications

Patient Presentation

Inclusion Criteria

1. Adult patients that have had an implantable ventricular assist device (VAD), including a left ventricular assist device (LVAD), right ventricular assist device (RVAD), or biventricular-assist device (BiVAD) and have symptoms of cardiovascular compromise
2. Patients with VADs that are in cardiac arrest
3. Patients with VADs that are experiencing a medical or injury-related event not involving the cardiovascular system or VAD malfunction

Exclusion Criteria

Adult patients who do not have a VAD in place

Patient Management

Assessment

1. Assess for possible pump malfunction
   a. Assess for alarms
   b. Auscultate for pump sound “hum”
   c. Signs of hypoperfusion including pallor, diaphoresis, altered mental status
2. If the VAD pump has malfunctioned:

a. Utilize available resources to troubleshoot potential VAD malfunctions and to determine appropriate corrective actions to restore normal VAD function:
   i. Contact the patient's VAD-trained companion, if available
   ii. Contact the patient's VAD coordinator, using the phone number on the device iii. Check all the connections to system controller
   iv. Change VAD batteries, and/or change system controller if indicated
   v. Have patient stop all activity and assess for patient tolerance
   vi. Follow appropriate cardiovascular condition-specific protocol(s) as indicated

Treatment and Interventions

1. Manage airway as indicated
2. Cardiac monitoring
3. IV access
4. Acquire 12-lead EKG
5. If patient is experiencing VAD-related complications or cardiovascular problems, expedite transport to the medical facility where VAD was placed if patient's clinical condition and time allows
6. If patient has a functioning VAD and is experiencing a non-cardiovascular-related problem, transport to a facility that is appropriate for the patient's main presenting problem without manipulating the device
7. If patient has a functioning VAD and is hypoperfused:
   a. Administer IV fluids (30 mL/kg isotonic fluid; maximum of 1 liter) over less than 15 minutes, using a push-pull method of drawing up the fluid in a syringe and pushing it through the IV
8. If patient is in full cardiac arrest:
   a. The decision whether to perform CPR should be made based upon best clinical judgment in consultation with the patient's VAD-trained companion and the VAD coordinator (or direct medical oversight if VAD coordinator unavailable)
   b. CPR may be initiated only where:
      i. You have confirmed the pump has stopped and troubleshooting efforts to restart it have failed, and
      ii. The patient is unresponsive and has no detectable signs of life

Notes/Educational Pearls

1. You do not need to disconnect the controller or batteries to:
   a. Defibrillate or cardiovert
   b. Acquire a 12-lead EKG
2. Automatic non-invasive cuff blood pressures may be difficult to obtain due to the narrow pulse pressure created by the continuous flow pump
3. Flow though many VAD devices is not pulsatile, and patients may not have a palpable pulse or accurate pulse oximetry
4. The blood pressure, if measurable, may not be an accurate measure of perfusion
5. Ventricular fibrillation, ventricular tachycardia, or asystole/PEA may be the patient's "normal" underlying rhythm. Evaluate clinical condition and provide care in consultation with VAD coordinator. If not normal for patient it may be necessary to provide intervention (e.g. signs of hypoperfusion such as altered mental status)
6. The patient's travel bag should always accompany them with back-up controller and spare batteries
7. If feasible, bring the patient's power module, cable, and display module to the hospital
8. All patients should carry a spare pump controller with them
9. The most common cause for VAD alarms is low batteries or battery failures

10. Although automatic non-invasive blood pressure cuffs are often ineffective in measuring systolic and diastolic pressure, if they do obtain a measurement, the MAP is usually accurate

11. Other VAD complications:

a. Infection
b. Stroke/Transient ischemic attack (TIA)
c. Bleeding
d. Arrhythmias
e. Cardiac tamponade
f. Congestive heart failure (CHF)
g. Aortic insufficiency

Quality Improvement

Key Documentation Elements

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

Performance Measures

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

Tachycardia with a Pulse

Aliases

1. Atrial fibrillation (A-FIB)
2. Supraventricular tachycardia (SVT)
3. Torsades
4. Atrial flutter
5. Multifocal atrial tachycardia (MAT)
6. Ventricular tachycardia

Patient Care Goals

1. Maintain adequate oxygenation, ventilation, and perfusion
2. Control ventricular rate
3. Restore regular sinus rhythm in unstable patient 4. Search for underlying cause:
    a. Medications (caffeine, diet pills, thyroid, decongestants) b. Drugs (cocaine, amphetamines)
    b. History of dysrhythmia
    c. congestive heart failure (CHF)

Patient Presentation

Patients will manifest elevated heart rate for age and may or may not also present with associated signs or 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 greater than 100 BPM in adults or relative tachycardia in pediatric patients

Exclusion Criteria

Sinus tachycardia

Patient Management

Assessment, Treatments, and Interventions

1. Adult Management

a. Manage airway as necessary
b. Administer oxygen as appropriate with a target of achieving 94–98% saturation
c. Initiate monitoring and perform 12-lead EKG
d. Establish IV access
e. Check blood glucose and treat hypoglycemia per the Hypoglycemia Protocol
f. Consider the following additional therapies if tachycardia with signs and symptoms or hemodynamic instability continues:

i. **Regular Narrow Complex Tachycardia – Stable** (SVT)

1. Perform vagal maneuvers
2. Adenosine 6 mg IV (proximal site) followed by 10 mL fluid bolus
   a. If tachycardia continues, give adenosine 12 mg IV
   b. A third dose of adenosine, 12 mg IV, can be given
3. Diltiazem 0.25 mg/kg slowly IV over 2 minutes
   a. After 15 minutes, a second dose of diltiazem 0.35 mg/kg IV may be given if needed
   b. For patients older than 65 years old, recommend maximum initial dose of diltiazem 10 mg IV and a maximum second dose of 20 mg
4. Metoprolol 5 mg IV given over 1–2 minutes. May repeat as needed q 5 minutes for a total of 3 doses
5. Verapamil 2.5–5 mg IV given over 2 minutes. May repeat with verapamil 5–10 mg after 15–30 minutes.

ii. **Regular Narrow Complex Tachycardia – Unstable**

1. Deliver a **synchronized** shock based on manufacturer's recommendations
2. For responsive patients, consider sedation and analgesia

iii. **Irregular Narrow Complex Tachycardia – Stable** (atrial fibrillation (A-FIB), atrial flutter, multifocal atrial tachycardia)

1. Diltiazem 0.25 mg/kg slowly IV over 2 minutes
   a. After 15 minutes, a second dose of diltiazem 0.35 mg/kg IV may be given if needed
   b. For patients older than 65 years old, recommend maximum initial dose of diltiazem 10 mg IV and a maximum second dose of 20 mg
2. Metoprolol 5 mg IV given over 1–2 minutes. May repeat as needed q 5 minutes for a total of 3 doses

iv. **Irregular Narrow Complex Tachycardia – Unstable**

1. Deliver a **synchronized** shock based on manufacturer's recommendation
2. For responsive patients, consider sedation

v. **Regular Wide Complex Tachycardia – Stable** (ventricular tachycardia, supraventricular tachycardia, atrial fibrillation/flutter with aberrancy, accelerated idioventricular rhythms, pre-excited tachycardias with accessory pathways)

1. Amiodarone 150 mg IV over 10 minutes a. May repeat once as needed
2. Procainamide 20–50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases *greater than* 50%, or maximum dose 17 mg/kg given
   a. Maintenance infusion: 1–4 mg/min b. Avoid if prolonged QT or CHF
3. Lidocaine 1–1.5 mg/kg IV
   a. May be repeated at 5-minute intervals for a maximum dose of 3 mg/kg IV
4. Adenosine 6 mg IV (proximal site) followed by 10 mL fluid bolus
   a. If monomorphic tachycardia continues, give adenosine 12 mg IV

vi. **Regular Wide Complex Tachycardia – Unstable**

1. Deliver a **synchronized** shock based on manufacturer's recommendation
2. For responsive patients, consider sedation

vii. **Irregular Wide Complex Tachycardia – Stable** (A-FIB with aberrancy, pre-excited A-FIB (i.e., A-FIB using an accessory pathway), multifocal atrial tachycardia (MAT) or polymorphic VT/torsades de pointes

1. Procainamide 20–50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases *greater than* 50%, or maximum dose 17 mg/kg given
    a. Maintenance infusion: 1–4 mg/min
    b. Avoid if prolonged QT or CHF
2. If torsades, give magnesium 1–2 g IV over 10 minutes
3. Amiodarone 150 mg IV over 10 minutes
    a. May repeat once as needed
    b. Administration of amiodarone, if needed, should follow procainamide in patients with Wolff–Parkinson–White syndrome

viii. **Irregular Wide Complex Tachycardia – Unstable**

1. Deliver a **synchronized** shock based on manufacturer's recommendation 2. For responsive patients, consider sedation

2. Pediatric Management

a. Manage airway as necessary
b. Administer oxygen as appropriate with a target of achieving 94–98% saturation c. Initiate monitoring and perform 12-lead EKG
d. Establish IV access
e. Check blood glucose and treat hypoglycemia per the Hypoglycemia Protocol
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. Adenosine 0.1 mg/kg (maximum of 6 mg)
        a. If unsuccessful, may repeat with 0.2 mg/kg (maximum of 12 mg)

ii. **Regular Narrow Complex Tachycardia – Unstable**
    1. Deliver a **synchronized** shock: 0.5–1 J/kg for the first dose
    2. Repeat doses should be 2 J/kg

iii. **Regular, Wide Complex Tachycardia — Stable**
    1. Consider adenosine 0.1 mg/kg (maximum of 6 mg) for SVT with aberrancy
    2. Otherwise give amiodarone 5 mg/kg IV (maximum of 150 mg) over 10 minutes

iv. **Regular, Wide Complex Tachycardia – Unstable**
    1. **Synchronized** cardioversion 0.5–1.0 J/kg

Notes/Educational Pearls

Key Considerations

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

2. A-FIB rarely requires cardioversion in the field. As it is difficult to ascertain the onset of this rhythm, the risk of stroke needs to be considered prior to cardioversion
3. A wide-complex irregular rhythm should be considered pre-excited A-FIB; extreme care must be taken in these patients
    a. Characteristic EKG findings include a short PR interval and, in some cases, a delta wave
    b. Avoid AV nodal blocking agents such as adenosine, calcium channel blockers, digoxin, and possibly beta-blockers in patients with pre-excitation A-FIB (e.g., Wolff-Parkinson-White Syndrome, Lown-Ganong-Levine Syndrome) because these drugs may cause a paradoxical increase in the ventricular response
    c. Blocking the AV node in some of these patients may lead to impulses that are transmitted exclusively down the accessory pathway, which can result in ventricular fibrillation
    d. Amiodarone or procainamide may be used as an alternative
4. Amiodarone or procainamide can be used as a rate-controlling agent for patients who are intolerant of or unresponsive to other agents, such as patients with CHF who may not otherwise tolerate diltiazem or metoprolol
    a. 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 mmHg
    a. Worsening CHF, chronic obstructive pulmonary disease (COPD), asthma, as well as hypotension and bradycardia can occur with use of metoprolol
6. Biphasic waveforms have been proven to convert A-FIB at lower energies and higher rates of success than monophasic waveforms
    a. Strategies include dose escalation (70, 120, 150, 170 joules (J) for biphasic or 100, 200, 300, 360 J for monophasic) versus beginning with single high energy/highest success rate for single shock delivered
7. Studies in infants and children have demonstrated the effectiveness of adenosine for the treatment of hemodynamically stable or unstable SVT
8. Adenosine should be considered the preferred medication for stable SVT
    a. Verapamil may be considered as alternative therapy in older children but should not be routinely used in infants
    b. Procainamide or amiodarone given by a slow IV infusion with careful hemodynamic monitoring may be considered for refractory SVT

Pertinent Assessment Findings

None noted

Patient Safety Considerations

1. Only use one antidysrhythmic at a time
2. Patients who receive beta-blockers (e.g., metoprolol) with calcium channel blockers (e.g., diltiazem) are at increased risk for hypotension and bradycardia
3. If using cardioversion, consider sedation and pain control
4. With irregular wide complex tachycardia (A-FIB with aberrancy such as Wolff-Parkinson-White and Lown-Ganong Levine), avoid use of AV nodal blocking agents (e.g., adenosine, calcium channel blockers, beta-blockers)
5. Patients with Wolff–Parkinson–White should be given procainamide prior to amiodarone

Quality Improvement

Key Documentation Elements

- Initial rhythm and all rhythm changes
- Time, dose, and response to medications given
- Cardioversion times, synchronization, attempts, joules, and response
- Obtain monitor strips after each intervention
- Patient weight
- Pediatric length-based tape color (for pediatrics who fit on tape)
- History of event supporting treatment of underlying causes

Performance Measures

- Time to clinical improvement from patient contact
- Blood sugar obtained
- Correct medication(s) and dose given for patient condition, age, and weight
- Correct cardioversion joules delivered given patient weight and/or condition
- Use of sedation for responsive patient

Suspected Stroke/Transient Ischemic Attack

Aliases

1. Cerebrovascular accident (CVA)
2. Transient ischemic attack (TIA)

Patient Care Goals

1. Detect neurological deficits
2. Determine eligibility for transport to a stroke center
3. Identify patients who have potentially sustained a stroke involving a large vessel occlusion (LVO)

Patient Presentation

1. Neurologic deficit such as facial droop, localized weakness, gait disturbance, slurred speech, altered mentation, sudden onset of dizziness/vertigo
2. 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 is unresponsive)
4. Severe headache, neck pain/stiffness, difficulty seeing

Inclusion Criteria

Patient has signs and symptoms consistent with stroke or transient ischemic attack (TIA)

Exclusion Criteria

1. If glucose less than 60 mg/dL (deciliter), treat per the Hypoglycemia Protocol
2. If trauma and Glasgow Coma Score (GCS) less than or equal to 13, treat per the Head Injury Protocol and General Trauma Management Protocol

Patient Management

Assessment

1. Use a validated prehospital stroke scale that may include, but is not limited to:
   a. Facial smile/grimace – ask patient to smile
   b. Arm drift – close eyes and hold out arms for count of 10 seconds
   c. Speech – ask patient to say "You can't teach an old dog new tricks"
2. Use a validated prehospital stroke severity scale that may include, but is not limited to:
   a. Vision changes
   b. Sensory neglect
   c. Aphasia
3. Pertinent historical data includes:
   a. History – "last known well" and source of that information
   b. Neurologic status assessment [See Footnote III. Neurologic Status Assessment]
   c. Patient is taking warfarin or any anticoagulant medication
   d. History of recent trauma
   e. History of recent seizure
   f. History of recent surgery
   g. History of recent hemorrhage (e.g., GI bleed)
4. Evaluate for the presence of stroke mimics including:
   a. Hypoglycemia
   b. Seizure
   c. Sepsis
   d. Migraine
   e. Intoxication

Treatment and Interventions

1. Determine "last known well" time
2. Administer oxygen as appropriate with a target of achieving 94–98% saturation
3. If seizure activity present, treat per Seizures Protocol
4. Check blood glucose level (BGL)
    a. Treat only if glucose less than 60 mg/dL
5. Acquire 12-lead EKG, not delaying transport
6. Early hospital notification per local stroke plan that should include any suspected large vessel occlusion (LVO) stroke

Patient Safety Considerations

1. Prevent aspiration – elevate head of stretcher 15–30 degrees if systolic BP greater than 100 mmHg
    a. Maintain head and neck in neutral alignment, without flexing the neck
2. Protect paralyzed limbs from injury
3. Avoid multiple IV attempts

Notes/Educational Pearls

Key Considerations

1. Transport and destination decisions should be based on local resources and stroke system of care
    a. Destination hospitals may include:
    i. Stroke Ready
    ii. Primary Stroke Center
    iii. Thrombectomy-capable Stroke Center
    iv. Comprehensive Stroke Center
2. Time of onset of stroke or last known well is critical data for patient treatment
    a. Positive stroke scale with time of onset or last known well less than 6 hours may be eligible for thrombolytic agents
    b. Positive stroke severity scale with time of onset or last known well less than 24 hours may be eligible for mechanical thrombectomy
        i. Consider transport to hospital capable of mechanical thrombectomy per local stroke plan
3. Do not treat hypertension
4. Place on cardiac monitor
5. **Pediatrics**:
    a. Treatment principles remain the same
    b. Although rare, pediatric patients can have strokes
    c. Stroke scales are not validated for pediatric patients
    d. The EMS crew should call ahead to make sure that the hospital can manage the patient

Quality Improvement

Key Documentation Elements

- "Last known well" must be as specific as possible
    - o If the patient was last known well prior to bedtime the night before, this is the time to be documented (not time the patient woke up with symptoms present)
- Blood glucose results
- Specific validated stroke scale used and findings
- Time of notification to receiving hospital

Performance Measures

- Documentation of time "last known well"
- Use of validated stroke scale
- Blood glucose level obtained

- Minimize EMS scene time
- Hospital stroke team pre-arrival alert or activation occurred as early as possible after positive stroke assessment finding.

ANNEX 3: General Medical

Abdominal Pain

Aliases None noted

Patient Care Goals

1. Improve patient comfort
2. Identify life-threatening causes of abdominal pain

Patient Presentation

Inclusion Criteria

Abdominal pain or discomfort related to a non-traumatic cause

Exclusion Criteria

1. Abdominal pain due to trauma [See General Trauma ManagementProtocol]
2. Abdominal pain due to or related to pregnancy [See OB/GYN Section]

Patient Management

Assessment

1. Perform airway assessment and management per the Airway Management Protocol
2. Obtain vital signs including pulse, blood pressure, respiratory rate, neurologic status assessment
3. Obtain blood glucose if hyperglycemia is suspected per Hyperglycemia Protocol
4. Provide evaluation and management of pain per the Pain Management Protocol
5. Obtain vascular access as necessary to provide analgesia and/or fluid resuscitation
6. Assess for life-threatening causes of abdominal pain, which may include:
    a. Signs and symptoms of ischemic, necrotic, or perforated bowel
        I. Severe tenderness
        II. iAbdominal pain with motion or palpation of the abdomen iii. Fever
        III. Bloody stool
        IV. Nausea and vomiting
        V. Absence of passage of stool or gas
        VI. Abdominal distention, with tympany to percussion
    b. Signs and symptoms of dissecting or ruptured abdominal aortic aneurysm(AAA)
        i. Unequal femoral or distal lower extremity pulses
        ii. “Pulsatile” abdominal mass
        iii. Associated back pain and/or chest pain
        iv. Known history of abdominal aortic aneurysm
    c. Signs and symptoms of ruptured ectopic pregnancy
        i. Vaginal bleeding
        ii. Recently diagnosed pregnancy
        iii. Recent missed period/menstrual cycle in women of childbearing age
    d. Signs and symptoms of appendicitis
        i. Focal right lower quadrant tenderness, possibly with rebound and guarding
        ii. Right lower quadrant tenderness noted during palpation of the left lower quadrant (positive Rovsing’s sign)
        iii. Peri-umbilical or diffuse abdominal tenderness with palpation of the abdomen/pelvis
        iv. Fever
        v. Nausea, vomiting.
        vi. Lack of appetite

e. Signs and symptoms of acute cholecystitis
    I. Right upper quadrant or epigastric tenderness
    II. Fever
    III. Nausea and vomiting
    IV. History of gallstones
f. Signs and symptoms of pyelonephritis
    i. Fever
    ii. Nausea, vomiting
    iii. Urinary frequency/urgency
    iv. Dysuria
    v. Hematuria
    vi. Back/flank pain
    vii. Costovertebral angle tenderness to percussion

7. Assess for signs of shock
    a. If shock is present, provide treatment per appropriate ShockProtocol
8. Assess for other non-life-threatening causes of abdominal pain
    a. Signs and symptoms of kidney stone
        i. Unilateral flank pain
        ii. Nausea, vomiting.
        iii. Hematuria

Treatment and Interventions

1. Medication Administration:
    a. Provide analgesia per the Pain Management Protocol
    b. Administer antiemetics per the Nausea-Vomiting Protocol
    c. Provide transport to an appropriate receiving facility. Consider specialty destination centers for conditions such as suspected abdominal aorticaneurysm and aortic dissection
    d. Reassess vital signs and response to therapeutic interventions throughout transport

Patient Safety Considerations

Abdominal pain in older adults, patients with bleeding disorders, patients on anticoagulation medications, children less than 2 years old and patients that are immunocompromised may be a harbinger for severe illness.

Notes/Educational Pearls

Key Considerations

1. Assess for life-threatening causes of abdominal pain
2. Provide appropriate treatment for pain, vomiting, and shock

Pertinent Assessment Findings

1. Rebound tenderness
2. Guarding
3. Abdominal distension
4. Abdominal tympany to percussion
5. Tenderness focal to a specific abdominal quadrant
6. Presence of “pulsatile” abdominal mass
7. Absence of or significant inequality of femoral or distal arterial pulses in lower extremities
8. Hyper or hypothermia
9. Rectal bleeding, hematemesis, vaginal bleeding 10. Jaundice

Quality Improvement

Key Documentation Elements

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

Performance Measures

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

Abuse and Maltreatment

Aliases

1. Maltreatment of vulnerable populations
2. Non-accidental trauma

Definitions

1. **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 of any age group. EMS clinicians should have a heightened awareness for vulnerable populations which include, but is not limited to, children, elderly, and adults with mental or physical disabilities
2. **Child Abuse/Maltreatment**: Child maltreatment includes any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child. An act of commission (child abuse) is the physical, sexual, or emotional maltreatment or neglect of a child or children. An act of omission (child neglect) includes, but is not limited to, failure to provide for the child's needs (e.g., physical, emotional, medical/dental, and educational neglect) and failure to supervise (e.g., inadequate supervision or safety precautions, lack of appropriate car seat use, and exposure to violent or dangerous environments)
3. **Human Trafficking**: when people are abducted or coerced into service (e.g., being forced into servitude without compensation and/or prostitution). Signs may include, but are not limited to, patient with branding/tattoos and environmental clues such as padlocks and/or doorknobs removed on interior doors and intact windows that are boarded up

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. Take appropriate steps to protect the safety of the responders as well as bystanders 3. Remove the patient from immediate danger
4. Assess any 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
6. Complete all mandatory reporting requirements per Protocols and local laws, rules, and regulations

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 and any other vulnerable individuals at the scene into a safe situation
e. Not to 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 histories from caregivers or bystanders regarding what happened
   d. Information provided by caregivers or patient that is not consistent with injury patterns
   e. Injuries not appropriate for patient's age or physical abilities (e.g., infants with injuries usually associated with ambulatory children, elders who have limited mobility with injury mechanisms inconsistent with their capabilities)
   f. Caregiver not allowing adult patient to speak for themselves, or who appears controlling – pay special attention to patients who cannot communicate due to young age or language and/or cultural barriers
   g. Inadequate safety precautions or facilities where the patient lives and/or evidence of security measures that appear to confine the patient inappropriately
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. Unexplained trauma to genitourinary systems or frequent infections to this system
   f. Evidence of malnourishment and/or serious dental problems
3. Have a high index of suspicion for abuse in children presenting with a Brief Resolved Unexplained Event (BRUE) [See Brief Resolved Unexplained Event (BRUE) & Acute Events in Infants Protocol]

Patient Management

Assessment

1. Primary survey and identify any potentially life-threatening issues
2. Document thorough secondary survey to identify clues of for potential abuse/maltreatment
3. Assess physical issues and avoid extensive investigation of the specifics of abuse or maltreatment, but document any statements made spontaneously by patient
   a. Avoid asking directed questions of a child

Treatment and Interventions

1. Address life-threatening issues
2. Remove the patient to a safe place even if no medical indication for transport
3. Report concerns about potential abuse/maltreatment to law enforcement, in accordance with local law
4. For patients transported, report concerns to hospital and/or law enforcement personnel (including Child Protective Services agencies where appropriate)

Patient Safety Considerations

1. If no medical emergency exists, the 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. 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. EMS clinicians are often unique in being the only members of the medical team to observe the home environment or injury scene. 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, interview, or intervene above and beyond those concepts and should leave further intervention to the appropriate law enforcement personnel
2. Abuse and maltreatment can happen to patients of all ages
3. 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
4. Document findings by describing what you see and not ascribing possible causes (e.g., "0.5-inch round burn to back" as opposed to "burn consistent with cigarette burn")

Pertinent Assessment Findings

As noted above

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

None noted

Agitated or Violent Patient/Behavioral Emergency

Aliases

1. Acute psychosis
2. Patient restraint
3. Agitated Delirium

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 or violent behavior, are a danger to self or others and in the assessment of the EMS clinician require physical and/or pharmacologic restraint to mitigate injury to self or others

Exclusion Criteria

1. Patients exhibiting agitated or violent behavior due to medical conditions including, but not limited to:
   a. Head injury
   b. Metabolic disorders (e.g., hypoglycemia, hypoxia)

Patient Management

Assessment

1. Note medications/substances on scene that may contribute to the agitation, or may be relevant to the treatment of a contributing medical condition
2. Maintain and support airway
3. Note respiratory rate and effort – If possible, monitor pulse oximetry and/or capnography
4. Assess circulatory status:
    a. Blood pressure (if possible)
    b. Pulse rate
    c. Capillary refill
5. Assess mental status
    a. Check blood glucose (if possible)
6. Obtain temperature (if possible)
7. Assess for evidence of traumatic injuries
8. Use a validated risk assessment tool such as RASS (Richmond Agitation Sedation Score), AMSS (Altered Mental Status Score), or BARS (Behavioral Activity Rating Scale) to risk stratify violent patients to help guide interventions

Treatment and Interventions

1. Establish patient rapport
    a. Attempt verbal reassurance and calm patient prior to use of pharmacologic and/or physical management devices
    b. Engage family members/loved ones to encourage patient cooperation if their presence does not exacerbate the patient's agitation
    c. Continued verbal reassurance and calming of patient following use of chemical/physical management devices
2. Pharmacologic management
    a. Notes:
        i. Selection of medications for pharmacologic management should be based upon the patient's clinical condition, current medications, and allergies in addition to EMS resources and medical direction
        ii. The medications are annotated to indicate when they are preferred for patients that are particularly high-risk for violence as assessed by a validated scale – note that the dosing can be adjusted to achieve different levels of sedation
        iii. **The numbering of medications below is not intended to indicate a hierarchy/preference of administration**
    b. Benzodiazepines
    i. Diazepam
        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 (maximum dose is 5 mg)
            OR
            b. 0.1–0.2 mg/kg IM (maximum dose is 10 mg)
    ii. Lorazepam
        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 (maximum dose is 2 mg)
            OR
            b. 0.05 mg/kg IM (maximum dose is 2 mg)

iii. Midazolam

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 (maximum dose 5 mg)
    OR
    b. 0.1–0.15 mg/kg IM (maximum dose is 5 mg)
    OR
    c. 0.3 mg/kg IN (maximum dose is 5 mg)

c. Antipsychotics

i. Droperidol (option for high violence risk)

1. **Adults**:
    a. 2.5 mg IV; 10-minute onset of action
    OR
    b. 5–10 mg IM; 20-minute onset of action
2. **Pediatrics**: Not routinely recommended

ii. Haloperidol

1. **Adults**:
    a. 5 mg IV; 5–10 minute onset of action
    OR
    b. 5–10 mg IM; 10–20 minute onset of action
2. **Pediatrics**: Age 6–12 years old: 1–3 mg IM (maximum dose 0.15 mg/kg)

iii. Olanzapine

(Note: Concurrent use of IM/IV benzodiazepines and olanzapine IM is not recommended as fatalities have been reported)

1. **Adults**:
    a. 10 mg IM; 15–30 minute onset of action
    b. 10 mg ODT PO or SL
2. **Pediatrics**:
    a. Age 6–11 years old: 5 mg IM *(limited data available for pediatric use)*
    b. Age 12–18 years old: 10 mg IM
    c. Age 6–18 years old: 5 mg ODT PO or SL

iv. Ziprasidone

1. **Adults**: 10 mg IM; 10-minute onset of action
2. **Pediatrics**:
    a. Age 6–11 years old: 5 mg IM *(limited data available for pediatric use)*
    b. Age 12–18 years old: 10 mg IM

d. Dissociative Agents (provide sedation and anesthesia) i. Ketamine (option for high violence risk)

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

3. Physical Management Devices

a. Body

i. Stretcher straps should be applied as the standard procedure for all patients during transport

ii. Physical management devices, including stretcher straps, should never restrict the patient's chest wall motion

iii. If necessary, sheets may be used as improvised supplemental stretcher straps. Other forms of improvised physical management devices should be discouraged
iv. Supplemental straps or sheets may be necessary to prevent flexion/extension of torso, hips, legs by being placed around the lower lumbar region, below the buttocks, and over the thighs, knees, and legs
v. Patients should never be placed in prone position

b. Extremities
i. Soft or leather devices should not require a key to release them
ii. Secure all four extremities to maximize safety for patient, staff, and others
iii. Secure all extremities to the stationary frame of the stretcher
iv. Multiple knots should not be used to secure a device

Patient Safety Considerations

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

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

13. Concurrent use of IM/IV benzodiazepines and olanzapine IM is not recommended as fatalities have been reported

Notes/Educational Pearls

Key considerations

1. Direct 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. Stretchers with adequate foam padding, particularly around the head, facilitates patient's ability to self-position the head and neck to maintain airway patency
4. For patients with key-locking devices, applied by another agency, consider the following options:
   a. Remove device and replace it with a device that does not require a key
   b. Administer pharmacologic management medication then remove and replace device with another non-key-locking device after patient has become more cooperative
   c. Transport patient accompanied in patient compartment by person who has device key
   d. Transport patient in the vehicle of person who has the device key if medical condition of patient is deemed stable, direct medical direction so authorizes, and law allows

Pertinent Assessment Findings

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

Quality Improvement

Key Documentation Elements

- Etiology of agitated or violent behavior if known
- Patient's medications, other medications or substances found on scene
- Patient's medical history or other historic factors reported by patient, family, or bystanders • Physical evidence or history of trauma
- Adequate oxygenation by pulse oximetry
- Blood glucose measurement
- Measures taken to establish patient rapport
- Dose, route, and number of doses of pharmacologic management medications administered • Clinical response to pharmacologic management medications
- Number and physical sites of placement of physical management devices
- Duration of placement of physical management devices
- Repeated assessment of airway patency
- Repeated assessment of respiratory rate, effort, pulse oximetry/capnography
- Repeated assessment of circulatory status with blood pressure, capillary refill, cardiac monitoring
- Repeated assessment of mental status and trends in the level of patient cooperation • Repeated assessment of capillary refill in patient with extremity securing devices
- Communications with EMS medical direction
- Initiation and duration of engagement with law enforcement

Performance Measures

- Incidence of injuries to patient, EMS personnel, or others on scene
- Incidence of injuries to patient, EMS personnel, or others during transport

- Medical or physical complications (including sudden death) in patients
- Advance informational communication of EMS protocols for the management of agitated and violent patients to others within the emergency care system and law enforcement
- Initiation and engagement with EMS medical direction
- Initiation and duration of engagement with law enforcement

Anaphylaxis and Allergic Reaction

(Adapted from an evidence-based Protocol created using the National Prehospital Evidence-Based Prehospital Protocol Model Process)

Aliases Anaphylactic Shock

Patient Care Goals

1. Provide timely therapy for potentially life-threatening reactions to known or suspected allergens to prevent cardiorespiratory collapse and shock
2. Provide symptomatic relief for symptoms due to known or suspected allergens

Patient Presentation

Inclusion Criteria

Patients of all ages with suspected allergic reaction and/or anaphylaxis

Exclusion Criteria None noted

Patient Management

Assessment

1. Evaluate for patent airway and presence of oropharyngeal edema
2. Auscultate for wheezing and assess level of respiratory effort
3. Assess for adequacy of perfusion
4. Assess for presence of signs and symptoms of anaphylaxis
    a. Anaphylaxis – More severe and is characterized by an acute onset involving:
        i. The skin (urticaria) and/or mucosa with either respiratory compromise or decreased BP or signs of end-organ dysfunction
        OR
        ii. Hypotension for that patient after exposure to a known allergen
            1. **Adults**: Systolic BP less than 90
            2. **Pediatrics**: See Footnote IV. Abnormal Vital Signs
        OR
        iii. Two or more of the following occurring rapidly after exposure to a likely allergen:
            1. Skin and/or mucosal involvement (urticaria, itchy, swollen tongue/lips)
                a. Skin involvement may be ABSENT in up to 40% of cases of anaphylaxis
            2. Respiratory compromise (dyspnea, wheezing, stridor, hypoxemia)
            3. Persistent gastrointestinal symptoms (vomiting, abdominal pain, diarrhea)
            4. Hypotension or associated symptoms (syncope, hypotonia, chest tightness, incontinence)
    b. Non-anaphylactic Allergic Reaction
        i. Signs involving only **one** organ system (e.g., localized angioedema that does not compromise the airway, or not associated with vomiting; hives alone)

Treatment and Interventions

1. If signs of allergic reaction **without** signs of anaphylaxis, go to Step 8
2. Epinephrine (Adrenaline) administration is the primary treatment for anaphylaxis. If signs of anaphylaxis, administer epinephrine (Adrenaline) 1 mg/mL at the following dose and route:
    a. **Adult** (25 kg or more) 0.3 mg IM in the anterolateral thigh
    b. **Pediatric** (less than 25 kg) 0.15 mg in the anterolateral thigh
    c. Epinephrine (Adrenaline) 1 mg/mL may be administered from a vial or via auto-injector, if available
3. If respiratory distress with wheezing is present, consider administering
    a. Albuterol 2.5–5 mg nebulized
    AND/OR
    b. Epinephrine (Adrenaline) 1 mg/mL, 5 mL nebulized
4. If stridor is present, consider administering epinephrine (Adrenaline) 1 mg/mL, 5 mL nebulized
5. If signs of anaphylaxis and hypoperfusion persist following the first dose of epinephrine (Adrenaline), additional IM epinephrine (Adrenaline) can be repeated q5–15 minutes at above noted doses
6. For signs of hypoperfusion, also administer 20 mL/kg isotonic fluid (normal saline or lactated Ringer's) rapidly (over 15 minutes) via IV or IO, and repeat as needed for ongoing hypoperfusion
7. Consider an epinephrine (Adrenaline) IV drip (0.5 mcg/kg/minute) when cardiovascular collapse (hypotension with altered mental status, pallor, diaphoresis and/or delayed capillary refill) is present despite repeated IM doses of epinephrine (Adrenaline) in conjunction with at least 60 mL/kg isotonic fluid boluses
8. For urticaria or pruritus, administer a diphenhydramine 1 mg/kg, up to maximum dose of 50 mg IM, IV, or PO)
    a. The IV route is preferred for the patient in severe symptoms
    b. As a supplement to diphenhydramine given for urticaria, any H2-blocking antihistamine (e.g., famotidine, cimetidine) can be given IV or PO in conjunction with diphenhydramine
9. Transport as soon as possible, and perform ongoing assessment as indicated. Cardiac monitoring is not required, but should be considered for those with known heart problems or who received multiple doses of epinephrine

Patient Safety Considerations

1. Time to epinephrine (Adrenaline) delivery
2. Concentration of epinephrine (Adrenaline) in relation to route
3. Weight-based dosing of medications

Notes/Educational Pearls

Key Considerations

1. When anaphylaxis is suspected, **EMS personnel should always consider epinephrine (Adrenaline) as first-line treatment**
2. Allergic reactions and anaphylaxis are serious and potentially life-threatening medical emergencies. It is the body's adverse reaction to a foreign protein (e.g., food, medicine, pollen, insect sting or any ingested, inhaled, or injected substance). A localized allergic reaction (e.g., urticaria or angioedema that does not compromise the airway) may be treated with antihistamine therapy. 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
3. Contrary to common belief that all cases of anaphylaxis present with cutaneous manifestations, such as urticaria 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

4. A thorough assessment and a high index of suspicion are required for all potential allergic reaction patients – consider:
   a. History of Present Illness
      i. Onset and location
      ii. Insect sting or bite
      iii. Food allergy/exposure
      iv. New clothing, soap, detergent
      v. Past history of reactions
      vi. Medication history
   b. Signs and Symptoms
      i. Itching or urticaria
      ii. Coughing, wheezing, or respiratory distress
      iii. Chest tightness or throat constriction
      iv. Hypotension or shock
      v. Persistent gastrointestinal symptoms (nausea, vomiting, and diarrhea)
      vi. Altered mental status (AMS)
   c. Other Considerations
      i. Angioedema (drug-induced)
      ii. Aspiration/airway obstruction
      iii. Vasovagal event
      iv. Asthma or chronic obstructive pulmonary disease (COPD) v. Heart failure
5. Gastrointestinal symptoms occur most commonly in food-induced anaphylaxis, but can occur with other causes
   a. Oral pruritus is often the first symptom observed in patients experiencing food-induced anaphylaxis
   b. Abdominal cramping is also common, but nausea, vomiting, and diarrhea are frequently observed as well
6. Patients with asthma are at high-risk for a severe allergic reaction

Pertinent Assessment Findings

1. Presence or absence of angioedema
2. Presence or absence of respiratory compromise
3. Presence or absence of circulatory compromise
4. Localized or generalized urticaria
5. Response to therapy

Quality Improvement

Key Documentation Elements

- Medications given
- Dose and concentration of epinephrine given
- Route of epinephrine administration
- Time of epinephrine administration
- Signs and symptoms of the patient

Performance Measures

- Percentage of patients with anaphylaxis that receive epinephrine for anaphylaxis:
  - Via the IM route (vs. other routes)
  - Via the IM route in the anterolateral thigh (vs. other locations)
- Percentage of patients with anaphylaxis who receive:
  - Epinephrine within 10 minutes of arrival
  - The appropriate weight-based dose of epinephrine
- Percentage of patients that require airway management in the prehospital setting (and/or the emergency department)

Altered Mental Status

Aliases

1. Altered level of consciousness
2. Confusion

Patient Care Goals

1. Identify treatable causes
2. Perform appropriate assessment and diagnostics (e.g., oxygen saturation, glucose check, monitor)
3. Protect patient from complications of altered mental status (e.g., respiratory failure, shock, cardiopulmonary arrest)

Patient Presentation

Inclusion Criteria

Impaired decision-making capacity

Exclusion Criteria Traumatic brain injury

Patient Management

Assessment

Look for treatable causes of altered mental status (AMS):

1. Airway: Make sure airway remains patent; reposition patient as needed
2. Breathing: Look for respiratory depression; check SPO2, EtCO2, and CO detector readings
3. Circulation: Look for signs of poor perfusion
4. Glasgow Coma Score and/or AVPU 5. Pupils
6. Head and neck: Evaluate for signs of trauma
7. Neck: Rigidity or pain with range of motion
8. Stroke assessment tool including focal neurologic findings
9. Blood glucose level
10. EKG or cardiac monitor: arrhythmia limiting perfusion
11. Breath odor: Possible unusual odors include alcohol, acidosis, ammonia
12. Chest/Abdominal: Intra-thoracic hardware, assist devices, abdominal pain or distention, signs of trauma
13. Extremities/skin: Track marks, hydration, edema, dialysis shunt, temperature to touch (or if able, use a thermometer), signs of trauma
14. Signs of infection: Fever, cough, skin changes, dysuria
15. Environment: Survey for pills, paraphernalia, substance use, medication patches, medical devices, ambient temperature, sun exposure, social indicators of neglect, carbon monoxide exposures, multiple casualties with same complaint

Treatment and Interventions

1. Oxygen [Refer to Universal Care Protocol]
2. Glucose [Refer to Hypoglycemia Protocol or Hyperglycemia Protocol]
3. Naloxone [Refer to Opioid Poisoning/Overdose Protocol]
4. Restraint: physical and chemical [See Agitated or Violent Patient/Behavioral Emergency Protocol]
5. Anti-dysrhythmic medication [See Cardiovascular Section for specific dysrhythmia Protocols]
6. Active cooling or warming [See Hypothermia/Cold Exposure Protocol or Hyperthermia/Heat Exposure Protocol]
7. IV fluids [See fluid administration doses in Shock Protocol and Hypoglycemia Protocol or Hyperglycemia Protocol]
8. Vasopressors [See Shock Protocol]

Patient Safety Considerations

1. With depressed mental status, initial focus is on airway protection, oxygenation, ventilation, and perfusion
2. The violent patient may need pharmacologic and/or physical management to insure proper assessment and treatment
3. Hypoglycemic and hypoxic patients can be irritable and violent [See Agitated or Violent Patient/Behavioral Emergency Protocol]

Notes/Educational Pearls

Key Considerations

1. History from bystanders and caregivers
2. Age of the patient
3. Development age and baseline functional status
4. Consider the following differential using the mnemonic **AEIOU-TIPS**:
   - **A** – **A**lcohol, **A**buse, **A**typical migraine
   - **E** – **E**pilepsy, **E**lectrolytes
   - **I** – **I**nsulin (hypoglycemia)
   - **O** – **O**xygen, **O**verdose
   - **U** – **U**remia (kidney failure)
   - **T** – **T**rauma, **T**umor, **T**emperature
   - **I** – **I**nfection
   - **P** – **P**sych, **P**oisoning
   - **S** – **S**eizure, **S**ubarachnoid hemorrhage, **S**epsis
5. Environment where patient found
6. Recent complaints (e.g., headache, chest pain, difficulty breathing, vomiting, fever)
7. Medical alert tags and accessory medical devices
8. Evaluate for reduced PO intake and/or vomiting and/or diarrhea or dehydration as a cause of AMS in the pediatric and geriatric populations
9. Evidence of ingestion or topical placement (e.g., pill bottles/medications, patches, detergent pods)
10. Medications a child may have access to including but not limited to (includes patches, drops, pills, injectables):
    a. Analgesics
    b. Antidepressants
    c. Antihypertensives/Cardiac medications
    d. Oral hypoglycemic
    e. Opioids
    f. Benzodiazepines
    g. Antiepileptics
    h. Prenatal vitamins
11. Substance use in the home (e.g., tobacco, marijuana, cocaine, amphetamines, PCP, alcohol) 12. Use of herbal or holistic medications

Pertinent Assessment Findings

1. Track marks
2. Breath odor
3. Skin temperature
4. Rash and/or petechiae
5. Evidence of trauma
6. Focal neurologic changes
7. Location

Quality Improvement

Key Documentation Elements

- Glasgow Coma Score (GCS) or AVPU description
- Baseline developmental status and change from baseline
- Temperature was taken when able
- Patient and medic safety were considered • Pupil and neck exam were done
- Evaluation of perfusion and skin exam were performed
- IV fluids given for poor perfusion

Performance Measure

- Hypoglycemia considered and treated appropriately
  - o Blood glucose level obtained
- Sepsis considered as a possible cause of hypotension
- Hypotension appropriately treated
- Naloxone is used as therapeutic intervention, not a diagnostic tool
- CO detector is used when available

Back Pain

Aliases None noted

Patient Care Goals

1. Improve patient discomfort
2. Identify life-threatening causes of back pain

Patient Presentation

Inclusion Criteria

Back pain or discomfort related to a non-traumatic cause

Exclusion Criteria

1. Back pain from spinal trauma [See Trauma Section]
2. Back pain due to sickle cell pain crisis [See Sickle Cell Pain Crisis Protocol]
3. Back pain from suspected labor [See OB/GYNSection]

Patient Management

Assessment

1. Perform airway assessment and management, per the Airway Management Protocol
2. Obtain vital signs including pulse, blood pressure, respiratory rate, neurologic status assessment, pulse oximetry, temperature
3. Provide evaluation and management of pain, per the Pain Management Protocol
4. Obtain vascular access as necessary to provide analgesia and/or fluid resuscitation
5. Assess for life-threatening causes of back pain, which may include:
   a. Spinal cord compression (e.g., from spinal epidural abscess, malignancy, spinal epidural hematoma for patients on anticoagulants)
      i. Urinary and/or bowel incontinence
      ii. Inability to walk due to weakness
      iii. New neurologic deficits in extremities
      iv. Loss of sensation in saddle distribution
   b. Aortic dissection or ruptured abdominal aortic aneurysm
      i. Unequal femoral or distal lower extremity pulses
      ii. “Pulsatile” abdominal mass
      iii. Associated abdominal pain and/or chest pain
      iv. Known history of abdominal aortic aneurysm or dissection

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

6. Assess for signs of shock. If shock is present, provide treatment per appropriate Shock Protocol
7. Assess for other non-life-threatening causes of back pain
   a. Kidney stone
      i. Unilateral flank pain
      ii. Nausea, vomiting
      iii. Possible hematuria
      iv. History of kidney stones

Treatment and Interventions

1. Medication Administration
   a. Provide analgesia, per Pain Management Protocol
   b. Administer antiemetics, per Nausea-Vomiting Protocol
   c. Provide transport to an appropriate receiving facility. Consider specialty destination centers for conditions such as suspected aortic emergency
   d. Reassess vital signs and response to therapeutic interventions throughout transport

Patient Safety Considerations

None noted

Notes/Educational Pearls

Key Considerations

1. Assess for life-threatening causes of back pain
2. Provide appropriate treatment for pain, vomiting, and shock
3. Consider transport to appropriate specialty center if aortic emergency suspected
4. Back and abdominal pain can often coexist with similar disease processes
5. Identify patients on anticoagulants since they are higher risk for spinal epidural hematoma or retroperitoneal hemorrhage which can present as back pain
6. Identify patients with intravenous drug abuse (IVDA) history and/or impaired immune system since they are higher risk for spinal epidural abscess
7. Identify patients with a history of cancer or with one suspicious for cancer – spinal metastases can cause spinal cord compression
8. Identify older adults or patients with prolonged use of corticosteroids at risk for vertebral body compression fracture

Pertinent Assessment Findings

1. Midline back tenderness
2. Back erythema or swelling
3. Motor and/or sensory loss in arms or legs
4. Loss of perianal sensation
5. Absence of or significant inequality of femoral or distal arterial pulses in lower extremities
6. Hyper or hypothermia
7. Rectal bleeding or hematemesis

Quality Improvement

Key Documentation Elements

- Assessment of back and abdomen to include findings on palpation/percussion including presence or absence of masses and presence and nature of tenderness/pain
    - Assesses initial and changes in neurologic status
    - Assesses initial and changes in perfusion/pulses

Performance Measures

- Assessment for life-threatening etiology
- Mitigation of pain, per the Pain Management

End-of-Life Care/Hospice Care

Aliases None noted

Patient Care Goals

1. When providing care for a patient near end-of-life:
    a. Provide relief from pain and other distressing symptoms
    b. Affirm dying as a normal process
    c. Integrate psychological and spiritual aspects of patient care
    d. Offer a support system to help the family cope during the patient's illness and in their own bereavement

Patient Presentation

Inclusion Criteria

Patients enrolled in hospice or end-of-life care, or who have advance care directives, experiencing complaints related to the illness for which the patient is receiving those services

Exclusion Criteria

Complaints unrelated to the illness for which the patient is receiving those services

Patient Management

Assessment, Treatment, and Interventions

1. Perform general patient management
2. Engage with the patient's hospice or end-of-life care team or their primary care physician if possible. If not a viable option, contact medical direction
3. If the patient can communicate and has the capacity to make decisions regarding treatment and transport, consult directly with the patient before treatment and/or transport
4. If the patient lacks the capacity to make decisions regarding treatment and/or transport, identify any advanced care planning in place for information relating to advanced care planning and consent for treatment
    a. Advance directives
    b. Medical/Physician Order for Life-Sustaining Treatment (MOLST/POLST) or similar directing forms
    c. Guardian, power of attorney, or other accepted healthcare proxy
5. If the patient requires pain relief [See Pain Management Protocol]
    a. Opioid medications are frequently the most appropriate choices for pain management
    b. Multimodal analgesia may be required for pain relief

c. Do not withhold opioids for fear of respiratory depression as patient comfort is the primary goal for hospice and end-of-life care

6. If the patient is experiencing severe respiratory distress, consider:
   a. Oxygen and bedside/handheld fan
   b. Noninvasive ventilation (BiPAP/CPAP) if aligned with patient care goals
   c. Opioids are the drug of choice for dyspnea for hospice and end-of-life care. If symptoms are unrelieved, follow written hospice orders or contact medical direction
   d. Anxiolytic if needed for anxiety
7. If the patient has nausea [See Nausea-Vomiting Protocol]
8. If the patient has excessive secretions or aspiration, provide suctioning
9. If the patient is anxious or has delirium, consider nonpharmacologic interventions such as creating a quiet environment, frequent reassurance, touch and verbal orientation
10. If the patient appears dehydrated
    a. Encourage PO fluid intake if patient can swallow
    b. If available, offer ice chips and swabs soaked in ice water
11. In collaboration with hospice or end-of-life care clinician, coordinate with guardian, power of attorney, or other accepted healthcare proxy if non-transport is considered

Patient Safety Considerations

1. Careful and thorough assessments should be performed to identify complaints not related to the illness for which the patient is receiving hospice or end-of-lifecare
2. Care should be delivered with the utmost patience and compassion

Notes/Educational Pearls

Key Considerations

1. Social interactions with family may affect end-of-life care
2. Scene safety should be considered when deciding on management

Pertinent Assessment Findings

1. Vital signs
2. Pain score
3. Neurologic exam
4. Lung sounds

Quality Improvement

Key Documentation Elements

- Interaction with hospice or end-of-life care clinician
- Confirmation of advanced directive or similar documentation
- Pain score if applicable

Performance Measures

- If patient in pain, pain score change
- If patient is nauseated, symptom relief

Hyperglycemia

Aliases

- Diabetes
- Diabetic ketoacidosis (DKA)
- Hyperosmolar hyperglycemic state (HHS)

Patient Care Goals

1. Limit morbidity from hyperglycemia by:
    a. Appropriate use of glucose monitoring
    b. Appropriate hydration for hyperglycemia

Patient Presentation

Inclusion Criteria

1. Adult or pediatric patient with altered level of consciousness [See Altered Mental Status Protocol]
2. Adult or pediatric patient with stroke symptoms (e.g., hemiparesis, dysarthria) [See Suspected Stroke/Transient Ischemic Attack Protocol]
3. Adult or pediatric patient with seizure [See Seizures Protocol]
4. Adult or pediatric patient with symptoms of hyperglycemia (e.g., polyuria, polydipsia, weakness, dizziness, abdominal pain, tachypnea)
5. Adult or pediatric patient with history of diabetes and other medical symptoms

Exclusion Criteria Patient in cardiac arrest

Patient Management

Assessment

1. Monitoring:
    a. Check blood glucose level
2. Secondary survey pertinent to altered blood glucose level:
    a. Constitutional: assess for tachycardia, hypotension, and tachypnea
    b. Eyes: assess for sunken eyes from dehydration
    c. Nose/mouth/ears: assess for dry mucous membranes or tongue bite from seizure
    d. Abdominal pain including nausea and vomiting especially in children
    e. Neurologic:
        i. Assess Glasgow Coma Score (GCS) and mental status
        ii. Assess for focal neurologic deficit: motor and sensory
3. Evaluate for possible concomitant sepsis and septic shock [See ShockProtocol]
4. Obtain 12-lead EKG to assess for findings consistent with hyperkalemia or acute coronary syndrome

Treatment and Interventions

1. If altered level of consciousness, stroke, or sepsis/septic shock, treat per Altered Mental Status Protocol, Suspected Stroke/Transient Ischemic Attack Protocol**,** or Shock Protocol accordingly
2. If glucose greater than 250 mg/dL with symptoms of dehydration, vomiting, abdominal pain, or altered level of consciousness:
    a. Provide volume expansion with normal saline bolus
        i. **Adult**: Normal saline 20 mL/kg at rate of 1000 mL/hr; if symptoms of hypovolemic shock, follow Shock Protocol.

ii. **Pediatric**: Normal saline 10 mL/kg bolus IV, reassess, and repeat up to 40 mL/kg total; if symptoms of hypovolemic shock, follow Shock Protocol.

3. If findings of hyperkalemia are present, administer IV fluids and consider administration of:
   a. Calcium chloride: 1 gm IV/IO over 5 minutes, ensure IV patency and do not exceed 1 mL per minute
   OR
   b. Calcium gluconate: 2 gm IV/IO over 5 minutes, with constant cardiac monitoring
4. If findings of hyperkalemia, consider administration of sodium bicarbonate 1 mEq/kg (max dose of 50 mEq) IV bolus over 5 minutes and consider albuterol 5 mg via nebulizer (can be repeated if no response is seen) to the two places in the document where the administration of albuterol is suggested for the treatment of hyperkalemia
5. Reassess patient
   a. Reassess vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment), mental status, and signs of dehydration
   b. If mental status changes, reassess blood glucose level and provide appropriate treatment if hypoglycemia has developed
6. Disposition
   a. Transport to closest appropriate receiving facility

Patient Safety Considerations

1. Overly aggressive administration of fluid in hyperglycemic patients may cause cerebral edema or dangerous hyponatremia. Cerebral edema is a leading cause of death in children with DKA but is very rare in adults
   a. Closely monitor for signs of altered mental status, increased intracranial pressure, and immediately discontinue IV fluids and elevate head of bed if signs of increased ICP develop
   b. Reassess and manage airway as needed
2. Asymptomatic hyperglycemia poses no risk to the patient while inappropriately aggressive interventions to manage blood sugar may harm patients

Notes/Educational Pearls

Key Considerations

1. New onset DKA in pediatric patients commonly presents with nausea, vomiting, abdominal pain, and/or urinary frequency
2. Consider causes for hyperglycemia by thinking about the **3I's**:
   a. Insulin: This refers to any medication changes for insulin or oral medications including poor compliance or malfunctioning insulin pump
   b. Ischemia: This refers to hyperglycemia sometimes being an indication of physiologic stress in a patient and can be a clue to myocardial ischemia in particular
   c. Infection: Underlying infection can cause derangements in glucose control

Pertinent Assessment Findings

1. Concomitant trauma
2. Abdominal pain, "fruity breath," and rapid-deep respirations (Kussmaul respirations) may be associated with DKA. Kussmaul respirations are indicative of severe acidosis in patients with DKA

Quality Improvement

Key Documentation Elements

- Document reassessment of vital signs and mental status after administration of IV fluids
- Document glucose level (if in scope of practice) when indicated

Performance Measures

- 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
- When hyperglycemia documented, appropriate volume replacement given while avoiding overzealous repletion before insulin therapy at receiving center
- 12-lead EKG obtained

Hypoglycemia

Aliases
None noted

Patient Care Goals

1. Limit morbidity from hypoglycemia by:
    a. Describing appropriate use of glucose monitoring
    b. Treating symptomatic hypoglycemia

Patient Presentation

Inclusion Criteria

1. Patients with blood glucose less than 60 mg/dL with symptoms of hypoglycemia
2. Patients with altered level of consciousness [See Altered Mental Status Protocol]
3. Patients with stroke symptoms (e.g., hemiparesis, dysarthria) [See Suspected Stroke/Transient Ischemic Attack Protocol]
4. Patients with seizure [See Seizures Protocol]
5. Patients with history of diabetes and other medical symptoms
6. Patients with suspected alcohol ingestion
7. Patients with metabolic disorders (glycogen storage disease, fatty oxidation or organic acid disorders, maple syrup urine disease)
8. Patients who appear to be intoxicated

Exclusion Criteria

Patient in cardiac arrest
Patient with normal mental status in absence of inclusion criteria listed above

Patient Management

Assessment

1. Monitoring:
    a. Check blood glucose level
2. Secondary survey pertinent to altered blood glucose level:
    a. Evaluate for presence of an automated external insulin delivery device (insulin pump)
    b. Constitutional: assess for tachycardia and hypotension
    c. Eyes: assess for sunken eyes from dehydration
    d. Nose/mouth/ears: assess for dry mucous membranes or tongue bite from seizure
    e. 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, treat per Altered Mental Status Protocol or Suspected Stroke/Transient Ischemic Attack Protocol accordingly
2. If blood glucose is 60 mg/dL or less administer one of the following:
    a. Conscious patient with a patent airway:
        i. Glucose, oral (in form of glucose tablets, glucose gel, tube of cake icing,etc.)
            1. **Adult** Dosing: 25 g
            2. **Pediatric** Dosing: 0.5–1 g/kg

b. Unconscious patient, or patients who are unable to protect their ownairway:
   i. Dextrose IV – administer in incremental doses until mental status improves or maximum field dosing is reached (if available, D10% is preferred)
      1. Maximum field **adult** dosing: 25 g of 10–50% dextroseIV
         a. 50 mL of 50% dextrose
         b. 100 mL of 25%dextrose
         c. 250 mL of 10%dextrose
      2. Maximum field **pediatric** dosing: 0.5–1 g/kg of 10–25% dextroseIV a. 2–4 mL/kg of 25% dextrose for those greater than 8 years old b. 5–10 mL/kg of 10% dextrose (newborns 2 mL/kg)
   ii. Glucagon IM/IN – an option for patients for whom IV access cannot be established
      1. **Adult** dosing: 1 mg IM/IN (or prefilled 3 mg dry powder IN or prefilled IM autoinjector)
      2. **Pediatric** dosing:
         a. 1 mg IM/IN if ≥ 20 kg (or ≥ 5 years old (or prefilled 4 mg dry powder IN for patients greater than 4 years old or prefilled IM autoinjector)
         b. 0.5 mg IM/IN if less than 20 kg (or less than 5 years old)
   iii. Remove or disable insulin pump if above treatments cannot becompleted
c. For patients with an insulin pump who are hypoglycemic with associated altered mental status (GCS less than 15):
   i. Stop the pump, disconnect, or remove at insertion site if patient cannot ingest oral glucose or ALS is not available
   ii. Leave the pump connected and running if able to ingest oral glucose or receive ALS interventions

3. Reassess patient
   a. Reassess vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) and mental status
   b. Repeat check of blood glucose level if previous hypoglycemia and mental status has not returned to normal
      i. It is not necessary to repeat check of blood glucose level blood sugar if mental status has returned to normal
   c. If maximal field dosage of dextrose solution does not achieve euglycemia and normalization of mental status:
      i. Initiate transport to closest appropriate receiving facility for further treatment of refractory hypoglycemia
      ii. Evaluate for alternative causes of altered mental status
      iii. Continue treatment of hypoglycemia using dextrose solutions as notedabove

4. Disposition
   a. If hypoglycemia with continued symptoms, transport to closest appropriate receiving facility
   b. Hypoglycemic patients who have had a seizure should be transported to the hospital regardless of their mental status and response to therapy
   c. If symptoms of hypoglycemia resolve after treatment, release without transport should only be considered if **all** the following are true:
      i. Repeat glucose is greater than 80 mg/dL
      ii. Patient takes insulin or metformin to control diabetes and does not take long-acting oral sulphunylurea agents (e.g., glipizide, glyburide, or others)
      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 or legal guardian refuses transport and EMS clinicians 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
viii. A clear cause of the hypoglycemia is identified (e.g., missed meal)

Patient Safety Considerations

1. Dextrose 10% can be safely used in all ages ofpatient. Dextrose 10% works as effectively and quickly as other concentrations
2. Dextrose 50% can cause local tissue damage if it extravasates from vein and may cause hyperglycemia. Dextrose 50% carries risk for little clinical gain. EMS systems may consider carrying no more than 25% concentration of dextrose for treating hypoglycemia in adults
3. For children less than 8 years old, dextrose concentration of no more than 25% should be used
4. Forneonates andinfants less than 1monthofage, dextrose concentration ofnomore than 10–12.5% should be used
5. Sulfonylureas (e.g., glyburide, glipizide) have long half-lives ranging from 12–60 hrs. Patients with corrected hypoglycemia who are taking these agents are at particular risk for recurrent symptoms and frequently require hospital admission

Notes/Educational Pearls

A formula for calculating a 0.5 g/kg dose of IV dextrose:
(____% concentration of glucose) x (_____mL/k g) = 50

For example:

Desired	Fluid type	mL of fluid Dose
0.5 g/kg	25% dextrose	2mL/kg
	10% dextrose	5mL/kg
1 g/kg	25% dextrose	4mL/kg
	10% dextrose	10mL/kg

Key Considerations

1. Using 10% dextrose is as effective and safer than other stronger concentrations
2. Consider contribution of oral diabetic medications to hypoglycemia
3. If possible, have family/patient turn off insulin pump
4. Consider potential for intentional overdose of hypoglycemic agents
5. Avoid overshoot hyperglycemia when correcting hypoglycemia. Administer dextrose-containing IV fluids in small doses until either mental status improves or a maximum field dose is achieved

Pertinent Assessment Findings

1. Concomitant trauma
2. Diaphoresis or hypothermia may be associated with hypoglycemia

Quality Improvement

Key Documentation Elements

- Document reassessment of vital signs and mental status after administration of glucose/dextrose/glucagon
- Document point of care glucose level (if in scope of practice) whenindicated

Performance Measures

- When in scope of practice, blood glucose is checked for all patients with symptoms of altered level of consciousness, seizure, stroke, or hypoglycemia
- If patient released at scene, criteria documented for safe release

Nausea-Vomiting

Aliases

1. Emesis
2. Gastroenteritis

Patient Care Goals

Identify hypoglycemia or hyperglycemia
Prevent dehydration

Patient Presentation

Inclusion Criteria

Currently nauseated and/or vomiting

Exclusion Criteria

None noted

Patient Management

Assessment

1. Routine patient care (e.g., vital signs)
2. History and physical examination focused on potential causes of nausea and vomiting (e.g., gastrointestinal, cardiovascular, obstetric, gynecologic, hypoglycemia, hyperglycemia, neurologic, oncologic, psychogenic, or toxidrome) as well as medications that may prolong the QT interval
3. Obtain glucose level

Treatment andInterventions

1. Antiemetic medication administration
   a. Isopropyl alcohol: Allow patient to inhale vapor from isopropyl alcohol wipe 3 times q (que, every) 15 minutes as tolerated
   b. Ondansetron (contraindicated for suspected or known diagnosis of prolonged QT syndrome)
      i. **Adult**:
         1. 4 mg IV/PO/SL
            OR
         2. 4 or 8 mg SL of the ODT formulation
      ii. **Pediatric** (6 months – 14 years old):
         1. 0.15 mg/kg IV/PO (maximum dose of 4 mg)
            OR
         2. 2 mg SL for ages 1–5 years old; age 6 and older use 4 mg of the ODT formulation c. Metoclopramide
      i. **Adult**: 10 mg IV/IM
      ii. **Pediatric** (greater than 2 years old only and greater than 12 kg):
         1. 0.1 mg/kg IM
            OR
         2. 0.1 mg/kg IV (maximum 10 mg)
            a. May repeat x 1 in 20–30 minutes if no relief
   d. Prochlorperazine
      i. **Adult**: 5 mg IV/IM
      ii. **Pediatric** (over 2 years old only and greater than 12 kg):
         1. 0.1 mg/kg slow IV
            OR
         2. 0.1 mg/kg deep IM (maximum 10 mg)
   e. Droperidol

i. **Adult**: 1.25 mg IV/IM (contraindicated for suspected or known diagnosis of prolonged QT syndrome)

f. Diphenhydramine
   i. **Adult**: 12.5–25 mg IV/IM/PO
   ii. **Pediatric** (over 2 years old only and greater than12 kg): 0.1 mg/kg IV (maximum 25 mg)

Patient Safety Considerations

1. Ondansetron should not be administered to patients who have a prolonged QT interval as it can cause torsades.
2. For very young pediatric patients, ondansetron can be sedating
3. Dystonic and extrapyramidal symptoms are possible side effects of antiemetics – If encountered, consider diphenhydramine:
   a. **Adult**: 25–50 mg IV/IM/PO
   b. **Pediatric**: 1 mg/kg IV/IM/PO (maximum dose 50 mg)
4. Medications that prolong the QT interval may alter treatment options.

Notes/Educational Pearls

Key Considerations

1. Ondansetron is preferred in children for the treatment of nausea and vomiting
2. Metoclopramide has fewer adverse effects than prochlorperazine in children
3. Prochlorperazine and metoclopramide (phenothiazines) have an increased risk of dystonic reactions
   a. Some phenothiazines also have an increased risk of respiratory depression when used with other medications that cause respiratory depression, and some phenothiazines can cause neuroleptic malignant syndrome
   b. Prochlorperazine carries a black box warning for use in elderly patients with dementia-related psychosis.
4. IV form of ondansetron may be given PO in same dose
5. Nausea and vomiting are symptoms of illness – in addition to treating the patient's nausea and vomiting a thorough history and physical are key to identifying what may be a disease in need of emergent treatment (e.g., bowel obstruction, myocardial infarction, pregnancy)

6. While ondansetron has not been adequately studied in pregnancy to determine safety, women should be counseled regarding the available data. In the first trimester of pregnancy, the administration of metoclopramide 5–10 mg IV with diphenhydramine 25 mg IV is recommended over the administration of ondansetron

Pertinent Assessment Findings

1. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment)
2. Risk factors for heart disease/EKG if applicable
3. Pregnancy status
4. Abdominal exam
5. Blood glucose levels

Quality Improvement

Key Documentation Elements

- Patient age
- Patient weight and/or length-based weight measure for pediatric patients
- Medications given, including time, clinician level, dose, dose units, route, response, and complications
- Vital signs before and after medication administration

- History and physical regarding etiology of nausea/vomiting
- EKG performed and interpretation documented if cardiac risk factors are present

Performance Measures

- In patients with nausea and vomiting, appropriate medication(s) was/were administered (including proper dosage) and the patient's response to treatment is documented
- Any event where complications occurred, such as a dystonic reaction, should have event and appropriate responsive interventions performed and documented he administration of ondansetron

Pain Management

Aliases

1. Analgesia
2. Pain control

Patient Care Goals

1. Compassionately manage all patients with pain
2. Minimize adverse events in the treatment of pain

Patient Presentation

Inclusion Criteria

Patients who are experiencing pain regardless of transport interval

Exclusion Criteria

Pregnancy with active labor

Patient Management

Assessment, Treatment, and Interventions

1. Choice of medication class, route of administration, dosing and frequency are based on pain severity and the need for escalation from oral to parenteral routes
2. The dosing Protocols apply to patients of all ages except where noted 3. Determine patient's pain score assessment using standard pain scale
    a. Less than 4 years old or those with cognitive impairment unable to self-report: i. Observational Scales
        1. **F**aces, **L**egs, **A**rms, **C**ry, **C**onsolability (**FLACC**)
        2. **C**hildren's **H**ospital of **E**astern **O**ntario **P**ain **S**cale (**CHEOPS**)
    b. 4–12 years old:
        i. Self-report scale
            1. Wong Baker Faces
            2. **F**aces **P**ain **S**cale (**FPS**)
            3. **F**aces **P**ain **S**cale **R**evised (**FPS-R**)
    c. Greater than 12 years old:
        i. Self-report scale
            1. **N**umeric **R**ating **S**cale(**NRS**)
4. Non-pharmacologic pain management options include
    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. Minor pain or as an adjunct for moderate/severe pain consider the following non-opioid analgesic options:
    a. Paracetamol (acetaminophen) 15 mg/kg PO or IV (maximum dose 1 g)
    b. Nonsteroidal anti-inflammatories
        i. Ibuprofen 10 mg/kg PO for patients greater than 6 months of age (maximum dose 800 mg) OR

ii. Ketorolac
1. Adult: 30 mg IM or 15 mg IV
2. Pediatric age 2–16 years old: 0.5 mg/kg (maximum dose of 30 mg IM or 15 mg IV)

c. Nitrous Oxide

6. For Moderate to Severe pain, analgesics include:
   a. Morphine sulfate:
      i. 0.1 mg/kg IM, IV or IO (maximum initial dose is 10 mg)
   b. Fentanyl:
      i. 1 mcg/kg IN, IM, IV or IO (maximum initial dose of 100 mcg)
   c. Hydromorphone:
      i. 0.015 mg/kg IM, IV, or IO (maximum initial dose 2 mg; maximum cumulative dose of 4 mg)
   d. Ketamine:
      i. 0.25 mg/kg IM, IV or IO (maximum initial dose 25 mg; maximum cumulative dose 100 mg)
7. Use of non-invasive capnography is an earlier predictor of hypoventilation than pulse oximetry if opioid medications are administered
8. Consider administration of oral, sublingual, or IV antiemetics to prevent nausea [See Nausea/Vomiting Protocol]
9. If indicated based on pain assessment, and vital signs allow, repeat pain medication administration (excluding paracetamol and nonsteroidal anti-inflammatory medicines) after 5 minutes of the previous dose
10. Transport in position of comfort and reassess as indicated

Patient Safety Considerations

1. All patients should have drug allergies identified prior to administration of pain medication
2. Administer opioids with caution to patients with Glasgow Coma Score (GCS) less than 15, hypotension, identified medication allergy, hypoxia (SPO2 less than 90%) after maximal supplemental oxygen therapy, or signs of hypoventilation
3. Opioids are contraindicated for patients who have taken monoamine oxidase inhibitors (MAOI) during the previous 14 days
4. Avoid non-steroidal anti-inflammatory medications such as ibuprofen and ketorolac in patients with NSAID allergy, aspirin-sensitive asthma, renal insufficiency, pregnancy, or known peptic ulcer disease
5. Ketorolac should not be used in patients with hypotension (due to renal toxicity)
6. Use of splinting techniques and application of ice should be done to reduce the total amount of medication used to keep the patient comfortable

Notes/Educational Pearls

Key Considerations

1. Intranasal routes of opioid analgesia are preferred as the initial dosing route in pediatrics where IV access may be problematic; consider in other patient populations when an IV in not otherwise indicated
2. Onset of action is dependent on the pharmacokinetics of the drug class as well as route of administration; oral analgesics are effective for pain control but have a slower onset of action so plan accordingly
3. Pain severity scores should be recorded before and after analgesic medication administration and upon arrival at destination
4. Patients with acute abdominal pain should receive analgesic interventions – Use of analgesics for acute abdominal pain does not mask clinical findings or delay diagnosis
5. Opiates may cause a rise in intracranial pressure

Pertinent Assessment Findings

1. Mental status (Glasgow Coma Score (GCS) and pain level)
2. Respiratory system (tidal volume, chest rigidity)
3. Gastrointestinal (assess for tenderness, rebound, guarding, and nausea)

Quality Improvement

Key Documentation Elements

- Documentation of patient vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) with pulse oximetry
- Acquisition of patient's allergies prior to administration of medication
- Documentation of initial patient pain scale assessment
- Documentation of medication administration with correct dose
- Documentation of patient reassessment with repeat vital signs and patient pain scale assessment

Performance Measures

- The clinical efficacy of prehospital analgesia in terms of adequacy of dosing parameters

Table 1. Adult Nonverbal Pain Scale University of Rochester Medical Center

Adult nonverbal pain scale University of Rochester Medical Center

Categories	0	1	2
Face	No particular expression or smile.	Occasional grimace, tearing, frowning, wrinkled forehead.	Frequent grimace, tearing, frowning, wrinkled forehead.
Activity (movement)	Lying quietly, normal position.	Seeking attention through movement or slow, cautious movement.	Restless, excessive activity and/or withdrawal reflexes.
Guarding	Lying quietly, no positioning of hands over areas of body.	Splinting areas of the body, tense.	Rigid, stiff.
Physiology (vital signs)	Stable vital signs	Change in any of the following: * SBP > 20 mm Hg. * HR > 20/minute.	Change in any of the following: * SBP > 30 mm Hg. * HR > 25/minute.
Respiratory	Baseline RR/SpO_2 Compliant with ventilator	RR > 10 above baseline, or 5% ↓SpO_2 mild asynchrony with ventilator	RR > 20 above baseline, or 10% ↓SpO_2 severe asynchrony with ventilator

Abbreviations: HR, heart rate; RR, respiratory rate; SBP, systolic blood pressure; SpO2, pulse oximetry.
Instructions: Each of the 5 categories is scored from 0-2, which results in a total score between 0 and 10. Document total score by adding numbers from each of the 5 categories. Scores of 0-2 indicate no pain, 3-6 moderate pain, and 7-10 severe pain. Document assessment every 4 hours on nursing flow-sheet and complete assessment before and after intervention to maximize patient comfort. Sepsis, hypo-volemia, hypoxia need to be excluded before interventions.

Source: Odhner M, Wegman D, Freeland N, Ingersoll G. Evaluation of a newly developed non-verbal pain scale (NVPS) for assessment of pain in sedated critically ill patients.

ANNEX 4: Resuscitation

Cardiac Arrest (VF/VT/Asystole/PEA)

Aliases

1. Arrest
2. Full arrest
3. Heart attack

Patient Care Goals

1. Return of spontaneous circulation (ROSC)
2. Preservation of neurologic function
3. High-quality chest compressions/CPR with minimal interruption from recognition of cardiac arrest until confirmation of ROSC or termination of care

Patient Presentation

Inclusion Criteria

Patients with cardiac arrest

Exclusion Criteria

1. Patients suffering cardiac arrest due to severe hypothermia [See Hypothermia/Cold Exposure Protocol]
2. Patients with identifiable Do Not Resuscitate (or equivalent such as POLST) order
3. Patients in arrest due to traumatic etiology [See General Trauma Management Protocol]

Patient Management

Assessment

1. The patient in cardiac arrest requires a prompt balance of treatment and assessment
2. In cases of cardiac arrest, assessments should be focused and limited to obtaining enough information to reveal the patient is pulseless
3. Once pulselessness is discovered, treatment 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 for shockable rhythms and minimally interrupted 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

a. If adequate, uninterrupted bystander CPR has been performed or if the patient arrests in front of the EMS clinicians, immediately proceed with rhythm analysis and defibrillation, if appropriate
b. It is realistic for EMS clinicians to tailor the sequence of rescue actions to coincide the most likely cause of arrest
c. There is insufficient evidence to recommend for or against delaying defibrillation to provide a period of CPR for patients in VF/pulseless VT out-of-hospital cardiac arrest
d. For adults and children with unwitnessed cardiac arrest or for whom an AED is not immediately available, it is reasonable that CPR be initiated while the defibrillator equipment is being retrieved and applied and that defibrillation, if indicated, be attempted as soon as the device is ready for use

2. The maximum setting on the defibrillator should be used for initial and subsequent defibrillation attempts. Defibrillation dosing should follow manufacturer's recommendation in the case of biphasic defibrillators. If the manufacturer's recommendation is unknown, use highest setting possible. In the case of monophasic devices, the setting should be 360J (joule) (or 4 J/kg for children)
3. Chest compressions should resume immediately after defibrillation attempts with no pauses for pulse checks for 2 minutes regardless of the rhythm displayed on the cardiac monitor
4. 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
5. If feasible, IV or IO access should be obtained. Administer epinephrine during the first or second round of compressions. Prioritize early administration of epinephrine for non-shockable rhythms
6. Continue the cycle of chest compressions for 2 minutes, followed by rhythm analysis and defibrillation of shockable rhythms; during this period, the proper strategy of airway management is currently not defined and many options for airway management exist. Regardless of the airway management and ventilation strategy, consider the following principles:
    a. The airway management strategy should not interrupt compressions
    b. Successful resuscitation from cardiac arrest depends primarily on effective, minimally interrupted chest compressions and prompt defibrillation if the patient is in pulseless VT/VF. As opposed to children, an adult's airway management is of secondary importance and should not interfere with compressions and defibrillation. Options for airway management include:
        i. Passive ventilation:
            1. High flow oxygen is applied via a non-rebreather mask with an oropharyngeal airway
            2. Some oxygen will be entrained with each decompression of the chest
            3. This may be applied for the first 3–4 compression cycles (6–8 minutes), after which one may consider BVM ventilation or placement of an advanced airway
        ii. BVM ventilation at 10 breaths per minute (1 breath every 10 compressions), applied during the upstroke between compressions, without interrupting the compressions, targeting a ventilatory volume of 500 mL (adults)
        iii. BVM ventilation with 30:2 ventilation to compression ratio: Each 30 compressions, the compressions are paused briefly to allow 2 BVM ventilations, then compressions immediately resumed
            1. **Pediatric Consideration:** For multiple rescuer CPR in children, 15:2 is the recommended compression-to-ventilation ratio (30:2 for single rescuer)
            2. **Pediatric Consideration:** For neonates, 3:1 is the recommended compression-to-ventilation ratio
        iv. Advanced airway placement:
            1. Either a supraglottic airway or an endotracheal tube may be placed without interruption of compressions
            2. Ventilations are provided at 10 breaths/minute for adults
            3. **Pediatric Consideration:** for children, 1 breath every 3–5 seconds is recommended (12–20 breaths/minute)
            4. **Pediatric Consideration:** deliver volume needed to achieve chest rise
7. Consider use of antiarrhythmic for recurrent VF/Pulseless VT
    a. The principal objective of antiarrhythmic drug therapy in shock-refractory VF and pulseless VT is to facilitate the restoration and maintenance of a spontaneous perfusing rhythm in concert with the shock termination of VF/VT; some antiarrhythmic drugs have been associated with increased rates of ROSC and hospital

admission, but none have yet been proven to increase long-term survival or survival with good neurologic outcome
    i. Amiodarone (5 mg/kg IV, max of 300 mg) may be considered for VF/pulseless VT that is unresponsive to CPR, defibrillation, and a vasopressor therapy
    ii. Lidocaine (1 mg/kg IV) may be considered as an alternative to amiodarone for VF/pulseless VT that is unresponsive to CPR, defibrillation, and vasopressor therapy
    iii. The routine use of magnesium for VF/pulseless VT is not recommended in adult patients unless it is refractory, polymorphic VT, or Torsades de pointes.
  b. There is inadequate evidence to support the routine use of lidocaine and beta-blockers after cardiac arrest by EMS. There is insufficient evidence to recommend for or against the routine initiation or continuation of other antiarrhythmic medications after ROSC from cardiac arrest
  c. For torsades de pointes, give magnesium sulfate 2 g IV administered over 1–2 minutes (or 25–50 mg/kg for **pediatrics**). There is insufficient evidence to recommend for or against the routine administration during cardiac arrest
8. Consider reversible causes of cardiac arrest which include the following:
  a. Hypothermia – additions to care include attempts at active rewarming [See Hypothermia/Cold Exposure Protocol]
  b. The dialysis patient/known hyperkalemic patient – Additions to care include the following:
    i. Calcium gluconate 10% 1 g IV bolus over 2 minutes (for **pediatrics**, the mg/kg which is 1 mL/kg), can repeat the dose if no response **OR**
    ii. Calcium chloride 10% 1 g IV bolus over 2 minutes (for **pediatrics**, the dose is 20 mg/kg which is 0.2 mL/kg)
    iii. Sodium bicarbonate 1 mEq/kg IV
  c. Tricyclic antidepressant overdose. Additions to care include sodium bicarbonate 1 mEq/kg IV
  d. Hypovolemia. Additions to care include normal saline 2 L IV (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
  f. If tension pneumothorax suspected, perform needle decompression. Assess ETT, if misplaced, replace ETT
9. If at any time during this period of resuscitation the patient regains return of spontaneous circulation, treat per Adult Post-ROSC (Return of Spontaneous Circulation) Care Protocol

Patient Safety Considerations

1. Performing manual chest compressions in a moving vehicle may pose a clinician safety concern
2. In addition, manual chest compressions during patient movement are less effective in regard to hands on time, depth, recoil and rate
3. Ideally, patients should be resuscitated as close to the scene as operationally possible
4. Risks and benefits should be considered before patient movement in cardiac arrest situations

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) and less than 2.4 inches (6 cm) for adults and children or 1.5 inches (4 cm) for infants; adolescents who have entered puberty should receive the same depth of chest compressions as an adult
  c. Allow for complete chest recoil (avoid leaning)

   d. Minimize interruptions in compressions
   e. Avoid rescuer fatigue by rotating rescuers at least every 2 minutes. Some EMS pit crew approaches use a clinician on either side of the chest, alternating compressions every minute or every 100 compressions to avoid fatigue
2. **Avoid excessive ventilation** and consider delayed airway management – If no advanced airway, consider:
   a. Passive ventilation using an NRB with 3–4 cycles of uninterrupted chest compressions (for arrests of suspected cardiac etiology). Consider BVM ventilation or advanced airway after 3–4 cycles
   b. BVM ventilation every 10–15 compressions with cycles of uninterrupted chest compressions. Upstroke ventilation between compressions.30:2 ventilation to compression ratio for adults, and 15:2 for children when 2 rescuers are present
   c. If an advanced airway is placed, ventilations should not exceed 10 breaths/minute (1 breath every 6 seconds or 1 breath every 10 compressions) in adults. **Pediatric Consideration:** For children with an advanced airway, 1 breath every 3–5 seconds is recommended (equivalent to 12–20 breaths/minute)
3. Quantitative end-tidal capnography (EtCO2) should be used to monitor effectiveness of chest compressions
   a. If EtCO2 less than 10 mmHg during the initial phases of resuscitation, attempt to improve chest compression quality
   b. Consider additional monitoring with biometric feedback which may improve compliance with suggested Resuscitation Section
4. Chest compressions are usually the most rapidly applied therapy for the patient in cardiac arrest and should be initiated 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 (e.g., 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 between 30 seconds and 2 minutes of chest compressions in cases of no bystander chest compressions or to perform defibrillation as soon as possible after chest compressions initiated in cases of witnessed arrest
5. There is insufficient evidence to recommend the routine use of extracorporeal CPR (ECPR) for patients with cardiac arrest. In settings where it can be rapidly implemented, ECPR may be considered for select cardiac arrest patients for whom the suspected etiology of the cardiac arrest is potentially reversible during a limited period of mechanical cardiorespiratory support
6. Chest compressions should be reinitiated immediately after defibrillation as pulses, if present, are often difficult to detect and rhythm and pulse checks interrupt compressions
7. Continue chest compressions between completion of AED analysis and AED charging
8. The effectiveness of chest compressions decreases when moving patients
   a. 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
   b. Chest compressions are also less effective in a moving vehicle
   c. It is also dangerous to EMS clinicians, patients, pedestrians, and other motorists to perform chest compressions in a moving ambulance
   d. For these reasons and because in most cases the care provided by EMS clinicians is equivalent to that provided in emergency departments, resuscitation should occur on scene
9. The maximum setting on the defibrillator should be used for initial and subsequent defibrillation attempts. Defibrillation dosing should follow manufacturer's recommendation in the case of biphasic defibrillators. If the manufacturer's recommendation is unknown, use highest setting possible. In the case of monophasic devices, the setting should be 360 J (joule) (or 4 J/kg for children)

10. IV or IO access without interrupting chest compressions
11. Administer epinephrine (0.1 mg/kg, maximum dose 1 mg) IV/IO during the first or second round of compressions
12. At present, the most effective mechanism of airway management is uncertain due to 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
        i. Current recommendations suggest using the highest flow rate possible through NRB or BVM
        ii. This should not be continued into the post-resuscitation phase in which the goal should be an oxygen saturation (SpO2) of 94–98%
    e. **Pediatric Considerations**: Special attention should be applied to the pediatric population and airway management/respiratory support. Given that the most likely cause of cardiac arrest is respiratory, airway management may be considered early in the patient's care
        i. However, the order of Circulation-Airway-Breathing is still recommended as the order of priority by the American Heart Association for pediatric resuscitation to ensure timely initiation of chest compressions to maintain perfusion, regardless of the underlying cause of the arrest
        ii. In addition, conventional CPR is preferred in children, since it is associated with better outcomes when compared to compression-only CPR
13. Special Circumstances in Cardiac Arrest
    a. Trauma, treat per the General Trauma Management Protocol
    b. Pregnancy
        i. The best hope for fetal survival is maternal survival
        ii. Position the patient in the supine position with a second rescuer performing manual uterine displacement to the left to displace the gravid uterus and increase venous return by avoiding aorto-caval compression
        iii. If manual displacement is unsuccessful, the patient may be placed in the left lateral tilt position at 30°. This position is less desirable than the manual uterine displacement as chest compressions are more difficult to perform in this position
        iv. Chest compressions should be performed slightly higher on the sternum than in the non-pregnant patient to account for elevation of the diaphragm and abdominal contents in the obviously gravid patient
        v. Defibrillation should be performed as in non-pregnant patients
    c. Arrests of respiratory etiology (including drowning). In addition to the above, consider early management of the patient's airway. Passive ventilation with a NRB is not indicated for these patients
14. **Application of the "pit crew" model of resuscitation**
    a. Ideally, clinicians 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 who 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. Use 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. For IO access:
1. The proximal humerus is the preferred site for adults
2. The tibial site is preferred for infants and children
v. During the first four cycles of compressions/defibrillation (approximately 10 minutes) avoid advanced airway placement
vi. One responding clinician 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 clinicians 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

15. The EMS agency must perform a Quality Improvement (QI) review of care and outcome, overseen by the agency medical director, for every patient that receives CPR
a. 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
b. The QI should be coordinated with local 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:
  - O Resuscitation attempted and all interventions performed o Arrest witnessed
  - O Location of arrest
  - O First monitored rhythm o CPR before EMS arrival
  - O Outcome
  - O Any ROSC
  - O Presumed etiology

Performance Measures

- Time to scene
- Time to patient
- Time to first CPR
- Time to first shock
- Time of ROSC
- Review of CPR quality
  o Compression fraction
  o Average and longest peri-shock pause o Rate and depth of compressions

Adult Post-ROSC (Return of Spontaneous Circulation) Care

Aliases
None noted

Patient Care Goals
The immediate ROSC period is critical in stabilizing patients and preparing for transport. The goal is therefore to maximize survival and optimize neurologic and cardiovascular function following a return of spontaneous circulation by the following steps:

Secure airway
Obtain vascular access Maximize blood pressure
Identify ST-elevation myocardial infarction (STEMI) or reversible causes of arrest
Recognize pending re-arrest
Consider appropriate destination choice

Patient Presentation

Inclusion Criteria
Patient returned to spontaneous circulation following cardiac arrest resuscitation

Exclusion Criteria
None noted

Patient Management

Assessment, Treatment, and Interventions

1. Perform general patient assessment attempting to identify cause of cardiac arrest.
2. Support life-threatening problems associated with airway, breathing, and circulation.
   a. For example, most of the pediatric cardiac arrest occurs due to non-cardiac causes such as respiratory failure (hypoxemia) or shock (hypovolemia).
3. Monitor closely for recurrence of cardiac arrest using clinical and adjunctive criteria such as cardiac monitoring, EtCO2 monitoring, and physical signs of perfusion
4. Administer oxygen as appropriate with a target of achieving 94–98% saturation. Do **not** hyperoxygenate.
5. Do **not** hyperventilate. Maintain a ventilation rate of 8–10 breaths per minute, targeting an EtCO2 of 35–45 mmHg.
6. For hypotension (SBP less than 90 mmHg or MAP less than 65 in adults) see Shock Protocol
7. Perform serial 12-lead EKGs to assess for evidence of reversible cause of arrest such as STEMI or electrolyte derangement (e.g., hyperkalemia)
8. Post-cardiac arrest patients with evidence or interpretation consistent with ST elevation myocardial infarction (STEMI/acute MI) should be transported preferably to a facility capable of emergent cardiac catheterization or, as a secondary option, to a STEMI receiving facility based upon local resources and system of care
9. Check blood glucose
   a. If hypoglycemic, treat per Hypoglycemia Protocol
   b. If hyperglycemic, notify hospital on arrival
10. If patient seizes, treat per Seizures Protocol
11. Consider transporting patients to an age-appropriate facility which offers specialized adult or pediatric post-resuscitation care

Patient Safety Considerations

1. Avoid hyperthermia (temperature greater than 37.5° C or 99.5° F) by avoiding excessive environmental heat exposure, warm blankets, etc.
    a. Beyond interventions to prevent hyperthermia or fever, prehospital initiation of therapeutic hypothermia (targeted temperature management) is not routinely recommended

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. Similarly, hypoventilation (suggested by an EtCO2 greater than 40–45) contributes to worsening acidosis and may precipitate re-arrest
2. Most patients are comatose immediately after resuscitation and will require airway management and ventilatory assistance
3. Many patients experience "stunning" of the cardiac muscle after ROSC. Hypotension is common, and volume resuscitation or vasopressor support is often required. Refer to the [Shock Protocol] for further recommendations
4. Common non-cardiac causes of post-resuscitation hypotension include hyperventilation, hypovolemia, and traumatic pneumothorax from chest compressions
5. The condition of post-resuscitation patients fluctuates rapidly and continuously requiring close monitoring. A significant percentage of post-ROSC patients will re-arrest
6. Current research has demonstrated that care of patients with ROSC at specialized centers is associated with both decreased mortality and improved neurologic outcomes
7. Maintain mechanical CPR device in place in preparation for re-arrest
8. A moderate number of adult post-ROSC patients may have transient ST-elevation on EKG Consider performing serial EKGs. Post-ROSC patients should preferentially be transported to centers capable of managing STEMI, whenever possible

Pertinent Assessment Findings

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

Quality Improvement

Key Documentation Elements

- Immediate post-arrest rhythms, vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) and oxygen saturation
- Post-ROSC 12-lead EKG

Performance Measures

- Percent of ROSC patients transported to appropriate facility as defined by the EMS system

Resuscitation in Traumatic Cardiac Arrest

Aliases

Traumatic Cardiac Arrest (TCA)

Patient Care Goals

1. Return of spontaneous circulation
2. Treatment and resolution of the underlying pathophysiology leading to the traumatic cardiac arrest
3. When appropriate, transport to the closest and most capable hospital within the defined trauma system

Patient Presentation

Inclusion Criteria

Patients suffering blunt or penetrating trauma with cardiac arrest after arrival of EMS clinicians or while under the care of EMS clinicians (witnessed arrest or recent arrest with continued signs of life)

Exclusion Criteria

1. When the mechanism of injury does not correlate with the clinical condition, suggesting a nontraumatic cause of cardiac arrest, standard resuscitative measures should be followed. In such cases, refer to the Resuscitation Section
2. In victims of blunt or penetrating trauma with pulses or other signs of life on EMS clinician assessment refer to the General Trauma Management Protocol
3. In victims of blunt or penetrating trauma with rigor mortis, lividity, or evidence of injuries incompatible with life (including decapitation, hemicorporectomy).

Patient Management

Assessment

1. Management of traumatic cardiac arrest requires a balance of rapid, focused evaluation followed by prompt treatment of reversible life threats, including management of massive hemorrhage, airway management, decompression of tension pneumothorax, and resuscitation
2. Assess for signs of life, including pulses, respiratory effort, and evaluation of other signs of life
3. Assess for evidence of massive hemorrhage
    a. Including evidence of massive external hemorrhage
    b. Evidence of pelvic injury (such as instability)
4. Assess the patient's airway
5. Assess the patient's respiratory effort, if present, or for evidence of tension pneumothorax
6. Assess vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment)

Treatment and Interventions

Manage massive hemorrhage. Hemorrhage management takes priority in traumatic cardiac arrest. Refer to General Trauma Management Protocol for complete list of therapies for the treatment of massive hemorrhage, including the following:

a. Place tourniquets for wounds amenable to tourniquet placement
b. Use a combination of wound packing and direct pressure for junctional wounds or junctional tourniquets if available
c. Place a pelvic binder on all patients with blunt or blast trauma suffering traumatic arrest

2. Manage the patient's airway. Refer to the Airway Management Protocol
3. Perform bilateral, rapid chest decompression 4. Establish intravenous access
5. Initiate volume resuscitation and adjunctive hemorrhage control measures (such as tranexamic acid (TXA)) en route to the hospital

Patient Safety Considerations

None noted

Notes/Educational Pearls

Key Considerations

1. Survival from traumatic cardiac arrest requires careful coordination between rapid prehospital assessment, EMS clinician treatment of reversible causes of traumatic cardiac arrest and transport that is rapid, but also allows maintenance of necessary therapies in a manner that is effective for patients as well as safe for EMS clinicians
2. Evidence for the benefit of CPR in traumatic cardiac arrest is limited. Treatment priorities should initially focus on control of massive hemorrhage (including management of pelvis fractures), airway management, and consideration of bilateral needle thoracostomy. If CPR is performed at all, it should be performed en route to the hospital but only if it can be performed in a safe and effective manner by EMS clinicians
3. Unless there is an immediate and correctable cause, patients suffering traumatic cardiac arrest have the best chance for survival when arrival time to a hospital is within minutes
4. If transport is initiated, consider the ACS-COT's Once the above treatments and interventions have been performed, patients should be transported to the closest appropriate hospital within the defined trauma system
5. In an effort to reduce on-scene time, consider IV/IO access and initiation of resuscitation during transport
6. Optimal choices for resuscitation are (in descending order as available) as follows: whole blood, balanced blood products (red blood cells (RBC), plasma), packed red blood cells alone, liquid, or freeze-dried plasma alone, no fluid resuscitation. Excessive crystalloid and colloid have little to no value and may in fact be harmful in hemorrhagic shock

Pertinent Assessment Findings

1. Evidence of injuries incompatible with life
2. Evidence of signs of life

Quality Improvement

Key Documentation Elements

- Mechanism of injury
- Primary survey findings
- Secondary survey findings
- Scene time
- Procedures performed and patient response

Performance Measures

- Scene time
- Appropriateness of procedures, including airway management, hemorrhage control, needle thoracostomy, intravenous access and resuscitation

1. Manage massive hemorrhage. Hemorrhage management takes priority in traumatic cardiac arrest. Refer to General Trauma Management Protocol for complete list of therapies for the treatment of massive hemorrhage, including the following:
   a. Place tourniquets for wounds amenable to tourniquet placement
   b. Use a combination of wound packing and direct pressure for junctional wounds or junctional tourniquets if available
   c. Place a pelvic binder on all patients with blunt or blast trauma suffering traumatic arrest
2. Manage the patient's airway. Refer to the Airway Management Protocol
3. Perform bilateral, rapid chest decompression 4. Establish intravenous access
5. Initiate volume resuscitation and adjunctive hemorrhage control measures (such as tranexamic acid (TXA)) en route to the hospital

Patient Safety Considerations

None noted

Notes/Educational Pearls

Key Considerations

1. Survival from traumatic cardiac arrest requires careful coordination between rapid prehospital assessment, EMS clinician treatment of reversible causes of traumatic cardiac arrest and transport that is rapid, but also allows maintenance of necessary therapies in a manner that is effective for patients as well as safe for EMS clinicians
2. Evidence for the benefit of CPR in traumatic cardiac arrest is limited. Treatment priorities should initially focus on control of massive hemorrhage (including management of pelvis fractures), airway management, and consideration of bilateral needle thoracostomy. If CPR is performed at all, it should be performed en route to the hospital but only if it can be performed in a safe and effective manner by EMS clinicians
3. Unless there is an immediate and correctable cause, patients suffering traumatic cardiac arrest have the best chance for survival when arrival time to a hospital is within minutes
4. If transport is initiated, consider the ACS-COT's Once the above treatments and interventions have been performed, patients should be transported to the closest appropriate hospital within the defined trauma system
5. In an effort to reduce on-scene time, consider IV/IO access and initiation of resuscitation during transport
6. Optimal choices for resuscitation are (in descending order as available) as follows: whole blood, balanced blood products (red blood cells (RBC), plasma), packed red blood cells alone, liquid, or freeze-dried plasma alone, no fluid resuscitation. Excessive crystalloid and colloid have little to no value and may in fact be harmful in hemorrhagic shock

Pertinent Assessment Findings

1. Evidence of injuries incompatible with life
2. Evidence of signs of life

Quality Improvement

Key Documentation Elements

- Mechanism of injury
- Primary survey findings
- Secondary survey findings
- Scene time
- Procedures performed and patient response

Performance Measures

- Scene time
- Appropriateness of procedures, including airway management, hemorrhage control, needle thoracostomy, intravenous access and resuscitation.

ANNEX 5: Pediatric-Specific Protocols

Brief Resolved Unexplained Event (BRUE) & Acute Events in Infants

Aliases

Apparent Life-Threatening Event (ALTE)

Patient Care Goals

1. Recognize patient characteristics and symptoms consistent with a BRUE
2. Promptly identify and intervene for patients who require escalation of care
3. Choose proper destination for patient transport

Patient Presentation

Inclusion Criteria

1. **Suspected BRUE**: An event in an infant less than 1 year old reported by a bystander as sudden, brief (less than 1 minute), unexplained, and completely resolved upon EMS arrival that includes one or more of the following:
    a. Breathing change (absent, decreased, or irregular)
    b. Color change (central cyanosis or pallor)
    c. Marked change in muscle tone (hyper- or hypotonia)
    d. Altered level of responsiveness (increased, irritability, or decreased)

Exclusion Criteria

1. Any signs or symptoms suggestive of underlying or acute illness or injury present upon EMS evaluation, such as:
    a. Abnormal vital signs for age (including fever)
    b. Vomiting
    c. Signs of trauma
    d. Noisy or labored breathing
2. Identifiable cause for the event, such as:
    a. Gastric reflux (spitting up)
    b. Swallowing dysfunction
    c. Nasal congestion or excessive secretions from the nose and/or mouth
    d. Periodic breathing of the newborn
    e. Breath-holding spell
    f. Change in tone associated with choking, gagging, crying, feeding
    g. Seizure (e.g., eye deviation, nystagmus, tonic-clonic activity)
    h. Hypoglycemia
    i. Significant past medical history (e.g., congenital heart disease, pulmonary disease, VP shunt, or seizure disorder)
    j. Need for IV medication administration
3. History or exam concerning for child abuse or neglect
4. Color change that involved only redness (e.g., in the face) or isolated hands/feet cyanosis

Patient Management

Assessment

1. History
    a. History of circumstances and symptoms before, during, and after the event, including duration, interventions done, as well as patient color, tone, breathing, feeding, position, location, activity, and level of consciousness
    b. Other concurrent symptoms (e.g., fever, congestion, cough, rhinorrhea, vomiting, diarrhea, rash, labored breathing, fussy, less active, poor sleep, poor feeding)
    c. Prior history of BRUE (ever, including past 24 hours)
    d. Past medical history (e.g., prematurity, prenatal/birth complications, gastric reflux, congenital heart disease, developmental delay, airway abnormalities, breathing problems, prior hospitalizations, surgeries, or injuries)
    e. Family history of sudden unexplained death or cardiac arrhythmia in other children or young adults
    f. Social history: those living at home, recent household stressors, exposures to toxins/drugs, sick contacts
    g. Considerations for possible child abuse (i.e., multiple/changing versions of the story or reported mechanism of injury does not seem plausible, especially for child's developmental stage) [See Abuse and Maltreatment Protocol]
2. Exam
    a. Full set of vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment)
    b. General assessment:
        i. Signs of respiratory distress or increased work of breathing (e.g., tachypnea, grunting or other abnormal breath sounds, nasal flaring, retracting, or head bobbing)
        ii. Color, both central and peripheral (pallor, cyanosis, redness, or normal), capillary refill iii. Mental status (alert, tired, lethargic, unresponsive, or irritable)
    c. Head to toe exam, including:
        i. Physical exam for signs of trauma or neglect ii. Pupillary response and anterior fontanelle

Treatment and Interventions

1. Monitoring (all patients with possible BRUE)
    a. Continuous cardiac monitor
    b. Continuous pulse oximetry
    c. Serial observations during transport for change in condition
    d. Check point-of-care (POC) blood glucose and treat symptomatic hypoglycemia [See Hypoglycemia Protocol]
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 [See Airway Management Protocol]
    b. Suction excessive secretions from the nose and/or mouth (using bulb syringe or suction catheter) [See Pediatric Respiratory Distress (Bronchiolitis) Protocol]
3. Utility of IV placement and fluids
    a. Routine IVs should **not** be placed on all suspected BRUE patients
    b. IVs should be placed only for clinical concerns of shock or to administer IV medications
4. Transport the patient to the appropriate facility even if they appear well or have returned to their baseline

Patient Safety Considerations

1. Regardless of the patient's well appearance, all infants with a history of signs or symptoms suggestive of BRUE should be transported for further evaluation

a. By definition, infants who are not completely well-appearing at EMS evaluation do not meet the definition of possible BRUE and should be treated and transported according to local Protocols

2. Destination considerations
   a. All patients should be transported to facilities with at least baseline pediatric readiness, i.e., appropriate equipment, resources, and trained staff capable of providing initial emergency care and stabilization to pediatric patients prior to hospital admission or interfacility transfer, if feasible
   b. Consider transport to a facility with pediatric critical care capability for patients with any **high-risk criteria**:

      I. Less than 2 months of age
      II. History of prematurity (less than or equal to 32 weeks gestation)
      III. More than one BRUE, now or in the past
      IV. Event duration greater than 1 minute
      V. CPR or resuscitation by caregivers or trained rescuers

Notes/Educational Pearls

Key Considerations

1. BRUE is a group of symptoms, not a disease process
2. If the infant is not completely well upon EMS arrival, this excludes possible BRUE event:
   a. Treat and transport according to local Protocols
3. Avoid using "BRUE", "ALTE", "SIDS" (sudden infant death syndrome), or "near-miss SIDS" terminology with parent/guardian
4. EMS clinicians play a unique and important role in obtaining an accurate history soon after the event and in observing, documenting, and reporting environmental, scene and social indicators that may point to an alternate diagnosis
5. High-risk patients with a possible BRUE have worse outcomes and may require emergency department (ED) or inpatient testing, intervention, and/or follow-up
6. The determination of a BRUE is made only after hospital evaluation, not in the field:
   a. A few of these infants will die even after hospital evaluation and treatment
7. All patients should be transported to an ED
8. Contact medical direction if parent/guardian is refusing medical care and/or transport, especially if any high-risk criteria are present

Quality Improvement

Key Documentation Elements

- Document key aspect of history
  - The event:
    - Breathing (apnea or respiratory distress)
    - Color change (central and/or peripheral)
    - Change in muscle tone
    - Level of responsiveness
    - Event duration
    - Witnessed?
  - Pre-event circumstances and history
    - Event associated with feeding or other activity
    - History of prematurity
    - Prior BRUE events (ever or in past 24 hours)
    - Past medical history, especially cardiac, respiratory, gastrointestinal, neurologic
  - Caregiver resuscitation efforts
  - Post-event symptoms and circumstances
- Document key aspects of the exam and assess for changes after each intervention:

- Full set of vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment), temperature, and O_2 saturation
- Respiratory effort
- Mental status including pupillary reaction and pediatric Glasgow Coma Score (GCS) or AVPU
- Color (central and peripheral) and capillary refill
- Presence of signs of abuse, trauma, or neglect

- Document environmental and scene/social clues, especially those suggesting abuse, neglect, non-accidental trauma, or unsafe sleeping practices

Performance Measures

- Complete set of vital signs recorded
- Appropriate transport destination relative to risk criteria

Pediatric Respiratory Distress (Bronchiolitis)

(Adapted from an evidence-based Protocol created using the National Prehospital Evidence-Based Protocol Model Process)

Aliases

None noted

Patient Care Goals

1. Alleviate respiratory distress
2. Promptly identify respiratory distress, failure, and/or arrest, and intervene for patients who require escalation of therapy
3. Deliver appropriate therapy by differentiating other causes of pediatric respiratory distress

Patient Presentation

Inclusion Criteria

Child less than 2 years of age typically with diffuse rhonchi and/or wheezing with a viral or other undifferentiated illness characterized by rhinorrhea, cough, fever, tachypnea, and/or respiratory distress

Exclusion Criteria

1. Anaphylaxis
2. Croup
3. Epiglottitis
4. Foreign body aspiration
5. Submersion/drowning
6. Asthma

Patient Management

Assessment

1. History
   a. Onset of symptoms
   b. Concurrent symptoms (e.g., fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, foreign body aspiration)
   c. Sick contacts
   d. History of wheezing
   e. Respiratory and other treatments given
   f. Number of emergency department visits in the past year
   g. Number of admissions in the past year

h. Number of intensive care unit (ICU) admissions ever (including pediatric ICU (PICU) and neonatal ICU (NICU))
i. History of prematurity
j. Family history of asthma, eczema, or allergies
k. Change in feeding patterns and/or number of wet diapers

2. Exam
   a. Full set of vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, and O2 saturation
   b. Air entry (normal vs. diminished)
   c. Breath sounds (wheezes, crackles, rales, rhonchi, diminished, clear)
   d. Signs of distress (grunting, nasal flaring, retracting, accessory muscle use)
   e. Weak cry or inability to 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, mucous membranes (moist vs. tacky), fontanel (flat vs. sunken))

Treatment and Interventions

1. Pulse oximetry and end-tidal capnography (EtCO2) should be routinely used as an adjunct to other forms of respiratory monitoring
2. Perform EKG only if there are no signs of clinical improvement after treating respiratory distress
3. Airway
   a. Give supplemental oxygen – escalate from a nasal cannula to a simple face mask to a non-breather mask as needed, to maintain normal oxygenation (goal SpO2 94–98%)
   b. Suction the nose and/or mouth (via bulb or suction catheter) particularly if excessive secretions are present
4. Inhaled medications – nebulized epinephrine 5 mg (5 mL of 1 mg/mL solution) should be administered to children in severe respiratory distress with bronchiolitis in the prehospital setting if other treatments (e.g., suctioning, oxygen) fail to result in clinical improvement; if immediate reassessment after treatment does *not* demonstrate clinical improvement, airway management should be escalated as necessary (*see below* and refer to Airway Management Protocol)
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. Otherwise, IV access is not routinely needed in bronchiolitis.
6. Steroids are not efficacious and should not be given
7. Improvement of oxygenation and/or respiratory distress with non-invasive airway adjuncts:
   a. High flow nasal cannula (HFNC) or continuous positive airway pressure (CPAP) can be administered, when available, for severe respiratory distress
   b. Bag-valve-mask ventilation should be utilized in children with respiratory failure or impending respiratory failure
8. Supraglottic devices and intubation
   a. Supraglottic devices and intubation should be utilized only if bag-valve-mask (BVM) ventilation fails
   b. The airway should be managed in the least invasive way possible

Patient Safety Considerations

Routine use of lights and sirens is not recommended during transport

Notes/Educational Pearls

Key Considerations

1. Suctioning can be a very effective intervention to alleviate distress since infants are obligate nose breathers
2. Heliox should **not** be routinely administered to children with respiratory distress
3. Insufficient data exist to recommend the use of inhaled steam or nebulized saline
4. Although albuterol and steroids have previously been a consideration, the most recent evidence does not demonstrate a benefit in routine use of albuterol or steroids for bronchiolitis
5. Ipratropium and other anticholinergic agents should not be given to children with bronchiolitis in the prehospital setting
6. Although nebulized hypertonic saline has been shown to decrease hospital length of stay when used for bronchiolitis, it does not provide immediate relief of distress and should not be administered to children in respiratory distress in the prehospital setting

Pertinent Assessment Findings

Frequent reassessment is necessary to determine if interventions have alleviated signs of respiratory distress.

Quality Improvement

Key Documentation Elements

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

- Respiratory rate
- Oxygen saturation
- Use of accessory muscles
- Breath sounds
- Air entry
- Color
- Mental Status

Performance Measures

- Supplemental oxygen, high flow oxygen by nasal cannula (HFNC), time to administration of specified interventions in the protocol
- Rate of administration of accepted therapy (whether certain medications/interventions were given)
- Change in vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, O2 saturation and capnography values)
- Time to administration of specified interventions in the protocol
- Number of advanced airway attempts
- Mortality

Pediatric Respiratory Distress (Croup)

(Adapted from an evidence-based Protocol created using the National Prehospital Evidence-Based Protocol Model Process)

Aliases
None noted

Patient Care Goals

1. Alleviate respiratory distress
2. Promptly identify respiratory distress, respiratory failure, respiratory arrest, and intervene for patients who require escalation of therapy
3. 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

1. Presumed underlying cause that includes one of the following:
   a. Anaphylaxis
   b. Asthma
   c. Bronchiolitis (wheezing in a patient less than 2 years of age)
   d. Foreign body aspiration
   e. Submersion/drowning
   f. Epiglottitis

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 (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, and O2 saturation
   b. Presence of stridor at rest or when agitated
   c. Description of cough
   d. Other signs of distress (grunting, nasal flaring, retracting, use of accessory muscles)
   e. Color (pallor, cyanosis, normal)
   f. Mental status (alert, tired, lethargic, unresponsive)

Treatment and Interventions

1. Monitoring

a. Pulse oximetry and EtCO2 should be routinely used as an adjunct to other forms of respiratory monitoring

2. Airway
   a. Give supplemental oxygen. Escalate from a nasal cannula to a simple face mask to a non-breather mask to SPO2 94-98%

b. Suction the nose and/or mouth (via bulb or suction catheter) if excessive secretions are present

3. Inhaled medications should be administered to all children with croup in respiratory distress with signs of stridor at rest—these medications should be repeated at this dose with unlimited frequency for ongoing respiratory distress
   a. Epinephrine 5 mg (5 mL of 1 mg/mL solution) nebulized (may repeat in 20 minutes as needed), or
   b. Racemic epinephrine 0.5 mL of 2.25% solution mixed in 2.5 mL NS (may repeat in 20 minutes as needed)
   c. Humidified oxygen or mist therapy is not indicated
4. Dexamethasone 0.6 mg/kg oral, IV, or IM to maximum dose of 16 mg should be administered to patients with suspected croup
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
6. Improvement of oxygenation and/or respiratory distress with non-invasive airway adjuncts
   a. Heliox for the treatment of croup can be considered for severe distress not responsive to more than 2 doses of epinephrine
   b. Continuous positive airway pressure (CPAP) should be administered for severe respiratory distress
   c. BVM ventilation should be utilized in children with respiratory failure
7. Supraglottic devices and intubation — should be utilized only if BVM ventilation fails. The airway should be managed in the least invasive way possible

Patient Safety Considerations

1. Routine use of lights and sirens is not recommended during transport
2. Patients who receive inhaled epinephrine should be transported to definitive care

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
4. Without stridor at rest or other evidence of respiratory distress, inhaled medications may not be necessary

Pertinent Assessment Findings

1. Respiratory distress (retractions, wheezing, stridor, accessory muscle use)
2. Decreased oxygen saturation
3. Skin color
4. Neurologic status assessment
5. Reduction in work of breathing after treatment 6. Improved oxygenation after breathing

Quality Improvement

Key Documentation Elements

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

- Respiratory rate
- Oxygen saturation
- Use of accessory muscles or tracheal tugging
- Breath sounds
- Air entry
- Mental status
- Color

Performance Measures

- Time to administration of specified interventions in the protocol
- Frequency of administration of specified interventions in the protocol

Neonatal Resuscitation

Aliases
None noted

Patient Care Goals

1. Plan for resources based on number of anticipated patients (e.g., mother and newborn or multiple births)
2. Provide routine care to the newly born infant
3. Perform a neonatal assessment
4. Rapidly identify newly born infants requiring resuscitative efforts
5. Provide appropriate interventions to minimize distress in the newly born infant
6. 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 less than 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, maternal bleeding, difficult delivery (e.g., shoulder dystocia, prolapsed or nuchal cord, breech))
   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 (auscultation of chest is preferred since palpation of umbilical stump is less accurate)
   d. Muscle tone (poor or strong)
   e. Color/Appearance (central cyanosis, acrocyanosis, pallor, normal)
   f. **APGAR** score (**A**ppearance, **P**ulse, **G**rimace, **A**ctivity, **R**espiratory effort) — may be calculated for documentation, but not necessary to guide resuscitative efforts
   g. Estimated gestational age (term, late preterm, premature)
   h. Pulse oximetry should be considered if resuscitative efforts are initiated or if supplemental oxygen is administered

Treatment and Interventions

1. If immediate resuscitation is required and the newborn is still attached to the mother, clamp the cord in two places and cut between the clamps. If no resuscitation is required, warm/dry/stimulate the newborn, and then cut/clamp the cord after 60 seconds or the cord stops pulsating
2. **Dry, warm, 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. If signs of respiratory distress with airway obstruction, suction mouth then nose; routine suctioning is not recommended
4. Apply cardiac monitor, if available
5. If heart rate greater than 100 BPM
   a. Monitor for central cyanosis — provide blow-by oxygen as needed
   b. Monitor for signs of respiratory distress. If apneic or in significant respiratory distress:
      i. **Ventilate**: BVM ventilation with room air at 40–60 breaths per minute
         1. Positive pressure ventilation (PPV) with bag-mask device may be initiated with room air (21% oxygen) in term and late preterm babies; otherwise use 100% oxygen
         2. Goal: SPO2 at 10 minutes is 85–95%
      ii. Consider endotracheal intubation per local Protocols
6. **Evaluate**: If heart rate less than 100 BPM
   a. Initiate BVM ventilation with room air at 40–60 breaths per minute for 90 seconds with room air
      i. Primary indicator of effective ventilation is improvement in heart rate
      ii. Evaluate heart rate every 30 seconds
      iii. 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; can control rate and volume by saying "squeeze, release" – squeeze the bag just until chest rise is indicated then release to allow for exhalation

      b. If no improvement after 90 seconds, change oxygen delivery to 30% FiO2 (fraction of inspired oxygen) if blender available, otherwise 100% FiO2 until heart rate normalizes
   c. Consider endotracheal intubation or supraglottic airway per local Protocols if BVM ventilation is ineffective
7. **Resuscitate**: If heart rate less than 60 BPM:
   a. Ensure effective ventilations with supplementary oxygen and adequate chest rise
   b. If no improvement after 30 seconds, initiate chest compressions — two-thumb-encircling-hands technique is preferred
   c. Coordinate chest compressions with positive pressure ventilation (3:1 ratio, 90 compressions and 30 breaths per minute)
   d. Consider endotracheal intubation or supraglottic airway per local Protocols
   e. Administer epinephrine (Adrenaline) (0.1 mg/mL) 0.01 mg/kg IV/IO (preferable if access obtained) or 0.1 mg/kg via the ETT (if unable to obtain access) q 3–5 min if heart rate remains less than 60 BPM
8. Consider checking a blood glucose for ongoing resuscitation, maternal history of diabetes, ill appearing or unable to feed
9. Administer 20 mL/kg normal saline IV/IO for signs of shock or post-resuscitative care

Patient Safety Considerations

1. Hypothermia is common in newborns and worsens outcomes of nearly all post-natal complications
   a. Ensure heat retention by drying the infant thoroughly, covering the head, and wrapping the baby in dry cloth
   b. 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
   c. Newborn infants are prone to hypothermia which may lead to hypoglycemia, hypoxia, and lethargy. Aggressive warming techniques should be initiated including

drying, swaddling, and warm blankets covering body and head. When available, radiant warmers or other warming adjuncts are suggested for babies who require resuscitation, especially for preterm babies. Check blood glucose and follow Hypoglycemia Protocol as appropriate

2. During transport, neonate should be appropriately secured (e.g., secured to mother with approved neonatal restraint system, car seat or isolette) and mother should be appropriately secured

Notes/Educational Pearls

Key Considerations

1. Approximately 10% of newly born infants require some assistance to begin breathing at birth and 1% require resuscitation to support perfusion
2. Most newborns require only drying, warming, and stimulating to help them transition from fetal respiration to newborn respiration. The resuscitation sequence can be remembered as ***Dry, Warm, and Stimulate – Ventilate – Evaluate – and Resuscitate***

Table 1. Assessments that are used to initiate BMV and chest compressions

		INTERVENTION INDICATED		
		Blow-by Oxygen	Bag-Mask-Ventilation (BVM)	BVM and Chest compressions
ASSESSMENT	Heart Rate (BPM)	> 100	60–100	< 60
	Respiratory Distress/Apnea	No	Yes	
	Central Cyanosis Present	Yes	Yes/No	

3. Deliveries complicated by maternal bleeding (placenta previa, vas previa, or placental abruption) place the infant at risk for hypovolemia secondary to blood loss
4. Low birth weight infants are at high-risk for hypothermia due to heat loss

Table 2. Projected Pulse Oximetry in Infants Over Time

Time Since Birth	Projected Increase in Pulse Oximeter Over Time
1 minute	60–65%
2 minutes	65–70%
3 minutes	70–75%
4 minutes	75–80%
5 minutes	80–85%
10 minutes	85–90%

5. Measuring the pulse oximetry on the right hand provides the most accurate oxygen saturation (SpO2) in infants that are transitioning from fetal to normal circulation. At 60 seconds, 60% is the target with an increase of 5% every minute until 5 minutes of life when pulse oximetry is 80–85%

6. Both hypoxia and excess oxygen administration can result in harm to the infant. If prolonged oxygen use is required, titrate to maintain an SPO2 of 85–95%

7. While not ideal, a larger facemask than indicated for patient size may be used to provide BVM ventilation if an appropriately sized mask is not available. Avoid pressure over the eyes as this may result in bradycardia
8. Increase in heart rate is the most reliable indicator of effective resuscitative efforts 9. A multiple gestation delivery may require additional resources and/or clinicians
10. There is no evidence to support the routine practice of administering sodium bicarbonate for the resuscitation of newborns
11. **APGAR** scoring is not critical during the resuscitation, although it may be prognostic after 20 minutes if the **APGAR** Score remains "0" despite resuscitation

Table 3. APGAR Score

Sign	0	1	2
Appearance:	Blue, Pale	Body pink, Extremities blue	Completely pink
Pulse:	Absent	Slow (less than l00)	≥ 100
Grimace:	No response	Grimace	Cough or Sneeze
Activity:	Limp	Some flexion	Active motion of extremities
Respirations:	Absent	Slow, Irregular	Good, Crying

Source: The Apgar Score. www.acog.org

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

- Historical elements
  - O Prenatal complications
  - O Delivery complications
  - O Date and time of birth
  - O Estimated gestational age
- Physical exam findings
  - O Heart rate
  - O Respiratory rate
  - O Respiratory effort o Appearance
  - O **APGAR** score at 1 minute and 5 minutes

Performance Measures

- Prehospital on-scene time
- Call time for additional resources
- Arrival time of additional unit
- Time to initiation of interventions
- Use of oxygen during resuscitation
- Presence of advanced life support (ALS) versus basic life support (BLS) clinicians
- Hypothermia on arrival in the emergency department
- Hypoglycemia evaluated and treated

- ROSC (return of spontaneous circulation) and/or normalization of heart rate
- Length of stay in neonatal intensive care unit
- Length of stay in newborn nursery
- Length of stay in hospital
- Knowledge retention of prehospital clinicians
- Number of advanced airway attempts
- Mortality

ANNEX 6: OB/GYN

Childbirth

Aliases

- Birth
- Delivery
- Labor

Patient Care Goals

1. Obtain necessary history to plan for birth and resuscitation of the newborn 2. Recognize imminent birth
2. Plan for resources based on number of anticipated patients (e.g., mother and child or multiple births)
3. Assist with uncomplicated delivery of term newborn
4. Recognize complicated delivery situations (e.g., nuchal or prolapsed umbilical cord, breech delivery, shoulder dystocia) and plan for management and appropriate transport destination
5. Apply appropriate techniques when an obstetric complication exists

Patient Presentation

Inclusion Criteria

Imminent delivery with crowning

Exclusion Criteria

1. Vaginal bleeding in any stage of pregnancy [See Obstetrical/Gynecological Conditions Protocol]
2. Emergencies in first or second trimester of pregnancy [See Obstetrical/Gynecological Conditions Protocol]
3. Seizure from eclampsia [See Obstetrical/Gynecological Conditions Protocol and Eclampsia/Pre-Eclampsia Protocol]

Patient Management

Assessment:

1. Signs of imminent delivery:
   a. Crowning or other presentation in vaginal opening
   b. Urge to push
   c. Urge to move bowels
   d. Mother's sense of imminent delivery
2. Signs of active labor
   a. Contractions
   b. Membrane rupture
   c. Bloody show

Treatment and Interventions

1. If patient in labor but no signs of imminent delivery, transport to appropriate receiving facility
2. Delivery should be controlled to allow a slow controlled delivery of infant – This will prevent injury to mother
   a. Support the infant's head as needed and apply gentle counterpressure to help prevent the head from suddenly delivering

3. Check for nuchal cord (i.e., around the baby's neck)

a. If present, slip it over the head
b. If unable to free the cord from the neck, double clamp the cord and cut between the clamps

4. Do **not** routinely suction the infant's airway (even with a bulb syringe) during delivery
5. Grasping the head with hand over the ears, gently guide head down to allow delivery of the anterior shoulder
6. Gently guide the head up to allow delivery of the posterior shoulder
7. Slowly deliver the remainder of the infant
8. After 1 minute or once the cord stops pulsating, clamp cord about 5–6 inches from the abdomen with two clamps; cut the cord between the clamps
    a. If resuscitation is needed, the baby can still benefit from a 1-minute delay in cord clamping. Start resuscitation immediately after birth and then clamp and cut the cord at 1 minute
    b. While cord is attached, take care to ensure the baby is not significantly higher positioned than the mother to prevent blood from flowing backwards from baby to placenta
9. Dry, warm, and stimulate infant, wrap in towel and place on maternal chest unless resuscitation needed
10. Resuscitation takes priority over recording APGAR scores. Record APGAR scores at 1 and 5 minutes once neonate is stabilized
11. After delivery of infant, suctioning (including suctioning with a bulb syringe) should be reserved for infants who have obvious obstruction to the airway or require positive pressure ventilation (follow Neonatal Resuscitation Protocol for further care of the infant) The placenta will deliver spontaneously, often within 5–15 minutes after the infant is delivered
    a. Do not force the placenta to deliver; do not pull on the umbilical cord
    b. Contain all tissue in plastic bag and transport
12. After delivery, massaging the uterus (should be located at about the umbilicus) [fundal massage] and allowing the infant to nurse will promote uterine contraction and help control bleeding
    a. Estimate maternal blood loss
    b. Treat mother for hypovolemia as needed
13. Transport infant secured to mother with approved neonatal restraint system, in car seat or isolette unless resuscitation is needed
14. Keep infant warm during transport
15. Most deliveries proceed without complications – If complications of delivery occur, apply high flow oxygen to mother and expedite transport to the appropriate receiving facility. Maternal resuscitation is critical for best fetal outcome. Contact medical direction and/or closest appropriate receiving facility for direct medical oversight and to prepare the receiving team. The following are recommendations for specific complications:
    a. Shoulder dystocia – if delivery fails to progress after head delivers, quickly attempt the following
        i. Hyperflex mother's hips to severe supine knee-chest position (i.e., McRoberts' maneuver)
        ii. Apply firm suprapubic pressure to attempt to dislodge shoulder. This often requires two EMS clinicians to perform and allows for delivery in up to 75% of cases
        iii. Attempt to angle baby's head as posteriorly as possible but NEVER pull
        iv. Continue with delivery as normal once the anterior shoulder is delivered
    b. Prolapsed umbilical cord
        i. Placed gloved hand into vagina and gently lift head/body off the cord
            1. Assess for pulsations in cord, if no pulses are felt, lift the presenting part off the cord
            2. Wrap the prolapsed cord in moist sterile gauze
            3. Maintain until relieved by hospital staff

ii. If previous techniques are not successful, mother should be placed in prone knee-chest position or extreme Trendelenburg with hips elevated

c. Breech birth
   i. Place mother supine, allow the buttocks, feet, and trunk to deliver spontaneously, then support the body while the head is delivered
   ii. If needed, put the mother in a kneeling position which may assist in the delivery of the newborn
   iii. Assess for presence of prolapsed cord and treat as above
   iv. If head fails to deliver, place gloved hand into vagina with fingers between infant's face and uterine wall to create an open airway. Place your index and ring fingers on the baby's cheeks forming a "V" taking care not to block the mouth and allowing the chin to be tilted toward the chest flexing the neck
   v. When delivering breech, you may need to rotate the baby's trunk clockwise; or sweep the legs from the vagina
   vi. Once the legs are delivered support the body to avoid hyperextension of the head; keep the fetus elevated off the umbilical cord
   vii. NEVER pull on the body, especially a preterm or previable baby – just support the baby's body while mother pushes when she feels the urge to

d. The presentation of an arm or leg through the vagina is an indication for immediate transport to hospital

e. Nuchal cord
   i. After the head has been delivered, palpate the neck for a nuchal cord, if present, slip over the head
   ii. The cord can be doubly clamped and cut between the clamps; the newborn should be delivered promptly

f. Excessive bleeding during active labor may occur with placenta previa or placental abruption
   i. Obtain history from patient – known previa, recent pre-eclampsia symptoms, hypertension history, recent trauma, drug use especially cocaine
   ii. Placenta previa most likely will prevent delivery of infant vaginally iii. Place large bore IV and administer IV fluids as indicated
   iv. If available, transfusion or the administration of whole blood as indicated
   v. C-Section most likely needed – transport emergently

g. Postpartum hemorrhage
   i. Obtain history from patient – history of prenatal or delivery complications, recent trauma, prescription anticoagulants, drug use especially cocaine
   ii. Perform fundal massage
   iii. Initiate IV fluid resuscitation and, if approved by medical direction, transfuse blood products
   iv. Consider administration of tranexamic acid (TXA)
   v. Although recommended following all deliveries, if postpartum hemorrhage occurs following delivery, consider administration of oxytocin

h. Maternal cardiac arrest
   i. Apply manual pressure to displace uterus from midline
   ii. Treat per the Cardiac Arrest Protocol (VF/VT/Asystole/PEA) for resuscitation care (defibrillation and medications should be given for same indications and doses as if non-pregnant patient)
   iv. Transport as soon as possible if infant is estimated to be over 24 weeks gestation (perimortem Cesarean section (also known as resuscitative hysterotomy) at receiving facility is most successful if started within 5 minutes of maternal cardiac arrest)

Patient Safety Considerations

1. Supine Hypotension Syndrome:
    a. If mother has hypotension before delivery, place patient in left lateral recumbent position or manually displace gravid uterus to the left in supine position
    b. Knee-chest position may create safety issues during rapid ambulance transport
2. Do **not** routinely suction the infant's airway (even with a bulb syringe) during delivery
3. Newborns are very slippery, take care not to drop the infant
4. Dry, warm and stimulate all newborns to facilitate respirations and prevent hypothermia
5. Do not pull on the umbilical cord while the placenta is delivering
6. 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. Due date (calculate gestational age in weeks)
        i. If unknown gestational age, rough estimated gestational age with palpation of the uterine fundus at the umbilicus is 20 weeks
    f. Last menstrual period
        i. Only ask for estimated last menstrual period (first day of last period) if patient has not had prenatal care/ultrasound and does not know their due date.
    g. Prenatal care
    h. Number of expected babies (multiple gestations)
    i. Drug use and maternal medication use
    j. Any known pregnancy complications – hypertension, gestational diabetes, placenta previa, premature labor, history of fetal demise, fetal anomalies/birth defects, etc.
    k. Signs of imminent delivery (e.g., crowning, urge to push, urge to move bowels, mother feels delivery is imminent)
    l. Location where patient receives care (considered a preferred destination if time delay is not an issue and based on local protocols)
2. Notify medical direction/receiving facility if:
    a. Antepartum hemorrhage
    b. Postpartum hemorrhage
    c. Breech presentation
    d. Limb presentation
    e. Complicated nuchal cord (around neck) – unable/difficult to reduce
    f. Prolapsed umbilical cord
    g. Shoulder dystocia
    h. Maternal cardiac arrest
    i. If anticipated transport time is greater than 30 minutes
3. Some light bleeding/bloody show (blood-tinged mucus/fluid) is normal with any childbirth
    a. Large quantities of blood/clots or profuse bleeding are abnormal

Table 1. APGAR Score

Sign	0	1	2
Appearance:	Blue, Pale	Body pink, Extremities blue	Completely pink
Pulse:	Absent	Slow (less than l00)	≥ 100
Grimace:	No response	Grimace	Cough or Sneeze
Activity:	Limp	Some flexion	Active motion of extremities
Respirations:	Absent	Slow, Irregular	Good, Crying

Quality Improvement

Key Documentation Elements

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

Performance Measures

- Recognition of complications
- Documentation of APGAR scores
- Maternal reassessment

Eclampsia/Pre-Eclampsia

Aliases

Pregnancy induced hypertension
Pregnant seizures
Toxemia of pregnancy

Patient Care Goals

1. Recognize serious conditions associated with pregnancy and hypertension
2. Prevention of eclampsia-related seizures
3. Provide adequate treatment for eclampsia-related seizures

Patient Presentation

Inclusion Criteria

1. Female patient, more than 20-weeks' gestation, presenting with hypertension and evidence of end organ dysfunction including renal insufficiency, liver involvement, neurological, or hematological involvement
2. May occur up to 6 weeks postpartum but is rare after 48 hours post-delivery
    a. Often the presenting symptom of postpartum pre-eclampsia is headache or SOB
3. Severe features of pre-eclampsia include:
    a. Severe hypertension (SBP *greater than* 160, DBP *greater than* 110)
    b. Headache
    c. Confusion/altered mental status
    d. Vision changes including blurred vision, spots/floaters, loss of vision (these symptoms are often a precursor to seizure)
    e. Right upper quadrant or epigastric pain
    f. Shortness of breath/Pulmonary edema
    g. Ecchymosis suggestive of low platelets (bruising, petechiae)

h. Vaginal bleeding suggestive of placental abruption
i. Focal neurologic deficits suggesting hemorrhagic or thromboembolic stroke

4. Eclampsia
    a. Any pregnant patient who is seizing should be assumed to have eclampsia and treated as such until arrival at the hospital
    b. Seizure in any late term pregnancy or postpartum patient
5. Eclampsia/pre-eclampsia can be associated with abruptio placenta and fetal loss

Exclusion Criteria

None noted

Patient Management

Assessment

1. Obtain history
    a. Gestational age in weeks or recent post-partum
    b. Symptoms suggestive of end organ involvement such as headache, confusion, visual disturbances, seizure, epigastric pain, right upper quadrant pain, nausea/vomiting, stroke symptoms, shortness of breath
    c. Previous history of hypertension or known pre-eclampsia
2. Monitoring
    a. Vital signs including repeat blood pressures every 10 min
3. Secondary survey pertinent to obstetric issues:
    a. Constitutional: vital signs, skin color
    b. Abdomen: distension, tenderness, uterine rigidity
    c. Genitourinary: visible bleeding
    d. Neurologic: mental status, focal deficits

Treatment and Interventions

1. Severe hypertension (SBP *greater than* 160 or DBP *greater than* 110) lasting more than 15 min with associated preeclampsia symptoms
    a. Severely elevated blood pressures must be treated to reduce the risk of maternal stroke
    b. However, goal blood pressure should be roughly 140/90 to maintain uterine perfusion and to keep fetus well-oxygenated
    c. Goal BP is approximately 140/90 to reduce stroke risk but maintain uterine perfusion
        i. Labetalol 20 mg IV over 2 minutes
            1. May repeat every 10 minutes X 2 doses for persistent severe hypertension with preeclampsia symptoms
            2. Goal is to reduce MAP by 20–25% initially
            3. Ensure that HR is *greater than* 60 BPM prior to administration **OR**
        ii. Hydralazine 5 mg IV
            1. May repeat 10 mg after 20 minutes for persistent severe hypertension with preeclampsia symptoms
            2. Goal is to reduce MAP by 20–25% initially **OR**
        iii. Nifedipine 10 mg immediate release PO
            1. May repeat 10–20 mg by mouth every 20 minutes X 2 doses for persistent severe hypertension with pre-eclampsia symptoms
            2. Goal is to reduce MAP by 20–25% initially
    d. Magnesium sulfate: 4 g IV over 5–10 min, followed by 2 g/hr
    e. Reassess vital signs every 10 minutes during transport
2. Seizure prophylaxis and seizure management, associated with pregnancy greater than 20-weeks gestation
    a. Magnesium sulfate

i. Seizure prophylaxis: 4 g IV over 20–30 minutes, followed by 2 g/hr IV if available
ii. Seizure Management: 6 g IV over 5–10 minutes or 8 g IM (4 grams in each buttock) to prevent seizure

b. Benzodiazepine, per Seizures Protocol, for active seizure not responding to magnesium. **Caution: respiratory depression**

3. IV fluids:
   a. NS or LR – keep continuous infusion with maximum rate of fluids to 80 mL/hr
4. Administer high flow oxygen as indicated
5. Disposition
   a. Transport emergently to closest appropriate receiving facility – notify en route if possible so the receiving team can prepare
   b. Patients in second or third trimester of pregnancy should be transported on left side or with uterus manually displaced to left to ensure adequate uterine perfusion

Patient Safety Considerations

1. Magnesium toxicity (progression)
   a. Hypotension followed by
   b. Loss of deep tendon reflexes followed by
   c. Somnolence, slurred speech followed by
   d. Respiratory paralysis followed by
   e. Cardiac arrest
2. Treatment of magnesium toxicity
   a. Stop magnesium drip
   b. Give calcium gluconate 3 g IV or calcium chloride 1 g IV in cases of pending respiratory arrest
   c. Support respiratory effort

Notes/Educational Pearls

Key Considerations

1. Delivery of the placenta is the only definitive management for pre-eclampsia and eclampsia
2. Early treatment of severe pre-eclampsia with magnesium for seizure prophylaxis and anti-hypertensive significantly reduces the rate of eclampsia. Use of magnesium encouraged if signs of severe pre-eclampsia present to prevent seizure
3. Patients with a history of chronic hypertension may have superimposed pre-eclampsia
4. Although less frequent, eclampsia, including eclampsia-related seizures, can occur in postpartum patients

Pertinent Assessment Findings

1. Vital signs assessment with repeat blood pressure monitoring before and after treatment
2. Assessment of deep tendon reflexes after magnesium therapy
3. Examination for end organ involvement
4. Evaluate fundal height

Quality Improvement

Key Documentation Elements

Document full vital signs and physical exam findings

Performance Measures

- Patients with signs of hypertension and greater than 20-week gestation or recent postpartum should be assessed for signs of pre-eclampsia
- Recognition and appropriate treatment of eclampsia

Obstetrical and Gynecological Conditions

Aliases
None noted

Patient Care Goals

1. Recognize serious conditions associated with hemorrhage during pregnancy even when hemorrhage or pregnancy is not apparent (e.g., ectopic pregnancy, abruptio placenta, placenta previa)
2. Provide 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. Consider pregnancy in any female between the ages of 10–60 years of age

Exclusion Criteria

1. Childbirth and active labor [See Childbirth Protocol]
2. Postpartum hemorrhage [See Childbirth Protocol]

Differential Diagnosis

1. Abruptio placenta: Most frequently occurs in third trimester of pregnancy; placenta prematurely separates from the uterus causing intrauterine bleeding
    a. Lower abdominal pain, uterine rigidity (often not present until abruption is advanced)
    b. Vaginal bleeding – this symptom may not occur in cases of concealed abruption
    c. Clinical index of suspicion for abruption (history of trauma, maternal hypertension, maternal drug use especially cocaine)
    d. Shock, with minimal or no vaginal bleeding
2. Placenta previa: placenta covers part or all of the cervical opening
    a. Generally, late second or third trimester
    b. Painless vaginal bleeding, unless in active labor
    c. For management during active labor [See Childbirth Protocol]
3. Ectopic pregnancy
    a. First trimester
    b. Abdominal/pelvic pain with or without minimal bleeding
    c. Shock is possible even with minimal or no vaginal bleeding
4. Spontaneous abortion (miscarriage)
    a. Generally, first trimester
    b. Intermittent pelvic pain (uterine contractions) with vaginal bleeding/passage of clots or tissue

Patient Management

Assessment

1. Obtain history
    a. Obstetrical history [See Childbirth Protocol]
    b. Abdominal pain – onset, duration, quality, radiation, provoking or relieving factors
    c. Vaginal bleeding – onset, duration, quantity (pads saturated)
    d. Syncope/lightheadedness
    e. Nausea/vomiting
    f. Fever or history of recent fever
2. Monitoring

a. Monitor EKG if history of syncope or lightheadedness
b. Monitor pulse oximetry if signs of hypotension or respiratory symptoms

3. Secondary survey pertinent to obstetric issues
   a. Constitutional: vital signs, skin color
   b. Abdomen: distension, tenderness, peritoneal signs
   c. Genitourinary: visible vaginal bleeding
   d. Neurologic: mental status

Treatment and Interventions

1. If signs of shock or orthostasis:
   a. Position patient supine or in the left lateral recumbent position if third trimester and keep patient warm
   b. Place large bore IV
   c. Volume resuscitation: crystalloid 1–2 liters IV wide open
   d. Reassess vital signs and response to fluid resuscitation
   e. Save all possible tissue so that the receiving team can assess
2. Disposition – transport emergently to closest appropriate receiving facility – notify en route if possible so the receiving team may prepare

Patient Safety Considerations

1. Patients in third trimester of pregnancy should be transported on left side or with uterus manually displaced to left if hypotensive
2. Do not place hand/fingers into vagina of bleeding patient except in cases of prolapsed cord or breech birth that is not progressing

Notes/Educational Pearls

Key Considerations

Syncope can be a presenting symptom of intraabdominal hemorrhage from ectopic pregnancy or antepartum hemorrhage from spontaneous abortion, placental abruption, or placenta previa

Pertinent Assessment Findings

1. Vital signs to assess for signs of shock (e.g., tachycardia, hypotension)
2. Abdominal exam (e.g., distension, rigidity, guarding)
3. If pregnant, evaluate fundal height

Quality Improvement

Key Documentation Elements

Document full vital signs and physical exam findings

Performance Measures

- Patients with signs of hypoperfusion or shock should not be ambulated to stretcher.
- If available, IV should be initiated on patients with signs of hypoperfusion or shock
- Recognition and appropriate treatment of shock

ANNEX 7: Respiratory

Airway Management

Patient Care Goals

1. Maintain a patent airway
2. Provide effective oxygenation and adequate ventilation using the least invasive possible method to achieve those goals paired with pulse oximetry and end-tidal capnography ($EtCO_2$) data
3. Anticipate, recognize, and alleviate respiratory distress
4. Provide necessary interventions quickly and safely to patients with the need for respiratory support
5. Anticipate, identify, and plan for a potentially difficult airway
6. Optimize the patient for any advanced airway attempts

Patient Presentation

Inclusion Criteria

1. Patients with signs of severe respiratory distress/respiratory failure
2. Patients with evidence of hypoxemia or hypoventilation with medical or traumatic etiology
3. Patients with tracheostomies (See Tracheostomy Management Protocol)
4. Patients with acute foreign body airway obstruction

Exclusion Criteria

1. Chronically ventilated patients
2. Newborn patients

Patient Management

Implement emergent interventions and monitoring [Refer to Universal Care Protocol]

Assessment

1. History – Assess for:
   a. Time of onset of symptoms
   b. Associated symptoms and triggers for dyspnea (e.g., exertion, exercise, lying flat)
   c. History of asthma or other breathing disorders
   d. Choking or other evidence of upper airway obstruction
   e. History of trauma
   f. Prior similar episodes (e.g., prior intubation, prior ICU stay, prior airway surgery including tracheostomy, anaphylaxis, angioedema). If prior episodes, what has helped in the past (meds, interventions) Home interventions for symptoms (e.g., increased home oxygen, nebulizer)
   g. Severity of shortness of breath, sensation of dyspnea
2. Physical Examination – Assess for:
   a. Abnormal respiratory pattern, rate and/or effort
   b. Use of accessory muscles
   c. Ability to speak words/sentences
   d. Quality of air exchange, including depth of respiration and equality of breath sounds
   e. Abnormal breath sounds (e.g., wheezing, rhonchi, rales, or stridor)
   f. Cough
   g. Skin color (cyanosis or pallor), presence of diaphoresis
   h. Mental status, including anxiety
   i. Airway obstruction with foreign body or swelling (e.g., angioedema, posterior pharyngeal and laryngeal infections)

j. Signs of a difficult airway (short jaw or limited jaw thrust or mobility, small thyromental space, upper airway obstruction, large tongue, obesity, large tonsils, large neck, craniofacial abnormalities, excessive facial hair, tracheostomy scar or evidence of other neck/facial surgery, trismus)
k. Signs of fluid overload (e.g., ascites, peripheral edema)
l. Traumatic injuries impairing upper and lower airway anatomy and physiology:
    i. Facial injuries
    ii. High spine injury (affecting phrenic nerve/intercostals)
    iii. Neck injury (expanding hematoma, tracheal injury)
    iv. Chest wall injury (bruising), including rib and sternal fracture, paradoxical chest motion, subcutaneous air, sucking chest wound

Monitoring

1. Patients with significant respiratory distress should have continuous pulse oximetry and waveform capnography monitoring for both assessment and for guiding therapy
2. Pulse oximetry is indicated to assess oxygenation
3. Quantitative waveform capnography:
    a. Is indicated:
        i. For assessment and monitoring of ventilatory status in patients with significant respiratory distress, with or without airway adjuncts
        ii. To assist in decision-making for patients with respiratory difficulty of unclear cause (e.g., bronchospasm vs. pulmonary edema) and to help direct therapy
        iii. To evaluate acid-base status in critically ill patients
    b. Is **not** indicated for every patient with shortness of breath. Rather, it is a monitoring and decision-making tool for patients with significant respiratory distress where interpretation of the capnography waveform and $EtCO_2$ values assist in determining the appropriate course of treatment for the patient as well as the patient's response

Treatment and Interventions

1. Generally, the approach is to implement the interventions below in an escalating fashion to meet the patient care goals above
2. **Administer oxygen if needed** for air hunger or respiratory distress and titrate to a target SPO_2 of 94–98%. Depending on patient presentation, this may be accomplished with nasal cannula, nonrebreather, BVM, NIV
    a. Even in apneic patients, starting passive oxygenation while escalating interventions are implemented may be useful
    b. During CPR, maximal oxygen supplementation should be provided
    c. Consider humidified oxygen for patients with tracheostomy (See Tracheostomy Management Protocol)
3. **Open and maintain patent airway**. If needed,
    a. Provide head tilt/chin lift, or jaw thrust if concern for potential spinal injury
    b. Suction airway: for significantly contaminated airways, consider utilizing a **s**uction **a**ssisted **l**aryngeal **a**irway **d**econtamination (**SALAD**) technique
    c. Oropharyngeal airways (OPA) or nasopharyngeal airways (NPA) can be placed if needed to maintain a patent airway and make BVM ventilation more effective
        i. OPA are used for patients without gag reflex
        ii. NPA are used for patients with gag reflex
    d. Patient positioning can significantly impact respiratory mechanics. Patients with severe bronchospasm should be left in the position of comfort (perhaps tripod) whenever possible. Elevating the head or padding (shoulders, occiput) can assist with opening airway and respiratory mechanics. This can both improve the ability to ventilate and limit aspiration

e. For patients with **tracheostomy** in respiratory distress, see Tracheostomy Management Protocol

4. Use **bag-valve-mask (BVM) ventilation** in the setting of respiratory failure or arrest. Whenever possible, the patient's head should be elevated up to 30 degrees
    a. Two-person, two-thumbs-up BVM ventilation is preferred
    b. **PEEP** should be used with BVM
        i. 5 cmH_20 is generally an appropriate initial PEEP setting
        ii. Increase PEEP in stepwise fashion (2–3 cmH_20 at a time) as necessary, allowing time for the patient to equilibrate with each change before further adjustments are made. The goal is to reach the lowest PEEP needed to adequately ventilate the patient. Higher PEEP results in greater negative hemodynamic impact. Generally, physician consultation should be considered for higher PEEP levels (greater than 10–15 cmH_20)
    c. Continuous wave-form capnography monitoring should be placed in line
        i. In patients without primary pulmonary pathology (i.e., acute respiratory distress syndrome (ARDS), COPD), maintain $EtCO_2$ of no less than 35 and up to 40 mmHg. Patients with specific disease processes such as acute acid-base disorders (i.e., DKA, lactic acidosis due to severe sepsis or trauma), acute respiratory failure due to primary pulmonary pathology, or post-cardiac arrest will have different $EtCO_2$ parameters due to their underlying disease
        ii. In patients with severe head injury with signs of herniation (unilateral dilated pupil or decerebrate posturing), modest hyperventilation to $EtCO_2$ no less than 30 mmHg may be considered for a brief time
    d. Tidal volume:
        i. Ventilate with just enough volume to see chest rise, approximately 6–8 mL/kg ideal body weight
        ii. Over-inflation (e.g., excessive tidal volume) and overventilation (e.g., excessive minute ventilation) are both undesirable and potentially harmful
    e. Rate
        i. **Adult**: 10–12 breaths/minute
        ii. **Child**: 20–30 breaths/minute
        iii. **Infant**: 20–30 breaths/minute
    f. Continuously monitor $EtCO_2$ to guide tidal volume and minute ventilation
5. **Non-invasive ventilation (NIV**) should be considered early for severe respiratory distress or impending respiratory failure
    a. NIV options include continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP), bilevel nasal CPAP, and high flow oxygen by nasal cannula (HFNC)
    b. NIV can also be used to improve oxygenation pre-intubation in some patients with respiratory failure
6. **Supraglottic airways (SGA)**: Consider the use of an appropriately sized SGA if BVM (with OPA/NPA) alone is not effective in maintaining oxygenation and/or ventilation. This is especially important in children as prehospital endotracheal intubation is an infrequently performed skill in this age group and has not been shown to improve outcomes over prehospital BVM or SGA
7. **Endotracheal intubation**
    a. When less-invasive methods (two-person BVM, SGA placement) are ineffective or inappropriate, consider endotracheal intubation to maintain oxygenation and/or ventilation. Other indications may include potential airway obstruction, severe inhalation burns, multiple traumatic injuries, altered mental status with loss of normal protective airway reflexes
    b. Optimize patient for first-pass success with pre-procedure resuscitation, preoxygenation, positioning, sedatives and paralytics as indicated by patient presentation

i. A bougie may be a helpful adjunct to successful airway placement, especially when video laryngoscopy is unavailable and the glottic opening is difficult to visualize with direct laryngoscopy
ii. For experienced EMS clinicians, video laryngoscopy may enhance intubation success rates and should be used when available

c. Monitor clinical signs, pulse oximetry, cardiac rhythm, blood pressure, and waveform capnography for the intubated patient
d. For adults, the largest tube size possible should be placed in the patient to limit difficulty with mechanical ventilation and high airway pressures. Absent significant airway swelling or underlying anatomic abnormalities, initial tube size (internal diameter in millimeters) for adult females should be 7.5, adult males 8.0. For pediatrics, cuffed tubes are now recommended

8. **Post-intubation management**
   a. Inflate endotracheal tube cuff with minimum air to seal airway. An ETT cuff manometer can be used to measure and adjust the ETT cuff pressure to the recommended 20 cmH_20 pressure
   b. Confirm placement of advanced airway (endotracheal tube, SGA) with waveform capnography (most reliable), absent gastric sounds, and bilateral breath sounds
   c. Secure tube manually. Once proper position is confirmed, secure the tube with tape, twill, or commercial device
      i. Note measurement of tube at incisors or gum line and assess frequently for tube movement/displacement using continuous waveform capnography and visual inspection
      ii. Cervical collar and/or cervical immobilization device may help reduce neck movement and risk of tube displacement
   d. Continuously monitor correct airway placement with waveform capnography during treatment and transport, paying particular attention to reassessing after each patient movement
   e. Manual ventilation (see above for rate and tidal volume guidance)
   f. **Mechanical ventilation** should be considered following advanced airway placement
   g. Intubated patients should be provided appropriate sedation with sedative or opioid medications, and sedation titrated to an appropriate target level using RASS score or similar scale
   h. Consider PEEP adjustment to achieve oxygenation and ventilation goals (see above)
9. **Gastric decompression** can improve oxygenation and ventilation, so it should be strongly considered in any patient with an advanced airway and positive pressure ventilation
10. When patients cannot be oxygenated/ventilated effectively using the above interventions, or when conventional airway approaches are impossible, surgical airway management is a reasonable option if the clinician has competency in the procedure and risk of death for not escalating airway management seems to outweigh the risk of a procedural complication
11. Transport to the closest appropriate hospital for airway stabilization when respiratory failure cannot be successfully managed in the prehospital setting

Patient Safety Considerations

1. Suctioning to limit aspiration is a priority, since it is associated with development of hospital acquired pneumonia and related increases in ICU stay and mortality.
2. Avoid excessive pressures or tidal volumes during BVM ventilation. The goal is to avoid barotrauma as well as overventilation and related reduction of venous return/preload/cardiac output.

3. Routine use of sedation is not recommended for treatment of anxiety in patients on NIV. Anxiety should be presumed due to hypoxia or inadequate minute ventilation and treated primarily with ventilatory support.
4. Endotracheal intubation should only be used if less invasive methods do not meet patient care goals.
5. Once a successful SGA placement or intubation has been performed, obstruction or displacement of the tube can have further negative effects on patient outcome. Tubes should be secured with either a commercial tube holder or tape.
6. Meticulous attention should be paid to avoiding hypoxia and hypotension during intubation attempts to limit patient morbidity and mortality.
7. Waveform capnography should be placed prior to the first breath through an invasive airway to confirm placement.
8. Drug Assisted Airway Management (DAAM) should be reserved for specialized clinicians on operating within a comprehensive program with adequate resources, ongoing training and quality assurance measures, and close EMS physician oversight.
9. Once initiated and patient is tolerating mask, DO NOT discontinue CPAP/BiPAP until patient is on the emergency department stretcher and hospital CPAP/BiPAP is immediately available for patient to be switched over, or physician is at bedside and requesting CPAP/BiPAP be discontinued. Breaking the mask seal causes a significant decrease in airway pressures and may lead to abrupt decompensation due to atelectasis and alveolar collapse.
10. If patient deteriorates on CPAP/BiPAP (e.g., worsened mental status, increasing $EtCO_2$, vomiting), remove CPAP/BiPAP and escalate airway management options as above.
11. If an endotracheal tube becomes dislodged, SGA should be strongly considered.
12. Pediatric airway management requires appropriately sized tools and adjuncts based on patient size/age. A method for determining appropriate sizing should be available to all EMS clinicians.
    a. Skill in BVM ventilation and NIV application should be emphasized in pediatrics. b. SGA are reasonable primary and secondary adjuncts if needed.
    b. Pediatric endotracheal intubation has unclear benefit in the prehospital setting.
    c. Pediatric endotracheal tube placement and maintenance requires significant training to achieve and maintain competency.

Notes/Educational Pearls

Key Considerations

1. Oxygen is a drug with an appropriate dose range and undesirable effects from both too much and too little supplementation. Effective oxygenation meets the oxygen saturation (SpO_2) target set for that specific patient in the context of their acute and chronic medical condition(s). Permissive hypoxia ($SPO_2 \geq 90\%$) may be appropriate in patients with COPD or other complex respiratory pathology
2. Adequate ventilation provides sufficient minute ventilation to meet the patient's acute respiratory and metabolic needs and is generally titrated to an $EtCO_2$ goal
3. Paramedics are less likely to attempt endotracheal intubation in children than adults with cardiac arrest and are more likely to be unsuccessful when intubating children. Complications such as malposition of the ET tube or aspiration can be nearly three times as common in children as compared to adults
4. Continuous waveform capnography is an important adjunct in the monitoring of patients with respiratory distress, respiratory failure, and those treated with positive pressure ventilation. It should be used as the standard to confirm placement of all advanced airways. It can also be helpful in the respiratory distress patient without an invasive airway to assess for causes of respiratory distress, adequacy of ventilation, progression toward respiratory failure, monitoring of BVM ventilation, as well as numerous other applications that provide insight into acute metabolic and infectious disease processes. Continuous waveform capnography:

a. Should be used for patients with invasive airways for
    i. initial verification of correct airway placement
    ii. continuous evidence of correct tube placement
    iii. to adjust ventilatory rate
        1. to maintain $EtCO_2$ 35–45 in most patients
        2. to appropriately but not excessively hyperventilate patients with signs of herniation only to maintain $EtCO_2$ 30–35 (no lower than 30)
        3. to gradually decrease $EtCO_2$ in chronically and acutely severely hypercarbic patients including post-arrest

b. Is strongly encouraged in patients in cardiac arrest
    i. to monitor quality of CPR
    ii. as an early indicator of ROSC (rapid increase of 10–15 in $EtCO_2$)
    iii. to assist in evaluating prognosis for survival

c. Should be used in spontaneously breathing patients who are:
    i. on NIV
    ii. in severe respiratory distress (e.g., receiving epinephrine, magnesium therapy)

d. In spontaneously breathing patients, waveform capnography can help with assessment of critically ill patients, for example:
    i. assessment of adequacy of ventilation and change in ventilatory status in response to treatment
    ii. differentiating between severe bronchospasm (shark fin waveform) and other causes of respiratory distress (normal waveform, pulmonary edema)
    iii. hypotension due to sepsis or unclear cause (metabolic acidosis with/without compensatory respiratory alkalosis)
    iv. status epilepticus to evaluate ventilatory and acid/base status
    v. evaluation for acidosis in patients with altered mental status and potential diabetic ketoacidosis (metabolic acidosis)

5. Bag-valve-mask (BVM) ventilation (for cardiac arrest patients see Cardiac Arrest Protocol):
    a. Appropriately sized masks should completely cover the nose and mouth and maintain an effective seal around the cheeks and chin
    b. Ventilations should be delivered with only sufficient volume to achieve chest rise. Overventilation is undesirable
        i. In children, ventilating breaths should be delivered over one second, with a two second pause between breaths
        c. Ventilation rate:
            i. Adult
                1. Support spontaneous respirations if the patient is hypoventilating
                2. For apnea, provide one breath every 6 seconds adjusting based on pulse oximetry and digital capnometry or capnography (with the goal of 35–45 mmHg)
            ii. Pediatric – infant/child
                1. Support spontaneous respirations if the patient is hypoventilating
                2. For apnea, provide 1 breath every 2–3 seconds adjusting based on pulse oximetry and digital capnometry or capnography (with the goal of 35–45 mmHg)

6. PEEP improves oxygenation or decreases risk of developing hypoxemia, by increasing functional residual capacity (FRC), and tidal ventilation and may assist in meeting airway goals by decreasing intrapulmonary shunting of blood and better matching perfused lung to ventilated lung tissue, thus improving arterial oxygenation. It does not open fully collapsed alveoli but re-expands partially collapsed ones. It does not decrease extravascular lung water but redistributes it
    a. Higher levels of PEEP are particularly useful in patients with acute respiratory distress syndrome (ARDS)

b. PEEP should be increased slowly by 2–3 cmH_20 from 5 cmH_20 to a max of 15 cmH_20 closely monitoring response and vital sign changes

c. Excessive PEEP over distends alveoli, increases dead space and work of breathing, reduces lung compliance, and compresses alveolar capillaries, reducing oxygenation and risking pulmonary barotrauma

d. Increased intrathoracic pressure can progressively decrease cardiac output and is most notable when PEEP is greater than 15 cmH_20. The higher the level of PEEP (over 5 cmH_20), the more likely the patient will experience a variety of adverse consequences, both ventilatory and hemodynamic

7. Noninvasive ventilation (NIV) (e.g., CPAP or BiPAP):
   a. NIV goals of therapy will vary based on patient presentation and history. More support than is needed to relieve symptoms or "normal" is not necessarily better in these patients. Goals of care may include:
      i. Decreased air hunger
      ii. SPO_2 of $\geq$ 94%. Chronic COPD patients tolerate hypoxia better, and an SPO_2 of 90% may relieve their symptoms and be adequate
      iii. Normalization of respiratory rate (decreased tachypnea)
      iv. Normalization of $EtCO_2$. This means a downward trend in a patient with increased $EtCO_2$. Patients who have end stage COPD may have chronically elevated $EtCO_2$ as high as 50s–60s, and thus tolerate elevated $EtCO_2$ better so normalization may not be a good target
   b. The key to successful use of NIV in a patient who has not used it before is coaching and explanation of the process and reassurance of the patient
   c. For any patient on NIV, focus on maintaining a continuous mask seal is essential to maximizing the positive impact of PEEP, particularly at higher levels. Breaking the circuit or removing the mask should be meticulously avoided, as the significant atelectasis will occur which will take time to reverse
   d. Nebulized medications may be administered through a CPAP or BiPAP mask. A specialized T-connector with a spring valve assembly is required to allow maintenance of positive airway pressure
8. Orotracheal/Endotracheal intubation (ETI)
   a. Checklist use and use of protocolized interventions to optimize the patient physically and physiologically have been shown to both improve success rates of orotracheal intubation as well as decrease peri-intubation complications. Preparation should also include a promptly available plan for alternate airway placement if ETI unsuccessful.
   b.

Age	Size (mm) Uncuffed	Size (mm) Cuffed
Premature	2.5	
Term to 3 months	3.0	
3–7 months	3.5	3.0
7–15 months	4.0	3.5
15–24 months	4.5	3.5
2–15 years	[age(yrs.)/4]+4	[age(yrs.)/4] +3.5
>15 years		7.5 female 8.0 male

Endotracheal tube sizes (cuffed tubes preferred in pediatrics)

   c. Approximate depth of insertion = (3) x (endotracheal tube size)

d. In addition to preoxygenation, apneic oxygenation (high-flow oxygen by nasal cannula) may prolong the period before hypoxia during an intubation attempt

e. Positive pressure ventilation after intubation can decrease preload and subsequently lead to hypotension

f. Significant attention should be paid to adequate preoxygenation to avoid peri-intubation hypoxia and hypoxic cardiac arrest

g. Routine use of cricoid pressure is not recommended in pediatric or adult intubation

h. Prompt suctioning of soiled airways before intubation attempt may improve first pass success and limit morbidity and mortality

i. Confirm successful placement with waveform capnography. Less optimal methods of confirmation include bilateral chest rise, bilateral breath sounds, and maintenance of adequate oxygenation. Color change on $EtCO_2$ is less accurate than clinical assessment, and wave-form capnography is superior. Misting observed in the tube is not a reliable method of confirmation. Re-visualization with video laryngoscopy, when available, may assist in confirming placement when unclear due to capnography failure or conflicting information

j. Video laryngoscopy may be a useful tool for endotracheal intubation in the hands of a practiced clinician

6. Manual vs. Mechanical ventilation: If mechanical ventilation is available, it is preferred to manual ventilation due to the increased consistency of tidal volume and ventilatory rate, and its ability to limit risk of overventilation. [See Mechanical Ventilation (Invasive) Protocol]
7. For patients being transferred from a hospital ventilator to a transport ventilator, the patient's current ventilator settings are generally a reasonable starting point if the patient is being adequately oxygenated and ventilated based on pulse oximetry and capnography
8. Currently, there is limited experience with high-flow nasal cannula in the EMS environment, so evidence-informed recommendations are not included in this Protocol
9. Anxiety should be presumed due to hypoxia or inadequate minute ventilation and treated primarily with ventilatory support. Routine use of sedation is not recommended for treatment of anxiety in patients on NIV

Pertinent Assessment Findings

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

Quality Improvement

Key Documentation Elements

- Initial vital signs and physical exam
- interventions attempted including the method of airway intervention, the size of equipment used, and the number of attempts to achieve a successful result
- Indications for advanced airway management
- Subsequent vital signs and physical exam to assess for change after the interventions
- Occurrence of peri-intubation hypoxia (less than 90% SPO_2), bradycardia (per age),
- hypotension (SBP less than 90mmHg or lowest age-appropriate SBP) or cardiac arrest. The peri-intubation period encompasses the time from sedative administration to up to 10 minutes post any invasive airway attempt
- Post-intubation with advanced airway, $EtCO_2$ value and capnograph should be documented immediately after airway placement, with each patient movement (e.g., into and out of ambulance), and at the time of patient transfer in the ED
- Recordings of video laryngoscopy may be useful for quality improvement purposes

Performance Measures

- Percentage of clinicians that have received hands-on airway training (simulation or non-simulation-based) for basic and advanced airway adjuncts and skills within the past year
- Percentage of patients with initial hypoxia who improve to target saturation of 94–98% by arrival at hospital
- Percentage of patients with respiratory chief complaints for whom both oxygen saturation (SpO_2) and respiratory rate are measured and documented
- Rate of NIV use in respiratory distress (COPD, congestive heart failure (CHF)) patients with GCS 15
- Documentation of PEEP use with assisted ventilation
- Percentage of patients with advanced airway placement with capnographic verification of correct placement within 1 minute
- Percentage of patients with advanced airway placement who have documentation of waveform capnography for both initial confirmation and repeated verification of placement during transport and at hospital arrival
- Percentage of intubated patients with endotracheal tube verified in proper position upon turnover to receiving facility
- Rate of advanced airway (ETT or SGA) success without hypoxia or hypotension
- First pass success rate and number of intubation attempts

Respiratory Distress (includes Bronchospasm, Pulmonary Edema)

Patient Care Goals

1. Assure adequate oxygenation and ventilation
2. Recognize impending respiratory failure
3. Promptly identify and intervene for patients who require escalation of therapy
4. Deliver appropriate therapy by differentiating likely cause of respiratory distress
5. Alleviate respiratory distress

Patient Presentation

Inclusion Criteria

1. Patients aged 2 and older with respiratory distress due to disease processes including:
   a. Asthma exacerbation
   b. Chronic obstructive pulmonary disease (COPD) exacerbation
   c. Wheezing/bronchospasm from suspected pulmonary infection (e.g., pneumonia, acute bronchitis)
   d. Pulmonary edema of cardiac (i.e., heart failure) or non-cardiac etiology

Exclusion Criteria

1. Respiratory distress related to acute trauma
2. Respiratory distress due to a presumed underlying cause that includes one of the following:
   a. Anaphylaxis
   b. Bronchiolitis (wheezing in patients less than 2 years of age)
   c. Croup
   d. Epiglottitis
   e. Foreign body aspiration
   f. Submersion/drowning
   g. Lower airway obstruction from malignancy (very rare)

Patient Management

Assessment

1. History
   a. Onset of symptoms
   b. Concurrent symptoms (e.g., fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, foreign body aspiration)
   c. Usual triggers of symptoms (e.g., cigarette smoke, change in weather, upper respiratory infections, exercise)
   d. Sick contacts
   e. Treatments prior to EMS: Oxygen, inhaler, nebulizer, other treatments, chronic or recent steroids
   f. Hospitalizations: Number of emergency department visits in the past year, number of hospital admissions in the past year, number of ICU admissions (ever), previously intubated (ever)
   g. Family history of asthma, eczema, or allergies
2. Exam
   a. Full set of vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment), temperature, and O2 saturation. Consider temperature and waveform capnography
   b. Air entry (normal vs. diminished, prolonged expiratory phase)
   c. Breath sounds (wheezes, crackles, rales, rhonchi, diminished, clear)
   d. Skin color (pallor, cyanosis, mottling, normal) and temperature (febrile, diaphoretic)
   e. Mental status (alert, tired, lethargic, unresponsive)
   f. Signs of distress include:
      i. Apprehension, anxiety, combativeness
      ii. Hypoxia (less than 90% oxygen saturation)
      iii. Intercostal/subcostal/supraclavicular retractions, accessory muscle use
      iv. Grunting, stridor, inability to speak full sentences
      v. Nasal flaring
      vi. Cyanosis

Treatment and Interventions

1. Airway: See Airway Management Protocol for additional specifics
   a. Give supplemental oxygen for dyspnea to a target of 94–98% saturation. Escalate from a nasal cannula as needed to reach this goal
   b. BVM ventilation should be utilized in children with respiratory failure
   c. Non-invasive ventilation (NIV) should be administered for severe respiratory distress via BVM, continuous positive airway pressure (CPAP) or bi-level positive airway pressure (BiPAP)
   d. If indicated, bronchodilators should be administered in line with NIV
2. Monitoring
   a. Pulse oximetry and EtCO2 should be routinely used as adjuncts to other forms of monitoring in patients with respiratory complaints
   b. Continuous cardiac monitoring may be indicated in patients with respiratory distress associated with suspected acute or decompensated congestive heart failure (CHF) or dysrhythmia
   c. 12-lead EKG may be indicated to assess for dysrhythmia or ischemia, particularly in patients with risk factors for coronary artery disease and/or presentation consistent with CHF
3. IV Access and Fluids – IV access should be placed when IV medication administration is indicated, or when there are clinical concerns of dehydration so that IV fluids can be administered
4. Suspected bronchospasm, asthma, COPD:
   a. Inhaled Medications

i. While albuterol 2.5 mg nebulized is usually sufficient for mild wheezing without clinical distress, albuterol 5 mg nebulized (or 6 puffs metered dose inhaler) should be administered to all patients in respiratory distress with signs of bronchospasm (e.g., known asthmatics, quiet wheezers). Repeat at this dose with unlimited frequency for ongoing respiratory distress
ii. Ipratropium 0.5 mg nebulized should be given up to 3 doses in conjunction with albuterol

b. Steroids should be administered in the prehospital setting
i. PO steroid options for patients not critical enough to require IV placement include:
1. Dexamethasone (0.6 mg/kg, maximum dose of 16 mg) PO solution or IV solution given PO, or
2. Prednisolone/prednisone (1 mg/kg, maximum dose 60 mg) PO
ii. IV steroid options for critically ill patients include:
1. Dexamethasone (0.6 mg/kg, maximum dose of 16 mg) IV/IM, or
2. Methylprednisolone (2 mg/kg, maximum dose 125 mg) IV/IM
iii. Other steroids at equivalent doses may be given as alternatives

c. Magnesium sulfate (40 mg/kg IV, maximum dose of 2 g) over 10–15 minutes should be administered for severe bronchoconstriction and concern for impending respiratory failure. Consider decreased dose of 1 g IV for geriatric patients
d. Epinephrine (0.01 mg/kg of 1 mg/mL solution IM, maximum dose of 0.3 mg) should only be administered for impending respiratory failure as adjunctive therapy when there are no clinical signs of improvement with the above treatments

5. Adults with suspected pulmonary edema due to acute heart failure or fluid overload (such as dialysis noncompliance):
a. Restoration of adequate oxygenation and ventilation should precede or be accomplished simultaneously with other medication therapies below
i. CPAP/BiPAP: See Airway Management Protocol for goals of care and escalation of interventions
b. SBP less than 100 mmHg
i. IV fluid bolus 250–500 mL
ii. Consider vasopressor: Norepinephrine 0.02–2 mcg/kg/min
c. SBP less than 160 mmHg
i. Nitroglycerin
1. 0.4 mg SL, can repeat every 5 minutes for SBP greater than 100 mmHg
d. SBP >= 160 mmHg or MAP greater than 120
i. Nitroglycerin
1. 0.8 mg SL, can repeat every 5 minutes for SBP greater than 100 mmHg 2. Consider IV nitroglycerin infusion titrated to blood pressure

6. Suspected pulmonary edema due to other noncardiogenic causes (such as irritant inhalation, abrupt opioid withdrawal). Provide supportive care to promote adequate oxygenation.
a. Inhaled Medications
i. While albuterol 2.5 mg nebulized is usually sufficient for mild wheezing without clinical distress, albuterol 5 mg nebulized (or 6 puffs metered dose inhaler) should be administered to patients in respiratory distress with signs of bronchospasm (e.g., known asthmatics, quiet wheezers). Repeat at this dose with unlimited frequency for ongoing respiratory distress
ii. Ipratropium 0.5 mg nebulized should be given up to 3 doses in conjunction with albuterol

Patient Safety Considerations

1. Normal EtCO2 (35–45 mmHg) with tachypnea and respiratory distress is an indicator of impending respiratory failure
2. The use of nitrates should be avoided in any patient who has used a phosphodiesterase inhibitor within the past 48 hours. Examples are sildenafil (Viagra), vardenafil and tadalafil, which are used for erectile dysfunction and pulmonary hypertension. Also avoid use in patients receiving intravenous epoprostenol or treporstenil which are used for pulmonary hypertension
3. Invasive airways do not improve bronchospasm. The airway should be managed in the least invasive way possible. Supraglottic devices and endotracheal intubation should be considered only if BVM ventilation fails
4. Positive pressure ventilation in the setting of bronchoconstriction, either via a supraglottic airway or intubation, increases the risk of air trapping which can lead to pneumothorax and cardiovascular collapse. These interventions should be reserved for situations of respiratory failure
5. The following medications should not be administered to manage bronchospasm as there is no evidence of patient benefit:
    i. Inhaled magnesium sulfate
    ii. Heliox

Notes/Educational Pearls

1. The combination of ipratropium with albuterol may decrease the need for hospital admission in certain patients
2. Magnesium sulfate may cause hypotension that will usually respond to a fluid bolus
3. Patient with acute heart failure and hypotension have high mortality
4. When assessing for cause of respiratory distress, CHF tends to be associated with lower levels of EtCO2 compared to COPD. EtCO2 values that are extremely low and high are markers of poor outcomes and need for intubation or ICU admission

Key Considerations

1. Nebulizer droplets can carry viral particles and other airborne pathogens, so additional PPE should be considered, including placement of a surgical mask over the nebulizer (if feasible) to limit droplet spread
2. Factors that have been shown to be associated with increased mortality from asthma include:
    a. Severe asthma as evidenced by at least one of the following:
        i. Prior near-fatal asthma (e.g., ICU admission or intubation/mechanical ventilation)
        ii. Prior admissions for asthma or repeated ED visits, particularly if in the last year
        iii. Heavy use of beta-agonist medications, or requiring three or more classes of asthma medication
    b. Together with one or more behavioral or psychosocial contributors:
        i. Medication noncompliance
        ii. Alcohol or drug abuse
        iii. Obesity
        iv. Psychosis, depression, other psychiatric illness, or major tranquilizer use
        v. Employment or income difficulties
        vi. Severe domestic, marital, or legal stressors
3. Single dose dexamethasone has been found equally effective as several days dosing of other steroids, so dexamethasone is preferred over other po steroids
4. Acute heart failure is a common cause of pulmonary edema – other causes include:
    a. Opioid overdose
    b. High altitude exposure
    c. Kidney failure or dialysis noncompliance
    d. Lung damage caused by gases or severe infection

5. Nitroglycerin reduces left ventricular filling pressure primarily via venous dilation. At higher doses the drug variably lowers systemic afterload and increases stroke volume and cardiac output
6. Pulmonary edema is more commonly a problem of volume distribution than total body fluid overload, so administration of diuretics such as furosemide provide no immediate benefit for most patients and can cause significant harm. Inducement of inappropriate diuresis can lead to increased morbidity and mortality in patients with other disease processes such as pneumonia and sepsis
7. Nitrates provide both subjective and objective improvement, and might decrease intubation rates, incidence of MIs, and mortality. High-dose nitrates can reduce both preload and afterload and potentially increase cardiac output and blood pressure
8. If available and trained, ultrasound is useful to distinguish pulmonary edema from other causes of respiratory distress (including pneumothorax)
9. Pulmonary edema due to irritant gas inhalation (i.e., chlorine) generally is best managed by supportive care and escalation of airway interventions as above once the patient is appropriately decontaminated. Early poison center consultation should be strongly considered for guidance
10. Pulmonary edema due to high altitude should be managed as described in Altitude Illness Protocol

Pertinent Assessment Findings

1. Severe respiratory distress may manifest with hypoxia, altered mentation, diaphoresis, or inability to speak more than 2–3 words
2. In the setting of severe bronchoconstriction, wheezing may not be heard. Patients with known asthma with severe dyspnea should be empirically treated, even if wheezing is absent
3. A "shark fin" on waveform capnography suggests significant bronchospasm and obstructive physiology
4. Etiology of respiratory distress:
    a. Bronchospastic etiology (e.g., asthma, COPD) is suggested by:
        i. Wheezing on auscultation
        ii. "Shark fin" waveform capnograph or prolonged expiratory phase
        iii. History of asthma/COPD
    b. Fluid overload etiology (e.g., CHF, pulmonary edema) is suggested by:
        i. Jugular venous distention
        ii. Rales on auscultation
        iii. Peripheral edema
        iv. History of CHF, diuretic therapy, dialysis noncompliance, hypertension

Quality Improvement

Key Documentation Elements

Document key aspects of the exam at baseline and after each intervention:

- Respiratory rate
- Oxygen saturation
- EtCO2/waveform shape
- Use of accessory muscles
- Breath sounds and quality
- Mental status
- Response to interventions

Performance Measures

- Use of pulse oximetry and capnography for patients with moderate-severe respiratory distress (RR greater than age-appropriate normal, SPO2 less than 90%)
- Percentage of patients with abnormal pulse oximetry, respiratory rate, EtCO2 value with normalization on final set of vital signs

- Time to administration of oxygen in hypoxic patients
- Time to bronchodilator administration in patients with wheezing
- Percentage of asthma/COPD patients receiving steroids and bronchodilators
- Time to improved SPO2 and/or decreased respiratory rate
- Normalizing change in vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, O2 saturation, and capnography values with treatment
- Time to initiation of non-invasive positive pressure ventilation
- Number of CPAP/BiPAP patients who require intubation
- Documentation of blood pressure reassessment in patients receiving nitrates

ANNEX 8: Trauma

General Trauma Management

Aliases
None noted

Patient Care Goals

1. Rapid assessment and management of life-threatening injuries
2. Recognition of when to rapidly transport
3. Transport to the appropriate level of trauma care
4. Safe movement of patient to prevent worsening injury severity

Patient Presentation

Inclusion Criteria

1. Patients of all ages who have sustained an injury due to mechanical trauma, including:
    a. Blunt injury
    b. Penetrating injury
    c. Blast
    d. Burns

Exclusion Criteria
Not an acute traumatic injury

Patient Management

Initial Assessment

1. Primary survey (Use "**MARCH**" algorithm)
    a. **M**assive Hemorrhage
        i. Initial visual and body sweep to assess for penetrating wounds and severe life-threatening hemorrhage [See Extremity Trauma/External Hemorrhage Management Protocol]
    b. **A**irway
        i. Assess airway patency by asking the patient basic questions to assess for 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 (patients with a Glasgow Coma Score (GCS) less than or equal to "8" are more likely to require airway protection)
    c. **R**espiratory/Breathing
        i. Assess respiratory rate and pattern
        ii. Assess for tracheal deviation
        iii. Assess symmetry of chest wall movement
        iv. Listen bilaterally on lateral chest wall for breath sounds
    d. **C**irculation
        i. Assess blood pressure and heart rate
    e. **H**ead injury/**H**ypothermia
        i. Perform initial neurologic status assessment of GCS/AVPU (**A**lert, **V**erbal, **P**ainful, **U**nconscious) and pupillary size and responsiveness [See Footnote III. Neurologic Status Assessment and Head Injury Protocol]
        ii. Assess for gross motor movement of extremities

iii. Evaluate for clinical signs of traumatic brain injury with herniation including:
1. Unequal pupils
2. Lateralizing motor signs
3. Posturing

iv. Prevent hypothermia

Immediate Treatment and Interventions

1. Massive or exsanguinating hemorrhage control
   a. First stop severe external and extremity hemorrhage with extremity tourniquets or appropriate wound packing with hemostatic gauze. Be sure to roll patient and examine the back as well. [See Extremity Trauma/External Hemorrhage Management Protocol]
   b. Utilize junctional tourniquets if needed for junctional area hemorrhage
2. Airway
   a. If impending airway obstruction or altered mental status resulting in inability to maintain airway patency, immediately ensure patent airway. [See Airway Management Protocol and Spinal Care Protocol]
   b. Consider airway adjuncts as appropriate avoiding nasal airway adjuncts in patents with oral or other facial injuries. [See Airway Management Protocol]
3. Respiratory/Breathing
   a. If absent or diminished breath sounds in a hypotensive trauma patient, especially those with chest trauma and/or tracheal deviation, consider tension pneumothorax and perform needle decompression of side without breath sounds or side opposite tracheal deviation; may need second or third needle decompression on same side if there is a rush of air but patient again has symptoms
      i. Authorized sites are the 4th or 5th Intercostal Space (ICS) at the anterior axillary line (AAL) or the 2nd ICS at the mid-clavicular line (MCL)
      ii. 4th or 5th ICS at the AAL is preferred over the 2nd ICD at MCL.
   b. For open chest wound, place semi-occlusive dressing
   c. Monitor oxygen saturation (SpO_2) and, if indicated, provide supplemental oxygen to maintain SPO_2 greater than 94% and respiratory support if needed. [See Respiratory Section]
4. Circulation
   a. If pelvis is unstable, place pelvic binder or sheet to stabilize pelvis
   b. Establish IV access if needed (large bore preferred)
   c. Fluid resuscitation
      i. Adults
      1. If SBP greater than 90 mmHg and heart rate less than 120 BPM, no IV fluids required
      2. If SBP less than 90 mmHg or HR greater than 120 BPM, initiate resuscitation:
         a. Blood products are recommended if available
         b. If blood products not available, consider 500 mL bolus of IV fluid, repeat as needed for persistent signs and symptoms of shock
            i. If signs and symptoms of shock persist after a total of 1 L crystalloid bolus, contact online medical direction
         c. Trauma resuscitation target SBP 90 mmHg (palpable radial pulse or alert mental status)
         d. Reassess SBP after bolus given
      3. Head injury: target SBP greater than110 mmHg. Hypotension should be avoided to maintain cerebral perfusion

      ii. Pediatrics
      1. If patient demonstrates tachycardia for age with signs of poor perfusion (low BP, greater than 2-second capillary refill, altered mental status, hypoxia, weak pulses, pallor, or mottled/cool skin), give 20 mL/kg crystalloid bolus and reassess. Repeat as needed for persistent signs and symptoms of shock

a. If signs and symptoms of shock persist after a total of 60 mL/kg crystalloid bolus, contact online medical direction

2. Target normal BP for age [See Footnote IV. Abnormal Vital Signs]

d. Blood product administration may be considered based on local availability and protocols

e. Tranexamic acid (TXA) administration may be considered within three hours of injury and signs of hemorrhagic shock

5. Disability/Head/Hypothermia
   a. If clinical signs of traumatic brain injury [See Head Injury Protocol]
   b. Avoid/treat hypothermia
      i. Remove wet clothing
      ii. Cover patient to warm and/or prevent further heat loss
6. **NOTE**: Patients with major hemorrhage, hemodynamic instability, penetrating torso trauma, or signs of traumatic brain injury often require rapid surgical intervention. Minimize scene time (goal is under 10 minutes) and initiate rapid transport to the highest level of care within the trauma system
7. Repeat primary assessment or secondary assessment should be conducted en route to the trauma center
8. Decisions regarding transport destination should be based on the ACS-COT *2022 National Protocol for the Field Triage of Injured Patients*

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. Last meal
      v. Events leading up to the injury
   b. Secondary survey: Head to toe physical exam including re-assessment of interventions from primary survey
      i. Head/Face
         1. Palpate head and scalp and face and evaluate for soft tissue injury or bony crepitus indicating injury to skull or facial bones
         2. Assess for globe injury and subjective change in vision
         3. See Facial/Dental Trauma Protocol
      ii. Neck
         1. Check for:
            a. Contusions
            b. Abrasions
            c. Hematomas
            d. Jugular vein distention (JVD)
            e. Tracheal deviation
         2. Palpate for crepitus
         3. Spinal assessment per Spinal Care Protocol
      iii. Chest – See Initial Treatment
         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
         3. Cover eviscerated abdominal contents with moist dressings
      v. Pelvis
         1. Inspect for penetrating or soft tissue injuries

2. If pelvic pressure suspected, apply pelvic stabilization device

vi. Back
1. Maintain spinal alignment. Refer to Spinal Care Protocol
2. Inspect for penetrating or soft tissue injuries

vii. Neurologic status assessment [See Footnote III. Neurologic Status Assessment]
1. Serial assessment of mental status
2. Gross exam of motor strength and sensation in all four extremities

viii. Extremities
1. Assess for fracture/deformity – See Extremity Trauma/External Hemorrhage Management Protocol
2. Assess peripheral pulses/capillary refill

c. Additional treatment considerations
i. Maintain spine precautions per the Spinal Care Protocol
ii. Splint obvious extremity fractures per the Extremity Trauma/External Hemorrhage Management Protocol
iii. Provide pain medication per the Pain Management Protocol

Patient Safety Considerations

1. Life-threatening injuries identified on primary survey should be mitigated immediately with rapid transport to a trauma center
2. Monitor patient for deterioration over time with serial vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) and repeat neurologic status assessment [See Footnote III. Neurologic Status Assessment]
   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. [See Head Injury Protocol]
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 first control of massive hemorrhage using **MARCH** (**M**assive hemorrhage, **A**irway, **R**espiratory/Breathing, **C**irculation, **H**ead injury/**H**ypothermia)
2. Target scene time less than 10 minutes for unstable patients or those likely to need surgical intervention
3. Clinician training should include the *ACS-COT 2022 National Protocol for the Field Triage of Injured Patients*
4. 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 **ABC**s (**A**irway, **B**reathing, **C**irculation) and repeat neurologic status assessment [See Footnote III. Neurologic Status Assessment]
5. Use structured communication tool for patient handoff to higher level care such as **AT-MIST**
   a. **A**ge
   b. **T**ime of incident or onset of symptoms
   c. **M**echanism

d. **I**njuries noted
e. **S**ymptoms/**S**igns
f. **T**reatments provided

Quality Improvement

Key Documentation Elements

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

Performance Measures

- Monitor scene time for unstable patients
- Monitor appropriateness of procedures
- Monitor appropriate airway management

Blast Injuries

Aliases

None noted

Patient Care Goals

1. Maintain patient and clinician 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

1. Patients exposed to explosive force. Injuries may include any or all the following:
   a. Blunt trauma
   b. Penetrating trauma
   c. Burns
   d. Pressure-related injuries (barotrauma)
   e. Toxic chemical contamination
   f. Chemical, biological, radiological, nuclear, and explosive devices, or agents

Exclusion Criteria

None noted

Patient Management

Assessment

1. Hemorrhage Control
   a. Assess for and stop severe hemorrhage [See Extremity Trauma/External Hemorrhage Management Protocol]
2. Airway
   a. Assess airway patency
   b. Consider possible thermal or chemical burns to the airway
3. Breathing
   a. Evaluate the adequacy of respiratory effort, oxygenation, quality of lung sounds, and chest wall integrity
   b. Consider possible pneumothorax or tension pneumothorax (because of penetrating/blunt trauma or barotrauma)

c. Continually reassess for blast lung injury

4. Circulation
   a. Look for evidence of hemorrhage
   b. Assess BP, pulse, skin color/character, and distal capillary refill for signs of shock
5. Disability
   a. Assess patient responsiveness (e.g., **AVPU**) and level of consciousness (e.g., **GCS**) [See Footnote IV: Neurologic Status Assessment]
   b. Assess pupils
   c. Assess gross motor movement of extremities
6. Exposure
   a. Rapid evaluation of entire skin surface, including back (log roll), to identify blunt or penetrating injuries

Treatment and Interventions

1. Hemorrhage control:
   a. Control any severe external hemorrhage [See Extremity Trauma/External Hemorrhage Management Protocol]
2. Airway:
   a. If thermal or chemical burn to the airway is suspected, early airway management is vital
   b. Secure airway, utilizing airway maneuvers, airway adjuncts, supraglottic device, or endotracheal tube [See Airway Management Protocol]
3. Breathing:
   a. Administer oxygen as appropriate with a target of achieving 94–98% saturation.
   b. Assist respirations as needed
   c. Cover any open chest wounds with a semi-occlusive dressing
   d. If the patient has evidence of tension pneumothorax, perform needle decompression
4. Circulation:
   a. Establish IV access with two large bore IVs or IOs
      i. Administer resuscitative fluids, per the General Trauma Management Protocol
      ii. If the patient is burned, administer normal saline (NS) or lactated Ringer's (LR) per the Burns Protocol
5. Disability:
   a. If evidence of head injury, treat per the Head Injury Protocol
   b. Apply spinal precautions, per the Spinal Care Protocol
   c. Monitor GCS during transport to assess for changes
6. Exposure:
   a. Keep patient warm to prevent hypothermia

Patient Safety Considerations

1. Ensuring scene safety is especially important at the scene of an explosion
   a. Always consider the possibility of subsequent explosions
   b. Structural safety, possible toxic chemical contamination, the presence of poisonous gasses, and other hazards might cause a delay in patient extraction
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 a specialized burn center

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. Consider injuries due to barotrauma
    a. Tension pneumothorax
        i. Hypotension or other signs of shock associated with decreased or absent breath sounds, jugular venous distension, and/or tracheal deviation
    b. Tympanic membrane perforation resulting in deafness which may complicate the evaluation of their mental status and their ability to follow commands
5. Primary transport to a trauma or burn center is preferable, whenever possible

Pertinent Assessment Findings

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

Quality Improvement

Key Documentation Elements

- Airway status and intervention
- Breathing status:
    - o Quality of breath sounds (equal bilaterally)
    - o Adequacy of respiratory effort
    - o Oxygenation
- Documentation of burns, including **T**otal **B**urn **S**urface **A**rea (**TBSA**) [See Burns Protocol]
- Documentation of possible toxic chemical contamination

Performance Measures

- Airway assessment and early and aggressive management
- Appropriate IV fluid management
- Transport to trauma or burn center

Burns

Aliases
None noted

Patient Care Goals
Minimize tissue damage and patient morbidity from burns

Patient Presentation

1. Patient may present with:
   a. Airway – stridor, hoarse voice
   b. Mouth and nares – redness, blisters, soot, singed hairs
   c. Breathing – rapid, shallow, wheezes, rales
   d. Skin – Estimate Total Burn Surface Area (TBSA) and depth (partial vs. full thickness)
   e. Associated trauma – blast, fall, assault

Inclusion Criteria
Patients sustaining thermal burns

Exclusion Criteria
Electrical, chemical, and radiation burns [See Toxins and Environmental Section]

Special Transport Considerations

1. Transport to most appropriate trauma center when there is airway or respiratory involvement, or when significant trauma or blast injury is suspected
2. Consider air ambulance transportation for long transport times or airway management needs beyond the scope of the responding ground medic
3. Consider transport directly to burn center if partial or full thickness burns (TBSA) greater than 10% and/or involvement of hands/feet, genitalia, face, and/or circumferential burns

Scene Management

1. Assure crew safety:
   a. Power off
   b. Electrical lines secure
   c. Gas off
   d. No secondary devices
   e. Hazmat determinations made
   f. Proper protective attire including breathing apparatus may be required

Patient Management

Assessment

1. Circumstances of event – Consider:
   a. Related trauma in addition to the burns
   b. Inhalation exposures such as carbon monoxide (CO) and cyanide (CN)
   c. Pediatric or elder abuse
2. Follow **ABC**s (**A**irway, **B**reathing, **C**irculation) of resuscitation per the General Trauma Management Protocol
3. If evidence of possible airway burn, consider aggressive airway management
4. Consider spinal precautions for those that qualify per the Spinal Care Protocol
5. Estimate TBSA burned and depth of burn
   a. Use "Rule of 9's" [See burn related tables in Footnote II. Burn and Burn Fluid Charts]
   b. First-degree/superficial burns (skin erythema only) are not included in TBSA calculations

6. Document pain scale

Treatments and Interventions

1. Stop the burning
    a. Remove wet clothing (if not stuck to the patient)
    b. Remove jewelry
    c. Leave blisters intact
2. Minimize burn wound contamination
    a. Cover burns with dry dressing or clean sheet
    b. Do not apply gels or ointments
3. Monitor SPO_2, $EtCO_2$ and cardiac monitor
4. High flow supplemental oxygen for all burn patients rescued from an enclosed space
5. Establish IV access, avoid placement through burned skin
6. Evaluate respiratory status in patients with circumferential thoracic burns due to the risk for ventilatory compromise and potential need for escharotomy
7. Evaluate distal circulation in circumferentially burned extremities due to increased risk of circulatory compromise and potential need for escharotomy
8. Consider early management of pain and nausea/vomiting
9. Initiate fluid resuscitation – Use lactated Ringer's or normal saline
    a. If patient in shock:
        i. Consider other cause, such as trauma or cyanide toxicity
        ii. Administer IV fluid per the Shock Protocol
    b. If patient not in shock:
        i. Begin fluids based on estimated TBSA [See Footnote II. Burn and Burn Fluid Charts as appropriate to patient weight]
        ii. Pediatric patients weighing less than 40 kg, use length-based tape for weight estimate and follow
    c. For persons over 40 kg, the initial fluid rate can also be calculated using the "Rule of 10":
        i. Calculate the TBSA (round to nearest 10%)
        ii. Multiply TBSA x 10 = initial fluid rate (mL/hr) {for persons between 40–80 kg}
        iii. Add 100 mL/hr for every 10 kg of body weight over 80 kg
10. Prevent systemic heat loss and keep the patient warm

Special Treatment Considerations

1. If blast mechanism, treat per the Blast Injury Protocol
2. Airway burns can rapidly lead to upper airway obstruction and respiratory failure. After performing the appropriate airway management measures, the administration of nebulized epinephrine, bronchodilators, nebulized n-acetylcystine, and nebulized heparin, if available, can be considered to reduce edema of the laryngeal and pulmonary tissues and airway occlusion from secretions and blood.
3. Have a high index of suspicion for cyanide poisoning in a patient with depressed GCS, respiratory difficulty, and cardiovascular collapse in the setting of an enclosed-space fire. Give the antidote (hydroxocobalamin), if available, in this circumstance
4. Particularly in enclosed-space fires, carbon monoxide toxicity is a consideration and pulse oximetry may not be accurate [See Carbon Monoxide/Smoke Inhalation Protocol]
5. For specific chemical exposures (cyanide, hydrofluoric acid, other acids, and alkali) [See Topical Chemical Burn Protocol]
6. Consider decontamination and notification of receiving facility of potentially contaminated patient (e.g., methamphetamine (meth) lab incident)
7. Burns that involve significant sloughing or loss of skin can result in uncontrolled heat loss. These patients should be monitored closely for the development of hypothermia and appropriate preventative measures should be taken

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. If the patient is in shock within one hour of burn, it is not from the burn. Evaluate the patient carefully for associated trauma or cyanide toxicity.
3. If the patient is not in shock, the fluid rates recommended above will adequately maintain patient's fluid volume.
4. Pain management is critical in acute burns.
5. End-tidal capnography ($EtCO_2$) monitoring may be particularly useful to monitor respiratory status in patients receiving significant doses of narcotic pain medication.
6. Cardiac monitor is important in electrical burns and chemical inhalations.
7. TBSA is calculated only based on percent of second- and third-degree burns – First degree/superficial burns are not included in this calculation

Quality Improvement

Burn trauma is relatively uncommon. Clinicians should receive regular training on burn assessment and management.

Key Documentation Elements

- Initial airway status
- Total volume of fluid administered
- Body surface area of second- and third-degree burns (TBSA)
- Pulse and capillary refill exam distally on any circumferentially burned extremity
- Pain scale documentation and pain management

Performance Measures

- Patient transported to most appropriate hospital, preferably a burn center
- Pain scale documented and pain appropriately managed
- Airway assessment and management appropriately documented

Crush Injury/Crush Syndrome

Aliases
Compartment syndrome
Crush

Patient Care Goals

1. Recognizing traumatic crush injury mechanism
2. Minimize systemic effects such as rhabdomyolysis, hyperkalemia, acute kidney injury

Patient Presentation

Inclusion criteria
Traumatic crush mechanism of injury
Non-traumatic injuries that may cause compartment syndrome include prolonged immobilization, prolonged compression of the torso/limbs, electrical injury, or burns

Exclusion criteria
None noted

Patient Management

Assessment

1. Identify any severe hemorrhage
2. Assess airway, breathing, and circulation
3. Evaluate for possible concomitant injury (e.g., fractures, solid organ damage, or spinal injury)
4. Monitor for development of compartment syndrome (pain out of proportion to clinical exam,
   tense swelling, pain with passive stretch, muscle weakness, absent pulses, parasthesias)

Treatment and Interventions

1. The treatment of crushed casualties should begin as soon as they are discovered
2. If severe hemorrhage is present, see Extremity Trauma/External Hemorrhage Management Protocol
3. Establish IV access. IV fluids should be administered prior to releasing the crushed body part. Administer 1000 mL normal saline (NS) bolus. Avoid lactated Ringer's solution as it contains potassium. Crush injury without adequate fluid resuscitation develops into crush syndrome
4. For significant crush injuries or prolonged entrapment of an extremity, consider sodium bicarbonate 1 mEq/kg (maximum dose of 50 mEq) IV bolus over 5 minutes
5. Attach cardiac monitor. Obtain/interpret 12-lead EKG, if available. Carefully monitor for dysrhythmias or signs of hyperkalemia before and immediately after release of pressure and during transport (e.g., peaked T waves, wide QRS, lengthening QT interval, loss of P wave)
6. For pain control, consider analgesics [See Pain Management Protocol]

7. Consider the following post extrication
    a. Continued resuscitation with normal saline (500–1000 mL/hr for adults, 10 mL/kg/hr for children)
    b. If EKG suggestive of hyperkalemia or if findings of hyperkalemia, administer IV fluids and consider administration of:
        i. Calcium chloride – 1 gm IV/IO over 5 minutes, ensure IV patency and do not exceed 1 mL per minute (Pediatric: 10% 20 mg/kg, max 1 g, IV.IO over 5 minutes.
        OR
        ii. Calcium gluconate – 3 gm IV/IO over 5 minutes with constant cardiac monitoring (Pediatric: 10% 50 mg/kg (0.5 mL/kg), max 2 gram, IV over 5 minutes
    c. If not already administered, for significant crush injuries with EKG suggestive of hyperkalemia, administer sodium bicarbonate 1 mEq/kg (max dose of 50 mEq) IV bolus over 5 minutes
    d. If EKG suggestive of hyperkalemia, consider albuterol 5 mg via small volume nebulizer (can be repeated if no response is seen)

Patient Safety Considerations

Scene safety for both rescuers and patients are of paramount importance.

Notes/Educational Pearls

1. Causes of mortality in untreated crush syndrome:
    a. Immediate
        i. Severe head injury
        ii. Traumatic asphyxia
        iii. Torso injury with damage to intrathoracic or intra-abdominal organs
    b. Early
        i. Sudden release of a crushed extremity may result in reperfusion syndrome (acute hypovolemia, electrolyte abnormalities, and subsequent lethal arrhythmia)
        ii. Hyperkalemia (potassium is released from injured muscle cells)
        iii. Hypovolemia/shock
    c. Late
        i. Acute kidney injury (from release of toxins from injured muscle cells)
        ii. Coagulopathy and hemorrhage
        iii. Sepsis

Key Considerations

1. Rapid extrication and evacuation to a definitive care facility (trauma center preferred)
2. A patient with a crush injury may initially present with very few signs and symptoms. Maintain a high index of suspicion for any patient with a compressive mechanism of injury
3. A fatal medical complication of crush syndrome is hyperkalemia. Suspect hyperkalemia if T-waves become peaked, QRS becomes prolonged (greater than 0.12 seconds), absent P wave, prolonged QTc, or sine wave. Continue fluid resuscitation through extrication and transfer to hospital

Pertinent Assessment Findings

1. Mental status/Glasgow Coma Scale (GCS)
2. Evaluation for fractures and potential compartment syndrome development (neurovascular status of injured extremity)
3. Examination of spine
4. Evidence of additional trauma, potentially masked by with other painful injuries

Quality Improvement

Key Documentation Elements

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

Performance Measures

- Initiation of fluid resuscitation prior to extrication
- EKG/monitor to monitor for dysrhythmias or changes related to hyperkalemia
- Treatment of hyperkalemia if evidence is noted on EKG

Extremity Trauma/External Hemorrhage Management

Aliases

None noted

Patient Care Goals

1. Minimize blood loss from extremity hemorrhage
2. Avoid hemorrhagic shock due to extremity hemorrhage
3. Minimize pain and further injury due to fractures, dislocations, or soft-tissue injuries

Patient Presentation

Inclusion Criteria [Refer to Crush Injury and Crush Syndrome Protocol]

1. Traumatic extremity hemorrhage (external hemorrhage) due to blunt or penetrating injury
2. Known or suspected extremity fractures or dislocations

Exclusion Criteria

None noted

Patient Management

Assessment

1. Assess degree of extremity/external bleeding/blood loss
2. Vascular status of extremity:
    a. Pallor
    b. Pulse
    c. Capillary refill and skin temperature
3. Evaluate for obvious deformity, shortening, rotation, or instability
4. Neurologic status of extremity:
    a. Sensation to light touch
    b. Distal movement of extremity

Treatments and Interventions

1. Manage bleeding:
    a. Expose the wound and apply direct pressure to bleeding site, followed by a pressure dressing
    b. If direct pressure/pressure dressing is ineffective or impractical:
        i. If the bleeding site is amenable to tourniquet placement, apply a commercial tourniquet to extremity:
            1. Tourniquet should be placed 2–3 inches proximal to wound, not over a joint, and tightened until bleeding stops and distal pulse is eliminated
            2. If bleeding continues, place a second tourniquet proximal to the first
            3. For thigh wounds, consider placement of two tourniquets, side-by-side, and tighten sequentially

c. **Wound packing**:
    i. **Indications**: Groin/axillary ("junctional") injury or any limb wound with persistent bleeding despite direct pressure and/or application of commercial tourniquet(s)
    ii. **Materials**: hemostatic gauze, regular gauze, or any available material
    iii. **Procedure**: pack tightly and fully to the depth of the wound until bleeding stops (may require significant packing for deep, large wounds), then apply direct pressure and/or pressure dressing; do not remove packing to assess bleeding
        1. Pack around (do not remove) bone fragments or foreign objects
d. Junctional tourniquets may be considered for groin or axillary wounds, if available
e. Consider tranexamic acid (TXA) for injury associated with hemorrhagic shock if within three hours of injury

2. Manage pain [See Pain Management Protocol]
    a. Pain management should be strongly considered for patients with tourniquets and suspected fractures
    b. Do not loosen tourniquet to relieve pain
3. Stabilize suspected fractures/dislocations:
    a. Strongly consider pain management before attempting to move a suspected fracture
    b. If distal vascular function is compromised, gently attempt to restore normal anatomic position, and reassess perfusion status
    c. Use splints as appropriate to limit movement of suspected fracture
    d. Elevate extremity fractures above heart level whenever possible to limit swelling
    e. Apply ice/cool packs to limit swelling in suspected fractures or soft tissue injury, but do not apply ice directly to bare skin
    f. Reassess distal neurovascular status after any manipulation or splinting of fractures/dislocations
    g. Dress open wounds associated with fractures with saline-moistened gauze
4. Remove wet or blood-soaked clothing and use measures to prevent heat loss
5. Remove jewelry and potentially constricting clothing from the injured limb
6. Do not remove impaled foreign bodies

Patient Safety Considerations

1. If improvised tourniquet has been placed by bystander, reassess, and consider placing commercial tourniquet proximal to it
2. If tourniquet is placed:
    a. Ensure that the tourniquet is sufficiently tight to occlude the distal pulse
    b. Ensure that the tourniquet is well marked and visible, and that all subsequent clinicians are aware of the presence of the tourniquet
    c. Do not cover the tourniquet with clothing or dressings
3. Mark the time of tourniquet placement prominently on the patient and in the patient care report
4. Without removing the tourniquet or dressing, reassess frequently for signs of ongoing or renewed bleeding, such as:
    a. Blood soaking through dressing
    b. Bleeding distal to tourniquet

Notes/Educational Pearls

Key Considerations

1. Tourniquets should be applied to bare skin, 2–3 inches proximal to the wound
2. Tourniquet should be reassessed at every stage of patient movement to ensure ongoing hemorrhage control.
3. Survival is markedly improved when a tourniquet is placed ***before*** shock develops
4. Properly-applied tourniquets in conscious patients are painful – treat pain with analgesics, but do not loosen a tourniquet to relieve discomfort
5. Arterial pressure points may not be effective in controlling hemorrhage; however, may help slow bleeding while tourniquet is applied
6. Amputated body parts should be transported with patient for possible re-implantation
   a. It should remain cool but dry
   b. Place the amputated part in a plastic bag
   c. Place the bag with the amputated part on ice in a second bag
   d. Do not let the amputated part come into direct contact with the ice
7. Pediatric considerations:
   a. External hemorrhage control to prevent shock is critical in infants and young children, due to their relatively small blood volume
   b. Most commercial tourniquets can be used effectively on children over 2 years of age
   c. Stretch-wrap-tuck elastic-type tourniquets can be used on any age patient
   d. Direct pressure and wound packing may be more suitable for infants and young children
   e. Consult with local online medical direction regarding use of traction splints for femur fractures in young children, to avoid risk of possible nerve damage

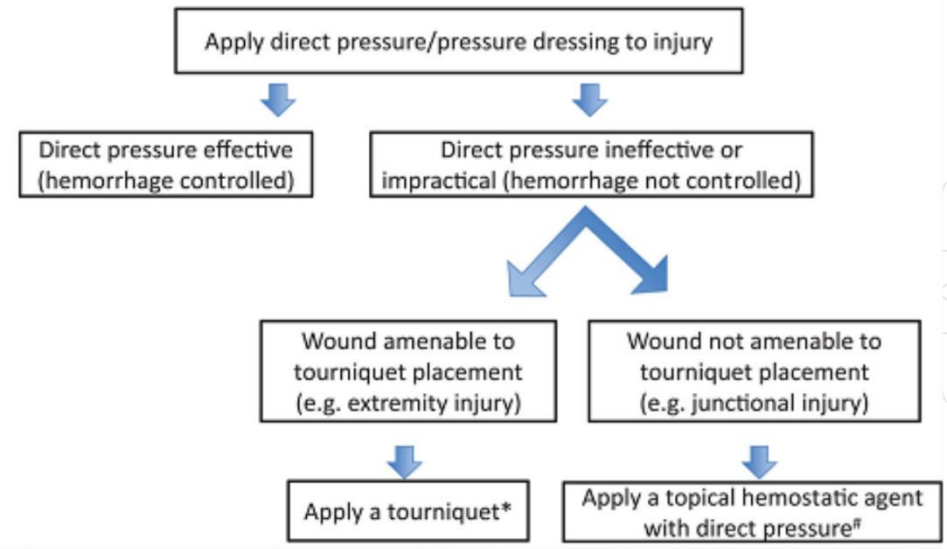
Quality Improvement

Key Documentation Elements

- Vital signs and vascular status of extremity after placement of tourniquet, pressure dressing, packing, and/or splint
- Time of tourniquet placement
- Documentation of signs/symptoms of possible compartment syndrome

Performance Measures

- Proper placement of tourniquet (location, cessation of bleeding)
- Proper marking and timing of tourniquet placement and notification of tourniquet placement to subsequent EMS clinicians and ED personnel
- Appropriate splinting and padding of fractures



Graphic 1. Prehospital External Hemorrhage Control Protocol

* Use of tourniquet for extremity hemorrhage is strongly recommended if sustained direct pressure is ineffective or impractical; Use a commercially produced, windlass, pneumatic, or ratcheting device, which has been demonstrated to occlude arterial flow and avoid narrow, elastic, or bungee-type devices; Utilize improvised tourniquets only if no commercial device is available; Do not release a properly applied tourniquet until the patient reaches definitive care

Apply a topical hemostatic agent, in combination with direct pressure, for wounds in anatomic areas where tourniquets cannot be applied and sustained direct pressure alone is ineffective or impractical; Only apply topical hemostatic agents in a gauze format that support wound packing; Only utilize topical hemostatic agents which have been determined to be effective and safe

Source: *Bulger et al. 2014*

Facial/Dental Trauma

Aliases
None noted

Patient Care Goals
1. Preservation of a patent airway
2. Preservation of vision
3. Preservation of dentition

Patient Presentation

Inclusion Criteria
Isolated facial injury, including trauma to the eyes, nose, ears, midface, mandible, dentition

Exclusion Criteria
1. General Trauma [See General Trauma Management Protocol]
2. Burn trauma [See Burns Protocol]

Patient Management

Assessment
1. Overall trauma assessment
2. **ABC**s (**A**irway, **B**reathing, **C**irculation) 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 aspiration)
3. Bleeding (which may be severe – epistaxis, oral trauma, facial lacerations)
4. Patient medications with focus on blood thinners/anti-platelet agents
5. Cervical spine pain or tenderness [See Spinal Care Protocol]
6. Mental status assessment for possible traumatic brain injury [See Head Injury Protocol]
7. Gross vision assessment
8. Dental avulsions
9. Any tissue or teeth avulsed should be collected, if possible
10. Specific re-examination geared toward airway and ability to ventilate adequately

Treatment and Interventions
1. Administer oxygen as appropriate with a target of achieving 94–98% saturation. Use $EtCO_2$ to help monitor for hypoventilation and apnea
2. IV access, as needed, for fluid or medication administration
3. Pain medication per the Pain Management Protocol
4. Avulsed tooth:
    a. Avoid touching the root of the avulsed tooth. Do not wipe off tooth
    b. Pick up at crown end. If dirty, rinse off under cold water for 10 seconds
    c. Place in milk or saline as the storage medium. Alternatively, an alert and cooperative patient can hold tooth in mouth using own saliva as storage medium
5. Eye trauma:
    a. Place eye shield for any significant eye trauma
    b. If globe is avulsed or enucleated, do not put back into socket. Cover eye socket with moist saline dressings and then place eye shield over it
6. Mandible unstable:
    a. Expect patient cannot spit/swallow effectively and have suction readily available
    b. Preferentially transport sitting up with emesis basin/suction available (in the absence of a suspected spinal injury.) [See Spinal Care Protocol]

7. Epistaxis: squeeze nose (or have patient do so) for 10–15 minutes continuously
8. Nose/ear avulsion:
    a. Recover tissue, if possible
    b. Transport with tissue wrapped in dry sterile gauze in a plastic bag placed on ice
    c. Severe ear and nose lacerations can be addressed with a protective moist sterile dressing

Patient Safety Considerations

1. Frequent reassessment of airway
2. Maintenance of a patent airway is the highest priority; therefore, conduct cervical spine assessment for field clearance (per Spinal Care Protocol) to enable transport sitting up for difficulty with bleeding, swallowing, or handling secretions

Notes/Educational Pearls

Key Considerations

1. Airway may be compromised because of fractures or bleeding
2. Lost teeth not recovered on scene may be in the airway
3. After nasal fractures, epistaxis may be posterior and may not respond to direct pressure over the nares with bleeding running down posterior pharynx, potentially compromising airway
4. Protect avulsed tissue and teeth
    a. Avulsed teeth may be successfully re-implanted if done so in a very short period after injury
    b. Use moist sterile dressing for ear and nose cartilage
5. For penetrating eye injuries, do not remove foreign bodies. Splint in place. Cover uninjured eye or ask patient to close eye to prevent conjugate movement of injured eye
6. Consider administration of antiemetics to prevent increases in intraocular pressure due to nausea and vomiting in penetrating and blunt trauma to the eye [See Nausea – Vomiting Protocol]

Pertinent Assessment Findings

1. Unstable facial fractures that can abruptly compromise airway
2. Loose teeth and retro-pharynx bleeding

Quality Improvement

Key Documentation Elements

- Airway patency and reassessment
- Degree and location of hemorrhage
- Mental status (GCS or AVPU)
- Technique used to transport tissue or teeth
- Eye exam documented, when applicable
- Assessment and management of cervical spine
- Patient use of anticoagulant medications

Performance Measures

- Appropriate airway management and satisfactory oxygenation
- Eye shield applied to eye trauma

Head Injury

Aliases
None noted

Patient Care Goals

1. Limit disability and mortality from head injury by limiting secondary brain injury through
    a. Promoting adequate oxygenation and preoxygenating to protect against unanticipated deterioration
    b. Promoting good cerebral perfusion and avoid hypotension
    c. Preventing hypocapnia (by avoiding hyperventilation and overventilation)

Patient Presentation

Inclusion Criteria
Adult or pediatric patient with blunt or penetrating head injury – loss of consciousness or amnesia not required

Exclusion Criteria None noted

Patient Management

Assessment

1. Maintain cervical stabilization [See Spinal Care Protocol]
2. Primary survey per the General Trauma Management Protocol
3. Monitoring:
    a. Continuous pulse oximetry
    b. Frequent systolic and diastolic blood pressure measurement
    c. Initial neurologic status assessment [See Footnote III. Neurologic Status Assessment] and reassessment with any change in mentation
    d. Moderate/severe head injury: apply continuous waveform $EtCO_2$, 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 pupils if decrease in mentation
    c. Nose/mouth/ears: evaluate for blood/fluid drainage
    d. Face: evaluate for bony stability
    e. Neck: palpate for cervical spine tenderness or deformity
    f. Neurologic:
        i. Perform neurologic status assessment (GCS or AVPU)
        ii. Evaluate for focal neurologic deficit: motor and sensory

Treatment and Interventions

NOTE: These are not necessarily the order they are to be done, but are grouped by conceptual areas

1. Airway:
    a. Administer high-flow oxygen via NRB (non-rebreather) as a precaution against unanticipated deterioration
    b. If patient unable to maintain airway, consider oral airway (nasal airway should not be used with significant facial injury or possible basilar skull fracture)
    c. BVM (bag-valve-mask) ventilation if high flow oxygen (HFO)/non-rebreather (NRB) inadequate to maintain good airway and/or oxygenation
    d. Place supraglottic airway or perform endotracheal intubation or if BVM ventilation ineffective in maintaining

oxygenation or if airway is continually compromised. Endotracheal intubation (ETI)/supraglottic airway (SGA) should only be used in systems that have continuous $EtCO_2$ monitoring

2. Breathing:
    a. For patients who cannot maintain adequate oxygenation with HFO/NRB, BVM ventilation (15 years old or older: 10 breaths per minute; 2–14 years old: 20 breaths per minute; less than 2 years old: 25 breaths per minute) with gentle manual bagging. Consider flow-controlled bags and ventilation rate timers to help prevent hyper-/overventilation
    b. SGA placement or ETI should only be performed if BVM ventilation fails to maintain adequate oxygenation. With advanced airways, manage with a target $EtCO_2$ of 40 (normal range 35–45 mmHg)
    c. Do not induce hypocapnia through hyper-/overventilation
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
        iii. Cover an injured eye with moist saline dressing and place cup over it
    b. Moderate/severe closed head injury
        i. Blood pressure: avoid hypotension
            1. **Adult** (age greater than 10 years): maintain SBP greater than or equal to 110 mmHg
            2. **Pediatric**: maintain SBP:
                a. Age less than 1 month: greater than 60 mmHg
                b. Age 1–12 months: greater than 70 mmHg
                c. Age 1–10 years: greater than 70 + 2x age in years
    c. Closed head injury
        i. Administer normal saline (NS)/lactated Ringer's (LR) fluid boluses to maintain SBP above threshold. Do not wait until after the patient is already hypotensive—*prevent* hypotension
    d. Do not delay transport to initiate IV access
4. Disability:
    a. Evaluate for other causes of altered mental status — check blood glucose during transport
    b. Spinal assessment and management, per Spinal Care Protocol
    c. Perform and trend neurologic status assessment (GCS or AVPU scale)
        i. Early signs of deterioration:
            1. Confusion
            2. Agitation
            3. Drowsiness
            4. Vomiting
            5. Severe headache
    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 3–13, P (pain) or U (unresponsive) on AVPU scale
        ii. Penetrating head trauma
        iii. Open or depressed skull fracture

Patient Safety Considerations

1. Do not hyperventilate patients: Maintain all patients in $EtCO_2$ range of 35–45 mmHg
2. Assume concomitant cervical spine injury in patients with moderate/severe head injury
3. **Geriatric Consideration:** Elderly patients with ankylosing spondylitis or severe kyphosis should be padded and immobilized in a position of comfort and may not tolerate a cervical collar

4. **Pediatric Consideration:** 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. Head injury severity Protocol:
   a. **Mild**: GCS 14–15/AVPU = (A)
   b. **Moderate**: GCS 9–13/AVPU = (V)
   c. **Severe**: GCS 3–8/AVPU = (P) or (U)
2. Important that clinicians be specifically trained in accurate neurologic status assessment [See Footnote III. Neurologic Status Assessment]
3. If endotracheal intubation or invasive airways are used, continuous waveform capnography is required to document proper tube placement and assure proper ventilation rate and minute volume (preventing both hyperventilation [too fast] and overventilation [too much])
4. Herniation is difficult to diagnose in the prehospital setting. Hyperventilation results in vasoconstriction which further decreases blood flow to the brain and worsens the secondary brain injury.

Pertinent Assessment Findings

1. Neurologic status assessment findings
2. Pupils
3. Trauma findings on physical exam

Quality Improvement

Key Documentation Elements

- High-flow oxygen with non-rebreather (NRB) mask
- Airway status and management
- $EtCO_2$ monitored and documented for all traumatic brain injury (TBI) patients with advanced airway and strict avoidance of hyperventilation, overventilation, and hypocapnia)
- Neurological status with vitals: AVPU, GCS
- Exams: Neurological and Mental Status Assessment pre- and post-treatment

Performance Measures

- No oxygen desaturation *less than* 90%
- No hypotension:
  - **Adults**: *less than* 110 mmHg
  - **Pediatrics**:
    - Age *less than* 1 month: *less than* 60 mmHg
    - Age 1–12 months: *less than* 70 mmHg
    - Age 1–10 years: *less than* 70 + 2x age in years
- Assess the patient's blood pressure prior to the administration of any medication that may cause hypotension.
- $EtCO_2$ target 40 mmHg (range 35–45 mmHg). Meticulous prevention of hypocapnia in all patients
- Triage to the appropriate level hospital within the local trauma system

Spinal Care

(Adapted from an evidence-based Protocol created using the National Prehospital Evidence-Based Protocol Model Process)

Aliases
None noted

Patient Care Goals

1. Select patients for whom spinal motion restriction (SMR) is indicated
2. Minimize secondary injury to spine in patients who have, or may have, an unstable spinal injury
3. Minimize patient morbidity from the unnecessary use of immobilization devices
4. Eliminate routine use of spinal immobilization devices without appropriate medical indication

Patient Presentation

Inclusion criteria
Traumatic mechanism of injury

Exclusion criteria
None noted

Patient Management

Assessment

1. Assess the scene to determine the mechanism of injury
    a. Mechanism alone should not determine if a patient requires spinal motion restriction – however, mechanisms that have been associated with a higher risk of injury are:
        i. Motor vehicle crashes (including automobiles, all-terrain vehicles, and snowmobiles)
        ii. Axial loading injuries to the spine
        iii. Falls greater than 10 feet
2. Assess the patient in the position found for findings associated with spine injury:
    a. Mental status
    b. Neurologic deficits
    c. Spinal pain or tenderness
    d. Any evidence of intoxication
    e. Other severe injuries, particularly associated torso injuries

Treatment and Interventions

1. Place patient in cervical collar and initiate spinal motion restriction in adults if there are any of the following:
    a. Patient complains of midline neck or spine pain
    b. Any midline neck or spinal tenderness with palpation
    c. Any abnormal mental status (including extreme agitation)
    d. Focal or neurologic deficit
    e. Any evidence of alcohol or drug intoxication
    f. Another severe or painful distracting injury
    g. Torticollis in children
    h. A communication barrier that prevents accurate assessment
    i. *If none of the above apply*, patient may be managed without a cervical collar
2. Patients with penetrating injury to the neck **should not** be placed in a cervical collar or other spinal precautions regardless of whether they are exhibiting neurologic symptoms or

not. Doing so can lead to delayed identification of injury or airway compromise and has been associated with increased mortality

3. If extrication is required:
    a. **From a vehicle**: After placing a cervical collar, if indicated, children in a booster seat and adults should be allowed to self-extricate. For infants and toddlers already strapped in a car seat with a built-in harness, extricate the child while strapped in his/her car seat
    b. **Other situations requiring extrication**: A, preferably padded, long board may be used for extrication, using the lift and slide (rather than a logroll) technique
4. Helmet removal
    a. If an American football helmet needs to be removed, it is recommended to remove the face mask followed by manual removal (rather than the use of automated devices) of the helmet while keeping the neck manually immobilized — occipital and shoulder padding should be applied, as needed, with the patient in a supine position to maintain neutral cervical spine positioning
    b. Evidence is lacking to provide guidance about other types of helmet removal
5. Do not transport patients on rigid long boards unless the clinical situation warrants long board use. An example of this may be facilitation of immobilization of multiple extremity injuries or an unstable patient where removal of a board will delay transport and/or other treatment priorities. In these situations, long boards should ideally be padded or have a vacuum mattress applied to minimize secondary injury to the patient
6. Patients should be transported to the nearest appropriate facility
7. Patients with severe kyphosis or ankylosing spondylitis may not tolerate a cervical collar. These patients should be immobilized in a position of comfort using towel rolls or sandbags

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 therefore immobilization straps should go across chest and pelvis and not across the abdomen
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
7. In an uncooperative patient, avoid interventions that may promote increased spinal movement
8. The preferred position for all patients with spine management is flat and supine. There are three circumstances under which raising the head of the bed to 30 degrees may be considered:
    a. Respiratory distress
    b. Suspected severe head trauma
    c. Promotion of patient compliance

Notes/Educational Pearls

Key Considerations

1. Evidence is lacking to support or to refute the use of manual stabilization prior to spinal assessment in the setting of a possible traumatic injury when the patient is alert with spontaneous head/neck movement. Clinicians should not manually stabilize these alerts and spontaneously moving patients since patients with pain will self-limit movement and forcing immobilization in this scenario may unnecessarily increase discomfort and anxiety

2. Certain populations with musculoskeletal instability may be predisposed to cervical spine injury. However, evidence does not support or refute that these patients should be treated differently than those who do not have these conditions. These patients should be treated according to the Spinal Care Protocol like other patients without these conditions
3. Pediatric considerations:
    a. Age alone should not be a factor in decision-making for prehospital spine care, yet the patient's ability to reliably be assessed at the extremes of age should be considered. Communication barriers with infants/toddlers or elderly patients with dementia may prevent the clinician from accurately assessing the patient
    b. There is no evidence that children experience non-contiguous multilevel injuries. The existing evidence suggests that the rate of contiguous multilevel injuries is exceedingly low at 1%
    c. Because of variation in head size to body ratio, consider additional padding under the shoulders to avoid excessive cervical spine flexion
4. Spinal precautions should be considered a treatment or preventive therapy
5. Patients who are likely to benefit from immobilization should undergo this treatment
6. Patients who are not likely to benefit from immobilization, who have a low likelihood of spinal injury, should not be immobilized
7. Ambulatory patients may be safely immobilized on gurney with cervical collar and straps and will not generally require a spine board. The role for standing take downs is extremely limited, e.g., extrication of a patient with a high likelihood of a spinal cord injury from a large body of water. Ambulatory patients may have a collar applied and walked to the EMS gurney
8. Reserve long spine board use for the movement of patients whose injuries limit ambulation and who meet criteria for the use of spinal precautions. Remove from the long board as soon as is practical

Pertinent Assessment Findings

1. Mental status
2. Normal neurologic examination
3. Evidence of intoxication
4. Evidence of multiple traumas with other severe injuries

Quality Improvement

Key Documentation Elements

- Patient complaint of neck or spine pain
- Spinal tenderness
- Mental status/GCS
    - Neurologic examination
    - Evidence of intoxication
- Documentation of multiple trauma
- Documentation of mechanism of injury
- Document patient capacity with:
    - o All barriers to patient care in the NEMSIS element "Barriers to Patient Care" (eHistory.01—required of all software systems)
    - o Exam fields for Mental Status and Neurological Assessment
    - o Vitals for Level of Responsiveness and Glasgow Coma Scale
    - o Alcohol and drug use indicators
- Patient age
- Patient who is underage and not emancipated: legal guardian name, contact, and relationship

Performance Measures

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

- Percentage of patients without known trauma who have a cervical immobilization device placed (higher percentage creates a negative aspect of care)
- Percentage of trauma patients who are transported on a long backboard (target is a low percentage)
- Percentage of patients with a cervical spinal cord injury or unstable cervical fracture who did not receive cervical collar

ANNEX 9: Toxins and Environmental

Poisoning/Overdose Universal Care

Aliases

Exposure, Overdose, Poison, Toxin

Patient Care Goals

1. Remove patient from hazardous 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)
3. Identify antidote or mitigating agent
4. Treat signs and symptoms in effort to stabilize patient

Patient Presentation

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

A. Absorption:

I. Nausea
II. Vomiting
III. Diarrhea
IV. Altered mental status
V. Abdominal pain
VI. Rapid heart rate
VII. Dyspnea
VIII. Wheezing
IX. Seizures
X. Arrhythmias
XI. Respiratory depression
XII. Sweating
XIII. Tearing
XIV. Defecation
XV. Constricted/dilated pupils
XVI. Rash
XVII. Burns to the skin

B. Ingestion:

I. Nausea
II. Vomiting
III. Diarrhea
IV. Altered mental status
V. Abdominal pain
VI. Rapid or slow heart rate

VII. Dyspnea
VIII. Seizures
IX. Arrhythmias
X. Respiratory depression
XI. Chemical burns around or inside the mouth
XII. Abnormal breath odors

C. Inhalation:

I. Nausea
II. Vomiting
III. Diarrhea
IV. Altered mental status
V. Abnormal skin color
VI. Dyspnea
VII. Seizures
VIII. Burns to the respiratory tract
IX. Stridor
X. Sooty sputum
XI. Known exposure to toxic or irritating gas
XII. Respiratory depression
XIII. Sweating
XIV. Tearing
XV. Constricted/dilated pupils
XVI. Dizziness
XVII. Injection:
XVIII. Local pain
XIX. Puncture wounds
XX. Reddening skin
XXI. Local edema
XXII. Numbness
XXIII. Tingling
XXIV. Nausea
XXV. Vomiting
XXVI. Diarrhea
XXVII. Altered mental status
XXVIII. Abdominal pain
XXIX. Seizures
XXX. Muscle twitching
XXXI. Hypoperfusion
XXXII. Respiratory depression
XXXIII. Metallic or rubbery taste

2. Toxidromes (constellations of signs and symptoms that add in the identification of certain classes of medications and their toxic manifestations). These toxidrome constellations may be masked or obscured in poly pharmacy events due to counteracting effects of the toxins

A. Anticholinergic

I. Red as a beet (flushed skin)
II. Dry as a bone (dry skin)
III. Mad as a hatter (altered mental status)
IV. Blind as a bat (mydriasis)
V. Hot as a pistol (hyperthermia)

VI. Full as a flask (urinary retention)
VII. "Tacky" like a pink flamingo (tachycardia and hypertension)

B. Cholinergic (DUMBELS)

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

I. Diarrhea
II. Urination
III. Miosis/Muscle weakness
IV. Bronchospasm/Bronchorrhea/Bradycardia (the killer Bs)
V. Emesis
VI. Lacrimation
VII. Salivation/Sweating

C. Opioids

I. Respiratory depression
II. Miosis (pinpoint pupils)
III. Altered mental status
IV. Decreased bowel sounds
V. Sedative Hypnotic
VI. Central nervous system depression
VII. Ataxia (unstable gait or balance)
VIII. Slurred speech
IX. Normal or depressed vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment)

E. Stimulants (Sympathomimetic)

I. Tachycardia, tachydysrhythmias
II. Hypertension
III. Diaphoresis
IV. Delusions/paranoia
V. Seizures
VI. Hyperthermia
VII. Mydriasis (dilated pupils)

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

I. Agitation
II. Ataxia
III. Diaphoresis
IV. Diarrhea
V. Hyperreflexia
VI. Mental status changes
VII. Myoclonus
VIII. Shivering
IX. Tremor
X. Hyperthermia
XI. Tachycardia

Exclusion Criteria:

None noted

Patient Management

Assessment

1. Make sure the scene is safe. Use environmental Carbon Monoxide (CO) detector on "first in" bag if possible

2. Consider body substance isolation (BSI) or appropriate PPE

3. Assess ABCD and, if indicated, expose patient for assessment and then recover to assure retention of body heat

4. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, and O2 saturation including temperature

5. Attach cardiac monitor and examine rhythm strip for arrhythmias (consider 12-lead EKG)

6. Check blood glucose level

7. Monitor pulse oximetry and end-tidal capnography (EtCO2) for respiratory decompensation

8. Perform carboxyhemoglobin device assessment, if available

9. When indicated, identify specific medication taken (including immediate release vs sustained release), time of ingestion, dose, and quantity. When appropriate, bring all medications (prescribed and not prescribed) found in the environment

10. Obtain an accurate ingestion history (as patient may become unconscious before arrival at the emergency department (ED)):

    a. Time of ingestion or exposure
    b. Route of exposure
    c. Quantity of medication or toxin taken (safely collect all possible medications or agents)
    d. Alcohol or other intoxicant taken

11. If bringing in exposure agent, consider the threat to yourself and the destination facility

12. Obtain pertinent cardiovascular history and other prescribed medications

13. Check for needle marks, paraphernalia, bites, bottles, or evidence of agent involved in exposure, self-inflicted injury, or trauma

14. Law enforcement should have checked for weapons and drugs, but you may need to recheck

15. Obtain any other pertinent patient history

16. Perform remainder of physical examination

Treatment and Interventions

1. Assure a patent airway

2. Administer oxygen as appropriate with a target of achieving 94–98% saturation, and if there is hypoventilation noted, support breathing

3. Initiate IV access for infusion of treatment medication and/or lactated Ringer's or normal saline if indicated, and obtain blood samples if EMS management might change based upon the value (e.g., glucose, lactate, cyanide)

4. Consider fluid bolus (20 mL/kg) if evidence of hypoperfusion

5. Administration of appropriate antidote or mitigating medication (refer to specific agent Protocol if not listed below)

a. Paracetamol (Acetaminophen) overdose:

I. Consider activated charcoal without sorbitol (1 g/kg) PO only if within the first hour of ingestion and prolonged transport to definitive care
II. Based on suspected quantity and timing, consider acetylcysteine (pediatric and adult), if available
    1. Loading dose is acetylcysteine 150 mg/kg IV; mix in 200 mL of dextrose 5% in water (D5W) and infuse over 1 hr
    2. After loading dose, give acetylcysteine 50 mg/kg IV in 500 mL D5W over 4 hrs.
    3. If IV is not available, acetylcysteine 140 mg/kg PO

iii. If risk of rapidly decreasing mental status, do not administer oral agents

b. Aspirin overdose:

I. Consider activated charcoal without sorbitol (1 gm/kg) PO only if within the first hour of ingestion
    a. As ASA is erratically absorbed, charcoal is highly recommended to be administered early
    b. If altered mental status or risk of rapid decreasing mental status from polypharmacy, do not administer oral agents including activated charcoal
II. In salicylate poisonings, let the patient breathe on their own, even if tachypneic, until there is evidence of decompensation or dropping oxygen saturation. Acid/base disturbances and outcomes worsen when the patient is manually ventilated

c. Benzodiazepine overdose:

I. Respiratory support
II. Consider fluid challenge (20 mL/kg) for hypotension
III. Consider vasopressors after adequate fluid resuscitation (1–2 liters of crystalloid in adult) for the hypotensive patient

d. Caustic substances ingestion (i.e., acids and alkali):

I. Evaluate for airway compromise secondary to spasm or direct injury associated with oropharyngeal burns

e. Dystonia (symptomatic), extrapyramidal signs or symptoms, or mild allergic reactions

I. Consider administration of diphenhydramine
    a. Adult: diphenhydramine 25–50 mg IV or IM
    b. Pediatric: diphenhydramine 1–1.25 mg/kg IVP/IO or IM (maximum single dose of 25 mg)

f. Monoamine oxidase inhibitor overdose (symptomatic, e.g., MAOI; isocarboxazid, phenelzine selegiline, tranylcypromine)

I. Consider administration of midazolam for temperature control
II. Adult and Pediatric: Midazolam 0.1mg/kg in2mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg — reduce by 50% for patients 69 years old or older

g. Opiate overdose, treat per the Opioid Poisoning/Overdose Protocol

h. Oral ingestion unknown poisoning:

I. If there is a risk of rapidly decreasing mental status or for petroleum-based ingestions, do not administer oral agents
II. Consider administration of activated charcoal without sorbitol (1 g/kg) PO particularly if it is within the first 1 hour after ingestion (including paracetamol) and there will be prolonged transport to definitive care.
III. Patients who have ingested medications with extended release or delayed absorption may also be administered activated charcoal

i. Selective serotonin reuptake inhibitors (SSRls):

I. Consider early airway management
II. Treat arrhythmias following Advanced Cardiac Life Support (ACLS) Protocols
III. Aggressively control hyperthermia with cooling measures
IV. Consider fluid challenge (20 mL/kg) for hypotension
V. Consider vasopressors after adequate fluid resuscitation (1–2 liters of crystalloid in adult) for the hypotensive patient [See Shock Protocol]
VI. For agitation, consider midazolam
    a. Adult: midazolam 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg
    b. Reduce by 50% for patients 69 years or older
    c. Pediatric: midazolam 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 4 mg or midazolam 0.2 mg/kg IN to maximum single dose of 10 mg

VII. For seizures, treat per Seizures Protocol

j. Tricyclic Antidepressant (TCA)/Sodium Channel Blocker Overdose:

I. Consider early airway management
II. If widened QRS (100 msec or greater), consider sodium bicarbonate 1–2 mEq/kg IV, this can be repeated as needed to narrow QRS and improve blood pressure
III. Consider fluid challenge (20 mL/kg) for hypotension
IV. Consider vasopressors after adequate fluid resuscitation (1–2 liters of crystalloid) for the hypotensive patient [See Shock Protocol]
V. For agitation, consider midazolam
    a. Adult: midazolam 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg
    b. Reduce by 50% for patients 69 years or older
    c. Pediatric: midazolam 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 4 mg or midazolam 0.2 mg/kg IN to maximum single dose of 10 mg
VI. For seizure, treat per Seizures Protocol

Patient Safety Considerations

1. Scene/environmental safety for patient and clinician

a. Consider environmental carbon monoxide monitor use

2. Monitor patient airway, breathing, pulse oximetry, EtCO2 for adequate ventilation as they may change over time

3. Repeat vital signs often

4. Monitor level of consciousness

5. Monitor EKG with special attention to rate, rhythm, QRS and QT duration

6. Maintain or normalize patient temperature

7. The regional poison center should be engaged as early as reasonably possible to aid in appropriate therapy and to track patient outcomes to improve knowledge of toxic effects. The Abu Dhabi hotline is available from 0700-2300 on weekdays and the number is 800424

Notes/Educational Pearls

Key Considerations

1. Each toxin or overdose has unique characteristics which must be considered in individual protocols

2. Activated charcoal (which does not bind to all medications or agents) is still a useful adjunct in the serious-agent, enterohepatic, or extended-release agent poisoning if the patient does not have the potential for rapid alteration of mental status or airway/aspiration risk. Precautions should be taken to avoid or reduce the risk of aspiration

3. Ipecac is not recommended for any poisoning or toxic ingestion — the manufacturer has stopped production of this medication

4. Flumazenil is not indicated in a suspected benzodiazepine overdose as it can precipitate refractory/intractable seizures if the patient is a benzodiazepine dependent patient

Pertinent Assessment Findings

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

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

1. Early airway management in the rapidly deteriorating patient
2. Accurate exposure history
    a. Time of ingestion/exposure
    b. Route of exposure
    c. Quantity of medication or toxin taken (safely collect all possible mediations or agents)
    d. Alcohol or other intoxicant taken
3. Appropriate protocol selection and management
4. Multiple frequent documented reassessments

ANNEX 10: Medications

Medical Director Approved Medications

The following table contains medications within the scope of practice of EMS professionals in Abu Dhabi. The ability to use a medication depends on the scope and grade of the healthcare practitioner as indicated in the table. Following this is a list of commonly encountered prehospital medications and their various generic and trade names, classes, indications, mechanisms, and contraindications. This list is meant to include both the medications in the paramedic scope of practice as well as the larger body of medications EMS personnel may encounter in various settings (e.g poisoning, interfacility, over the counter medications).

Medical Director Approved Medications	EMR	EMT	Paramedic	Adv Paramedic	Critical Care Paramedic
Acetylsalicylic Acid		√	√	√	√
Activated Charcoal		√	√	√	√
Adenosine			√	√	√
Adrenaline [Epinephrine]			√	√	√
Adrenaline [Epinephrine] Autoinjector*	√#*	√#*	√	√	√
Amiodarone Hydrochloride			√#*	√	√
Atropine Sulphate			√	√	√
Beta 2 Adrenergic Stimulants [Salbutamol/albuterol] (nebulized)		√	√	√	√
Calcium Chloride 10% Calcium Gluconate 10%			√	√	√
Ceftriaxone					√
Cimetidine				√	√
Chlorpheniramine IV/ Diphenhydramine IV/PO		√#*	√	√	√
Dexamethasone			√#*	√	√
Dextrose 5% Water [D5W] (for medication infusion)		√#*	√	√	√
Dextrose 10% Water [D10W] (IV solution)		√#*	√	√	√
Dextrose 25%			√	√	√
Diazepam			√	√	√
Diclofenac Sodium			√	√	√
Dobutamine					√
Etomidate					√#*
Famotidine				√	√

Fentanyl			√	√	√
Furosemide				√	√
Glucagon		√#*	√	√	√
Glucose Gel/Powder		√	√	√	√
Glyceryl Trinitrate (Nitroglycerin)			√	√	√
Haloperidol /Droperidol				√	√
Helium gas mixture					√#*
Heparin					√
Hydralazine				√#*	√
Hydrocortisone			√#*	√	√
Hydroxocobalamin			√	√	√
Hyoscine-N-butylbromide					√
Ibuprofen		√	√	√	√
Ipratropium Bromide			√	√	√
Ketamine				√	√
Ketorolac			√	√	√
Labetalol				√	√
Lidocaine HCI (Local Anesthetic)					√
Lidocaine HCI (Systemic)				√	√
Lorazepam			√	√	√
Magnesium Sulphate			√	√	√
Mannitol			√	√	√
Medical Oxygen	√#*	√	√	√	√
Methoxyflurane		√	√	√	√
Metoclopramide Monohydrochloride			√	√	√
Metoprolol			√#*	√	√
Midazolam			√	√	√
Morphine Sulphate			√	√	√
Naloxone Hydrochloride		√#*	√	√	√
Nifedipine					√
Norepinephrine				√#*	√
Normal Saline 0.9%		√#*	√	√	√
Nitrous Oxide				√#*	√#*
Ondansetron (Oral for EMT-B)		√	√	√	√
Paracetamol (oral for EMT-B, oral or IV for other levels)		√#*	√	√	√
Procainamide			√	√	√
Prochlorperazine				√	√
Promethazine				√	√
Ranitidine				√	√
Rocuronium					√
Ringers Lactate/Hartmann's		√#*	√	√	√
Sildenafil					√
Sodium Bicarbonate 8.5%			√	√	√
Suxamethonium Chloride					√#*
Tenectaplase				√#*	√
Tranexamic Acid			√	√	√

	(Symbol Reference)
	**Cardiac arrest 1:10000 IV; anaphylaxis 1:1000 IM
	#* Medical Director approved privilege based on demonstrated competence in this skill *Epinphrine may be given by EMTs to patients in cardiac arrest when directed by a paramedic or higher level professional as part of the team approach to cardiac arrest maangement

Medication Reference List

Reference: Trade names, class, pharmacologic action and contraindications (relative and absolute) information from the website http://www.medscape.com, accessed October 23, 2021. Additional references include the 2020 American Heart Association Protocols for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, position statements from the American Academy of Clinical Toxicology and the European Association of Poison Control Centers (http://clintox.org/documents/positionpapers/Cathartics.pdf), and the article: Rodrigo GJ, Pollack CV, Rodrigo C, Rowe BH. Heliox for non-intubated acute asthma patients. Cochrane Database of Systematic Reviews 2006, Issue 4. Art. No.: CD002884.
NOTE: Not all contraindications were included for the purposes of this document. Contraindications which were not pertinent to EMS clinicians were not included for the purposes of streamlining this document.

Acetazolamide
Name — Diamox Sequels®
Class — Carbonic anhydrase inhibitors
Pharmacologic Action—Inhibits hydrogen ion excretion in renal tubule, increasing sodium, potassium, bicarbonate, and water excretion and producing alkaline diuresis
Indications — Acute mountain sickness
Contraindications — Known hypokalemia/hyponatremia, hypersensitivity to acetazolamide or sulfa, liver disease, renal disease, cirrhosis, long term administration in patients with chronic, noncongestive angle-closure glaucoma

Paracetamol (Acetaminophen)
Name — There are multiple over-the-counter medications, as well as scheduled drugs, that include paracetamol (acetaminophen, Tylenol®) as an active ingredient
Class — Analgesics, antipyretic, other
Pharmacologic Action—May work peripherally to block pain impulse generation; may also inhibit prostaglandin synthesis in CNS
Indications—Pain control, fever control
Contraindications—Hypersensitivity, severe acute liver disease

Acetic acid (vinegar)
Name—Vinegar
Class — Other
Pharmacologic Action — Stabilizes nematocyst discharge in non-United States jellyfish thus decreasing pain
Indications — Pain control for jellyfish envenomation (outside of the United States (US))
Contraindications — May increase nematocyst discharge for US jellyfish and therefore should be used outside of the US only

Acetylcysteine
Name—Mucomyst®, Acetadote®
Class — Antidotes, other
Pharmacologic Action—Acts as sulfhydryl group donor to restore liver glutathione; may also scavenge free radicals to prevent delayed hepatotoxicity as antioxidant; encourages sulfation pathway of metabolism for paracetamol (acetaminophen)
Indications — Antidote for paracetamol (acetaminophen) overdose
Contraindications — Acute asthma
WARNING: Nausea and vomiting are common adverse effects following the oral administration of acetylcysteine

Activated Charcoal
Name — Actidose-Aqua®
Class — Antidotes, other
Pharmacologic Action—Adsorbs a variety of drugs and chemicals (e.g., physical binding of a molecule to the surface of charcoal particles); desorbtion of bound particles may occur unless the ratio of charcoal to toxin is extremely high
Indications — Overdose and poisoning
Contraindications — Unprotected airway (beware of aspiration), caustic ingestions, intestinal obstruction

Adenosine
Name — Adenocard®
Class — Antidysrhythmics
Pharmacologic Action—Slows conduction through AV node and interrupts AV reentry pathways, which restore normal sinus symptoms
Indications — Conversion of regular, narrow complex tachycardia – stable supraventricular tachycardia (SVT) or regular, monomorphic wide complex tachycardia
Contraindications — Hypersensitivity, second- or third-degree AV Block (except those on pacemakers), sick sinus syndrome, atrial flutter or fibrillation, ventricular tachycardia

Albuterol
Name — Proventil®, Ventolin®, Proair®, Accuneb®
Class — Beta-2 agonist
Pharmacologic Action — Beta-2 receptor agonist with some beta-1 activity; relaxes bronchial smooth muscle with little effect on heart rate
Indications — Bronchospastic lung disease
Contraindications — Hypersensitivity, tachycardia secondary to heart condition

Amiodarone
Name — Pacerone®, Cordarone®, Nexterone®
Class — Class III antidysrhythmics
Pharmacologic Action — Class III antidysrhythmic agent, which inhibits adrenergic stimulation; affects sodium, potassium, and calcium channels; markedly prolongs action potential and repolarization; decreases AV conduction and sinus node function
Indications — Management of regular wide complex tachycardia in stable patients, irregular wide complex tachycardia in stable patients, and as antidysrhythmic for the management of ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT)
Contraindications — Hypersensitivity, Severe sinus node dysfunction, second degree or third-degree heart block or bradycardia causing syncope (except with functioning artificial pacemaker), cardiogenic shock
WARNING: Avoid during breastfeeding

Amyl Nitrite
Name — component of the Cyanide Antidote Kit®
Class — Cyanide antidote
Pharmacologic Action — Reacts with hemoglobin to form methemoglobin, an oxidized form of hemoglobin incapable of oxygen transport but with high affinity for cyanide. Cyanide preferentially binds to methemoglobin over cytochrome a3, forming the nontoxic cyanomethemoglobin
Indications — Acute cyanide toxicity
Contraindications — None in the case of suspected pure cyanide toxicity noted, documented hypersensitivity, suspected or confirmed smoke inhalation and/or carbon monoxide poisoning
WARNING: There is a risk of worsening hypoxia due to methemoglobin formation

Aspirin
Name — Multiple over-the-counter medications, as well as scheduled drugs, include aspirin as an active ingredient. These include, but are not limited to, Bayer Buffered Aspirin®, Alka-Seltzer with Aspirin®, Ascriptin®, Bayer Women's Low Dose®, Ecotrin®
Class — Antiplatelet agent, non-steroidal anti-inflammatory drug (NSAID)
Pharmacologic Action — Inhibits synthesis of prostaglandin by cyclooxygenase; inhibits platelet aggregation; has antipyretic and analgesic activity
Indications — Antiplatelet agent for the care of patients suspected of suffering from an acute coronary syndrome
Contraindications — Hypersensitivity to aspirin or NSAIDs (aspirin-associated hypersensitivity reactions include aspirin-induced urticarial or aspirin-intolerant asthma), bleeding GI ulcers, hemolytic anemia from pyruvate kinase (PK) and glucose-6-phosphate dehydrogenase (G6PD) deficiency, hemophilia, hemorrhagic diathesis, hemorrhoids, lactating mother, nasal polyps associated with asthma, sarcoidosis, thrombocytopenia, ulcerative colitis

Atropine
Name — Atropen®**,** a component of Mark I® kits and DuoDote®
Class — Anticholinergic, toxicity antidotes
Pharmacologic Action — Competitively inhibits action of acetylcholinesterase on autonomic effectors innervated by postganglionic nerves
Indications — Management of nerve agent toxicity, symptomatic bradycardia (primary or related to toxin ingestion), organophosphate and carbamate insecticide toxicity
NOTE: Ineffective in hypothermic bradycardia
Contraindications — No absolute contraindications for ACLS, documented hypersensitivity in nerve agent/organophosphate scenarios
RELATIVE CONTRAINDICATIONS: Narrow-angle glaucoma, GI obstruction, severe ulcerative colitis, toxic megacolon, bladder outlet obstruction, myasthenia gravis, hemorrhage w/cardiovascular instability, thyrotoxicosis

Calcium Chloride
Name — Calcium Chloride
Class — Antidotes, other; calcium salts
Pharmacologic Action — Bone mineral component; cofactor in enzymatic reactions, essential for neurotransmission, muscle contraction, and many signal transduction pathways
Indications — For use in topical burns (hydrofluoric acid) or for use in calcium channel blocker overdose
Contraindications — Hypercalcemia, documented hypersensitivity, life-threatening cardiac arrhythmias may occur in known or suspected severe hypokalemia
WARNING: There is a risk for digitalis toxicity. Be cautious of peripheral IV use as significant tissue necrosis at injection site may occur

Calcium Gluconate
Name — Gluconate®
Class — Antidotes, other; calcium salts
Pharmacologic Action — Bone mineral component; cofactor in enzymatic reactions, essential for neurotransmission, muscle contraction, and many signal transduction pathways
Indications — For use in topical burns (hydrofluoric acid) or for use in calcium channel blocker overdose
Contraindications — Hypercalcemia, documented hypersensitivity, sarcoidosis, life-threatening cardiac arrhythmias may occur in known or suspected severe hypokalemia
WARNING: There is a risk for digitalis toxicity

Cimetidine
Name — Tagamet®
Class — Histamine H2 antagonist
Pharmacologic Action — blocks H2-receptors of gastric parietal cells, leading to inhibition of gastric secretions
Indications — For the management of gastric or duodenal ulcers, gastroesophageal reflux, as an adjunct in the treatment of urticarial and/or pruritis in patients suffering from allergic reaction
Contraindications — Hypersensitivity to cimetidine or other H2-receptor antagonists

Dexamethasone
Name — Decadron®, Dexasone®
Class — Corticosteroid, anti-inflammatory drugs
Pharmacologic Action — Potent glucocorticoid with minimal to no mineralocorticoid activity Decreases inflammation by suppressing migration of polymorphonuclear leukocytes (PMNs) and reducing capillary permeability; stabilizes cell and lysosomal membranes, increases surfactant synthesis, increases serum vitamin A concentration, and inhibits prostaglandin and proinflammatory cytokines; suppresses lymphocyte proliferation through direct cytolysis, inhibits mitosis, breaks down granulocyte aggregates, and improves pulmonary microcirculation
Indications — Used in the management of croup and bronchospasm, as well as the management of patients suffering from high altitude cerebral edema (HACE)
Contraindications — Documented hypersensitivity, systemic fungal infection, cerebral malaria

Dextrose
Name — D50W, DGlucose®, glucose
Class — Glucose-elevating agents; metabolic and endocrine, other
Pharmacologic Action — Parenteral dextrose is oxidized to carbon dioxide and water, and provides 3.4 kilocalories/gram of d-glucose
Indications — Used for the management of hypoglycemia
Contraindications — Hyperglycemia, anuria, diabetic coma, intracranial or intraspinal hemorrhage, dehydrated patients with delirium, glucose-galactose malabsorption syndrome, and documented hypersensitivity

Diazepam
Name — Valium®, Diastat®, AcuDial®
Class — Benzodiazepine, anticonvulsants, skeletal muscle relaxants, anxiolytic
Pharmacologic Action — Modulates postsynaptic effects of GABA-A transmission, resulting in an increase in presynaptic inhibition. Appears to act on part of the limbic system, as well as on the thalamus and hypothalamus, to induce a calming effect
Indications — For use in agitated or violent patients, as well as for the management of seizures
Contraindications — Documented hypersensitivity, severe respiratory depression

Diltiazem
Name — Includes Cardizem®, Dilacor®, Diltiaz®
Class — Calcium channel blocker, antidysrhythmic type IV
Pharmacologic Action — Inhibits extracellular calcium ion influx across membranes of myocardial cells and vascular smooth muscle cells, resulting in inhibition of cardiac and vascular smooth muscle contraction and thereby dilating main coronary and systemic arteries; no effect on serum calcium concentrations; substantial inhibitory effects on cardiac conduction system, acting principally at AV node, with some effects at sinus node
Indications — For management of narrow complex tachycardias
Contraindications — Documented hypersensitivity, Wolff-Parkinson-White syndrome, Lown-Ganong-Levine syndrome, symptomatic severe hypotension (systolic BP less than 90 mmHg), sick sinus syndrome (if no pacemaker), second- and third-degree heart block (if no pacemaker present), and complete heart block. Contraindications for IV administration: Use in newborns (because of benzyl alcohol), concomitant beta-blocker therapy, cardiogenic shock, ventricular tachycardia (must determine whether origin is supraventricular or ventricular)

Diphenhydramine
Name — Benadryl®
Class — Antihistamine — first generation
Pharmacologic Action — Histamine H1-receptor antagonist of effector cells in respiratory tract, blood vessels, and GI smooth muscle
Indications — For urticarial and/or pruritis in the management of patients suffering from allergic reaction as well as for the management of patents suffering from dystonia/akathisia **Contraindications —** Documented hypersensitivity, use controversial in lower respiratory tract disease (such as acute asthma), premature infants and neonates

Dopamine
Name — Intropin®
Class — Inotropic agent; catecholamine; pressor
Pharmacologic Action — Endogenous catecholamine, acting on both dopaminergic and adrenergic neurons. Low dose stimulates mainly dopaminergic receptors, producing renal and mesenteric vasodilation; higher dose stimulates both beta-1-adrenergic and dopaminergic receptors, producing cardiac stimulation and renal vasodilation; large dose stimulates alpha-adrenergic receptors
Indications — As a pressor agent used in the management of shock
Contraindications — Hypersensitivity to dopamine, pheochromocytoma, ventricular fibrillation, uncorrected tachyarrhythmias
WARNING: Dopamine is a vesicant and can cause severe tissue damage if extravasation occurs

Dobutatmine
Name - Dobutrex®
Class – Ionatropic agents
Pharmacologic Action - Strong beta1 and weak beta2/alpha effects, resulting in increased cardiac output, blood pressure, and heart rate, as well as decreased peripheral vascular resistance
Indications – For use in patients in cardiogenic shock
Contraindications – Hypersensitivity, acute myocardial infarction, severe hypertension, severe tachycardia, acute myocarditis, severe hypokalemia, hypertrophic subaortic stenosis, pheochromocytoma, uncorrected tachyarrhythmias

Droperidol
Name — Inapsine®
Class — Antiemetic agents; antipsychotic
Pharmacologic Action — Antiemesis: dopamine receptor blockade in brain, predominantly dopamine-2 receptor. When reuptake is prevented, a strong antidopaminergic, antiserotonergic response occurs. Droperidol reduces motor activity, anxiety, and causes sedation; also possesses adrenergic blocking, antifibrillatory, antihistaminic, and anticonvulsive properties

Indications — For use in the patient with acute delirium or psychosis
Contraindications — Hypersensitivity, known or suspected prolonged QT interval; QTc interval greater than 450 msec in females or greater than 440 msec in males
WARNING: Use with caution in patients with bradycardia, cardiac disease, concurrent MAO inhibitor therapy, Class I and Class III dysrhythmics or other drugs that prolong the QT interval and cause electrolyte disturbances due to its adverse cardiovascular effects, e.g., QT prolongation, hypotension, tachycardia, and torsades de pointes

Epinephrine
Name — EpiPen®, TwinJect®, Adrenaclick®, Auvi-Q, Adrenalin®, AsthmaNefrin®, Vaponefrin®
Class — Alpha/beta adrenergic agonist
Pharmacologic Action — Strong alpha-adrenergic effects, which cause an increase in cardiac output and heart rate, a decrease in renal perfusion and peripheral vascular resistance, and a variable effect on BP, resulting in systemic vasoconstriction and increased vascular permeability. Strong beta-1- and moderate beta-2-adrenergic effects, resulting in bronchial smooth muscle relaxation
Secondary relaxation effect on smooth muscle of stomach, intestine, uterus, and urinary bladder
Indications — For use in the management of patients suffering anaphylaxis, shock, cardiac arrest, bradycardia, or in the nebulized form for croup/bronchiolitis and IM form for refractory acute asthma
Contraindications — Hypersensitivity, cardiac dilatation and coronary insufficiency

Famotidine
Name — Pepcid®
Class — Histamine H2 antagonist
Pharmacologic Action — Blocks H2 receptors of gastric parietal cells, leading to inhibition of gastric secretions
Indications — For the management of gastric or duodenal ulcers, gastroesophageal reflux, as an adjunct in the treatment of urticarial and/or pruritus in patients suffering from allergic reaction
Contraindications — Hypersensitivity to famotidine or other H2-receptor antagonists

Fentanyl
Name —Currently only available in the generic form (formerly Sublimaze®)
Class — Synthetic opioid, opioid analgesics
Pharmacologic Action — Narcotic agonist-analgesic of opiate receptors; inhibits ascending pain pathways, thus altering response to pain; increases pain threshold; produces analgesia, respiratory depression, and sedation
Indications — Management of acute pain
Contraindications — Hypersensitivity
WARNING: Should be used with caution in the elderly and in patients with hypotension, suspected gastrointestinal obstruction, head injury, and concomitant CNS depressants

Glucagon
Name — GlucaGen®, Glucagon Emergency Kit®, GlucaGen HypoKit®
Class — Hypoglycemia antidotes, glucose-elevating agents, other antidotes (e.g., beta-blocker or calcium channel blocker overdose)
Pharmacologic Action — Insulin antagonist. Stimulates cAMP synthesis to accelerate hepatic glycogenolysis and gluconeogenesis. Glucagon also relaxes smooth muscles of GI tract
Indications — For the management of hypoglycemic patients as well as patients suffering symptomatic bradycardia after beta blocker or calcium channel blocker overdose
Contraindications — Hypersensitivity, pheochromocytoma, insulinoma
WARNING: Nausea and vomiting are common adverse effects following the administration of glucagon

Haloperidol
Name — Haldol®, Haldol Decanoate®, Haloperidol LA®, Peridol®
Class — First generation antipsychotic
Pharmacologic Action — Antagonizes dopamine-1 and dopamine-2 receptors in brain; depresses reticular activating system and inhibits release of hypothalamic and hypophyseal hormones
Indications — For the management of acute psychosis or agitated/violent behavior refractory to non-pharmacologic interventions
Contraindications — Documented hypersensitivity, Severe CNS depression (including coma), neuroleptic malignant syndrome, poorly controlled seizure disorder, Parkinson's disease
WARNING: Risk of sudden death, torsades de pointes, and prolonged QT interval from off-label IV administration of higher than recommended dose. Continuous cardiac monitoring is required if administering IV

Helium Gas Mixture
Name — Heliox®
Class — Optional method of oxygen delivery
Pharmacology — Less resistant than atmospheric air which may reduce the patient's work of breathing by increasing tendency to laminar flow and reducing resistance to turbulent flow
Indications — Persistent or severe bronchospasm in non-intubated patients with obstructive airway disease or pediatric patients with croup that is unresponsive to all other evidence-based medical interventions.
Contraindications — None

Hydralazine
Name — No listed brand name
Class — Vasodilator
Pharmacology — Direct vasodilator at the level of arterioles, with little effect on veins. Decreases systemic resistance.
Indications — Severe hypertension with pre-eclampsia symptoms
Contraindications — Hypersensitivity, coronary artery disease, mitral valve rheumatic heart disease. Use with caution in CVA, known renal disease, hypotension

Hydrocortisone succinate
Name — Cortef®, SoluCortef®
Class — Corticosteroid
Pharmacologic Action — Glucocorticoid; elicits mild mineralocorticoid activity and moderate anti-inflammatory effects; controls or prevents inflammation by controlling rate of protein synthesis, suppressing migration of polymorphonuclear leukocytes (PMNs) and fibroblasts, and reversing capillary permeability
Indications — For the management of adrenal insufficiency
Contraindications — Untreated serious infections (except tuberculous meningitis or septic shock), idiopathic thrombocytopenic purpura, intrathecal administration (injection), documented hypersensitivity

Hydromorphone
Name — Dilaudid®
Class — Synthetic opiate, opioid analgesic
Pharmacology — Narcotic agonist-analgesic of opiate receptors; inhibits ascending pain pathways, thus altering response to pain; increases pain threshold; produces analgesia, respiratory depression, and sedation
Indications — Management of acute pain
Contraindications — Hypersensitivity
WARNING: Should be used with caution in the elderly and in patients with hypotension, suspected gastrointestinal obstruction, head injury, and concomitant CNS depressants

Hydroxocobalamin

Name — Cyanokit®
Class — Cyanide antidote
Pharmacologic Action — Vitamin B12 with hydroxyl group complexed to cobalt which can be displaced by cyanide resulting in cyanocobalamin that is renally excreted
Indications — For the management of cyanide toxicity
Contraindications — Documented hypersensitivity
WARNING: Will cause discoloration of the skin and urine, can interfere with pulse oximetry. Due to its interference with certain diagnostic blood tests, the performance of prehospital phlebotomy is preferable prior to the administration of hydroxocobalamin

Ibuprofen
Name — There are multiple over-the-counter medications that include ibuprofen, such as Advil®, Motrin®
Class — Non-steroidal anti-inflammatory drug (NSAID)
Pharmacologic Action — Inhibits synthesis of prostaglandins in body tissues by inhibiting at least 2 cyclo-oxygenase (COX) isoenzymes, COX-1 and COX-2. May inhibit chemotaxis, alter lymphocyte activity, decrease proinflammatory cytokine activity, and inhibit neutrophil aggregation; these effects may contribute to anti-inflammatory activity
Indications — For the acute management of pain or as an antipyretic
Contraindications — Aspirin allergy; perioperative pain in setting of coronary artery bypass graft (CABG) surgery; preterm infants with untreated proven or suspected infection; bleeding with active intracranial hemorrhage or GI bleed; thrombocytopenia, coagulation defects, proven or necrotizing enterocolitis, significant renal impairment, congenital heart disease where patency or the patent ductus arteriosus (PDA) is necessary for pulmonary or systemic blood flow

Ipratropium
Name — Atrovent®
Class — Anticholinergics, respiratory
Pharmacologic Action — Anticholinergic (parasympatholytic) agent; inhibits vagally mediated reflexes by antagonizing acetylcholine action; prevents increase in intracellular calcium concentration that is caused by interaction of acetylcholine with muscarinic receptors on bronchial smooth muscle
Indications — For the management of asthma and chronic obstructive pulmonary disease (COPD)
Contraindications — Documented hypersensitivity to ipratropium, atropine, or derivatives.

Isopropyl Alcohol
Name — No brand name available
Class — Secondary alcohol
Pharmacology — In addition to traditional role as antiseptic, may be used as antiemetic
Indications — Nausea and vomiting
Contraindications — None

Ketamine
Name — Ketalar®
Class — General anesthetics, systemic
Pharmacologic Action — Produces dissociative anesthesia. Blocks N-methyl D-aspartate (NMDA) receptor
Indications — For the management of agitated or violent behavior
Contraindications — Hypersensitivity
RELATIVE/CONTROVERSIAL CONTRAINDICATIONS: Head trauma, intracranial mass/hemorrhage, hypertension, angina, and stroke, underlying psychiatric disorder
WARNING: Overdose may lead to panic attacks and aggressive behavior; rarely seizures, increased ICP, and cardiac arrest. Very similar in chemical makeup to PCP (phencyclidine), but it is shorter acting and less toxic

Ketoralac
Name — Toradol®
Class — Non-steroidal anti-inflammatory drug (NSAID)
Pharmacologic Action — Inhibits synthesis of prostaglandins in body tissues by inhibiting at least 2 cyclo-oxygenase (COX) isoenzymes, COX-1 and COX-2. May inhibit chemotaxis, alter lymphocyte activity, decrease proinflammatory cytokine activity, and inhibit neutrophil aggregation; these effects may contribute to anti-inflammatory activity
Indications — For the acute management of moderately severe pain
Contraindications — Allergy to aspirin, ketorolac, or other NSAIDS; women who are in active labor or are breastfeeding, significant renal impairment particularly when associated with volume depletion, previous or current GI bleeding, intracranial bleeding, coagulation defects, patients with a high-risk of bleeding

Labetalol
Name — Trandate®
Class — Beta-blockers, alpha activity
Pharmacology — Nonselective beta blocker with intrinsic sympathomimetic activity; also, alpha blocker **Indications —** severe hypertension with pre-eclampsia symptoms
Contraindications — Asthma or obstructive airway disease, severe bradycardia, second-degree or third-degree heart block (without pacemaker), cardiogenic shock, bronchial asthma, uncompensated cardiac failure, hypersensitivity, sinus bradycardia, sick sinus syndrome without permanent pacemaker; conditions associated with prolonged and severe hypotension. Use with caution in patients taking calcium channel blockers. Hypotension with or without syncope may occur, monitor. Consider pre-existing conditions, such as, sick sinus syndrome before initiating therapy. Use caution in patients with history of severe anaphylaxis to allergens; patients taking beta-blockers may become more sensitive to repeated challenges; treatment with epinephrine in patients taking beta-blockers may be ineffective or promote undesirable effects. Use with caution in patients with myasthenia gravis, psoriasis, or psychiatric illness (may cause or exacerbate CNS depression)

Lidocaine
Name — Lidocaine CV®, Lidopen®, Xylocaine®
Class — Class Ib antidysrhythmics
Pharmacologic Action — Class 1b antidysrhythmic; combines with fast sodium channels and thereby inhibits recovery after repolarization, resulting in decreasing myocardial excitability and conduction velocity
Indications — For the management of refractory or recurrent ventricular fibrillation or pulseless VT
Contraindications — Hypersensitivity to lidocaine or amide-type local anesthetic, Adams-Stokes syndrome, SA/AV/intraventricular heart block in the absence of artificial pacemaker. nitro (CHF), cardiogenic shock, second- and third-degree heart block (if no pacemaker is present), Wolff-Parkinson-White Syndrome

Lorazepam
Name — Ativan®
Class — Anticonvulsants, other; antianxiety agent; anxiolytics; benzodiazepines
Pharmacologic Action — Sedative hypnotic with short onset of effects and relatively long half-life; by increasing the action of gamma-aminobutyric acid (GABA), which is a major inhibitory neurotransmitter in the brain, lorazepam may depress all levels of the CNS, including limbic and reticular formation **Indications —** For the management of seizures, uncontrolled shivering in hypothermia, and for the management of agitated or violent patients suffering behavioral emergencies
Contraindications — Documented hypersensitivity, acute narrow angle glaucoma, severe respiratory depression, sleep apnea

Magnesium sulfate
Name — $MgSO_4$
Class — Class V antidysrhythmic, electrolyte
Pharmacologic Action — Depresses CNS, blocks peripheral neuromuscular transmission, produces anticonvulsant effects; decreases amount of acetylcholine released at end-plate by motor nerve impulse. Slows rate of sinoatrial (SA) node impulse formation in myocardium and prolongs conduction time. Promotes movement of calcium, potassium, and sodium in and out of cells and stabilizes excitable membranes
Indications — For the management of torsades de pointes or for severe bronchoconstriction with impending respiratory failure, seizure during the third trimester of pregnancy or in the postpartum patient
Contraindications — Hypersensitivity, myocardial damage, diabetic coma, heart block, hypermagnesemia, hypercalcemia

Methylprednisolone
Name — Medrol®, Medrol Dosepak®, DepoMedrol®, SoluMedrol®
Class — Corticosteroid, anti-inflammatory agent
Pharmacologic Action — Potent glucocorticoid with minimal to no mineralocorticoid activity. Modulates carbohydrate, protein, and lipid metabolism and maintenance of fluid and electrolyte homeostasis. Controls or prevents inflammation by controlling rate of protein synthesis, suppressing migration of polymorphonuclear leukocytes (PMNs) and fibroblasts, reversing capillary permeability, and stabilizing lysosomes at cellular level
Indications — For the management of acute bronchospastic disease as well as for adrenal insufficiency **Contraindications —** Untreated serious infections, documented hypersensitivity, IM route is contraindicated in idiopathic thrombocytopenic purpura, traumatic brain injury (high doses)

Metoclopramide
Name — Reglan®, Metozolv ODT®
Class — Antiemetic agent, prokinetic agent
Pharmacologic Action — Blocks dopamine receptors (at high dose) and serotonin receptors in chemoreceptor trigger zone of CNS; and sensitizes tissues to acetylcholine; increases upper GI motility but not secretions; increases lower esophageal sphincter tone
Indications — For the management of nausea and vomiting
Contraindications — Hypersensitivity to metoclopramide or procainamide, GI hemorrhage, mechanical obstruction, perforation, history of seizures, pheochromocytoma. Other drugs causing extrapyramidal symptoms (e.g., phenothiazines, butyrophenones)

Metoprolol
Name — Lopressor®, Toprol XL®
Class — Beta blocker, beta-1 selective
Pharmacologic Action — Blocks response to beta-adrenergic stimulation; cardio selective for beta-1 receptors at low doses, with little or no effect on beta-2 receptors
Indications — For management of narrow complex tachycardias
Contraindications — Hypersensitivity. *When administered for hypertension or angina*: Sinus bradycardia, 2nd or 3rd degree AV block, cardiogenic shock, sick sinus syndrome (unless permanent pacemaker in place), severe peripheral vascular disease, pheochromocytoma. *When administered for myocardial* i*nfarction*: Severe sinus bradycardia with heart rate less than 45 beats/minute, systolic BP less than 100 mmHg, significant first-degree heart block (PR interval at least 0.24 seconds), moderate-to-severe cardiac failure
WARNING: May cause 1st, 2nd, or 3rd degree AV block

Midazolam
Name — Versed®
Class — Anticonvulsants, other; antianxiety agent; anxiolytics; benzodiazepines
Pharmacologic Action — Binds receptors at several sites within the CNS, including the limbic system and reticular formation; effects may be mediated through gabba-aminobutyric acid (GABA) receptor system; increase in neuronal membrane permeability to chloride ions enhances the inhibitory effects of GABA; the shift in chloride ions causes hyperpolarization (less excitability) and stabilization of the neuronal membrane
Indications — For the management of seizures, uncontrolled shivering in hypothermia, and for the management of agitated or violent patients suffering behavioral emergencies
Contraindications — Documented hypersensitivity, severe respiratory depression, sleep apnea
WARNING: May cause respiratory depression, arrest, or apnea

Morphine Sulfate
Name — MS Contin®, Avinza®, Depodur®, Duramorph®, Infumorph®, Astramorph®, Kadian®, MSO4
Class — Opioid analgesic
Pharmacologic Action — Narcotic agonist-analgesic of opiate receptors; inhibits ascending pain pathways, thus altering response to pain; produces analgesia, respiratory depression, and sedation; suppresses cough by acting centrally in medulla
Indications — Management of acute pain
Contraindications — Hypersensitivity, paralytic ileus, toxin-mediated diarrhea, respiratory depression, acute or severe bronchial asthma, upper airway obstruction, GI obstruction (extended release), hypercarbia (immediate release tablets/solution), upper airway obstruction (epidural/intrathecal), heart failure due to chronic lung disease, head injuries, brain tumors, deliriums tremens, seizure disorders, during labor when premature birth anticipated (injectable formulation), cardiac arrhythmia, increased intracranial or cerebrospinal pressure, acute alcoholism, use after biliary tract surgery, surgical anastomosis (suppository formulation)

Naloxone
Name — Narcan®
Class — Opioid reversal agent
Pharmacologic Action — Competitive opioid antagonist; synthetic congener of oxymorphone
Indications — Reversal of acute opioid toxicity
Contraindications — Hypersensitivity
WARNING: Administration of naloxone can result in the sudden onset of opiate withdrawal (agitation, tachycardia, pulmonary edema, nausea, vomiting, and, in neonates, seizures)

Nifedipine
Name — Procardia®, Adalat CC®, Nifedical®
Class — Calcium channel blocker
Pharmacologic Action — Calcium-channel blocker; inhibits transmembrane influx of extracellular calcium ions across myocardial and vascular smooth muscle cell membranes without changing serum calcium concentrations; this results in inhibition of cardiac and vascular smooth muscle contraction, thereby dilating main coronary and systemic arteries. Vasodilation with decreased peripheral resistance and increased heart rate
Indications — For the management of high-altitude pulmonary edema (HAPE)
Contraindications — Hypersensitivity to nifedipine or other calcium-channel blockers, cardiogenic shock, concomitant administration with strong CYP3A4 inducers (e.g., rifampin, rifabutin, phenobarbital, phenytoin, carbamazepine, St. John's wort) significantly reduces nifedipine efficacy, Immediate release preparation (sublingually or orally) for urgent or emergent hypertension

Nitrous Oxide
Name — N_2O
Class — Weak inhalational anesthetic
Pharmacologic Action — Its analgesic mechanism of action is described as opioid in nature and may involve a number of spinal neuromodulators. The anxiolytic effect is similar to that of benzodiazepine and may involve gamma aminobutyric (GABA) receptors. The anesthesia mechanism may involve GABA and possibly N-methyl-D-aspartate receptors as well.[6] In general, the effect of nitrous oxide ceases as soon as the inhalation stops, with no residual effect
Indications — Analgesia in the patient who is capable of self-administration of this medication
Contraindications — Significant respiratory compromise, suspected abnormal air-filled cavities (e.g., pneumothorax, bowel obstruction, air embolism)
RELATIVE CONTRAINDICATIONS: History of stroke, hypotension, pregnancy, known cardiac conditions, known vitamin B12 deficiency

Nitroglycerin
Name — Nitrostat®, Nitrolingual Pumpspray®, NitroQuick®
Class — Nitrates, anti-anginal
Pharmacologic Action — Organic nitrate which causes systemic venodilation, decreasing preload. Cellular mechanism: nitrate enters vascular smooth muscle and converted to nitric oxide (NO) leading to activation of cyclic guanosine monophosphate (cGMP) and vasodilation. Relaxes smooth muscle via dose-dependent dilation of arterial and venous beds to reduce both preload and afterload, and myocardial O_2 demand. Also improves coronary collateral circulation. Lower BP, increases heart rate, occasional paradoxical bradycardia
Indications — As an anti-anginal medication for the management of chest pain as well as a reducer of preload for patients suffering from acute pulmonary edema
Contraindications — Hypersensitivity, acute myocardial infarction, severe anemia, recent use of erectile dysfunction medications (sildenafil (Viagra® — within last 24 hours), tadalafil (Cialis® — within last 48 hours), vardenafil (Levitra® — within last 48 hours), or other phopsphodiesterase-5 inhibitors). There is potential for dangerous hypotension, narrow angle glaucoma (controversial: may not be clinically significant). Nitrates are contraindicated in the presence of hypotension (SBP less than 90 mmHg or ≥30 mmHg below baseline), extreme bradycardia (less than 50 BPM), tachycardia in the absence of heart failure (greater than 100 BPM), and right ventricular infarction

Norepinephrine
Name — Levophed®, Levarterenol®
Class — Alpha/beta adrenergic agonist
Pharmacologic Action — Strong beta-1 and alpha-adrenergic effects and moderate beta-2 effects, which increase cardiac output and heart rate, decrease renal perfusion and peripheral vascular resistance, and cause variable BP effects
Indications — As a pressor agent used in the management of shock
Contraindications — Hypersensitivity, hypotension due to blood volume deficit, peripheral vascular thrombosis (except for lifesaving procedures)
RELATIVE CONTRAINDICATIONS: concomitant use with some general anesthetics: chloroform, trichloroethylene, cyclopropane, halothane

WARNING: Norepinephrine is a vesicant and can cause severe tissue damage if extravasation occurs. Do not use in the same IV line as alkaline solutions as these may deactivate it

Olanzapine
Name — Zyprexa®
Class — Antipsychotic, second generation, antimanic agents
Pharmacologic Action — May act through combination of dopamine and serotonin type 2 receptor site antagonism
Indications — For the management of agitated or violent patients suffering a behavioral emergency
Contraindications — Documented hypersensitivity
WARNING: Patients are at risk for severe sedation (including coma) or delirium after each injection and must be observed for at least 3 hours in registered facility with ready access to emergency response services. Patients are at significant risk of severe sedation when olanzapine is administered with benzodiazepines or to patients who have are taking benzodiazepines

Ondansetron
Name — Zofran®, Zofran ODT®, Zuplenz®
Class — Antiemetic, selective 5-HT3 antagonist
Pharmacologic Action — Mechanism not fully characterized; selective 5-HT3 receptor antagonist; binds to 5-HT3 receptors both in periphery and in CNS, with primary effects in GI tract. Has no effect on dopamine receptors and therefore does not cause extrapyramidal symptoms
Indications — For the management of nausea or vomiting
NOTE: EKG monitoring is recommended in patients who have electrolyte abnormalities, CHF, or bradyarrhythmias or who are also receiving other medications that cause QT prolongation
Contraindications — Hypersensitivity, coadministration with apomorphine; combination reported to cause profound hypotension and loss of consciousness
WARNING: May cause dose-dependent QT prolongation, avoid in patients with congenital long QT syndrome

Oxymetazoline
Name — Afrin®, Duramist Plus®, Dristan 12 Hr®, Sinarest 12 Hour®, Vicks Sinus 12 Hour®
Class — Decongestants, intranasal
Pharmacologic Action — Alpha-adrenergic agonist; stimulates alpha-adrenergic receptors and produces vasoconstriction in the arterioles of the nasal mucosa
Indications — For the management of epistaxis in the patient suffering facial trauma
Contraindications — Hypersensitivity

Potassium iodide
Name — Pima Syrup®, SSKI®, ThyroSafe®, ThyroShield®
Class — Antidotes, other; antithyroid agents
Pharmacologic Action — As a thyroid protective agent: Systemically circulating potassium iodide is readily taken up by thyroid gland by sodium/iodide transporter in basal membrane; blocking the thyroid uptake of radioactive isotopes of iodine; concentration gradient of thyroid gland to plasma is 20—50:1 **Indications —** Indicated during environmental radiation emergency to block uptake of radioactive iodine isotopes in thyroid and reduce risk of thyroid cancer
Contraindications — Iodine sensitivity (although allergy to radiocontrast media, contact dermatitis from iodine-containing antibacterials, allergy to seafood should not be considered evidence of potassium iodide allergy), hyperthyroidism, respiratory failure

Prednisone
Name – Deltasone®**,** Rayos®, Sterapred®
Class – Corticosteroid
Pharmacologic Action - Glucocorticosteroid which also elicits mild mineralocorticoid activity and dose dependent moderate-to-significant anti-inflammatory effects
Indications – Multiple uses per protocols
Contraindications – Avoid in untreated severe infections, documented hypersensitivity, or active varicella and fungal infections

Prednisolone
Name – Pediapred®**,** FloPred®, Orapred®**,** Millipred®**,** Prelone Syrup®**,** Veripred®
Class – Corticosteroid
Pharmacologic Action - Glucocorticosteroid which also elicits mild mineralocorticoid activity and dose dependent moderate-to-significant anti-inflammatory effects
Indications – Multiple uses per protocols
Contraindications – Avoid in untreated severe infections, documented hypersensitivity, or active varicella and fungal infections

Pralidoxime chloride (2-PAM)
Name — Protopam®, 2PAM Antidote®, Pralidoxime Auto Injector®, a component of Mark I® kits and DuoDote®
Class — Cholinergic, toxicity antidote
Pharmacologic Action — Binds to organophosphates and breaks alkyl phosphate-cholinesterase bond to restore activity of acetylcholinesterase
Indications — For the management of toxicity caused by organophosphate insecticides and related nerve gases (e.g., tabun, sarin, soman)
Contraindications — Documented hypersensitivity

Procainamide
Name — Pronestyl®, Procanbid®
Class — Class Ia antidysrhythmic
Pharmacologic Action — Class Ia (membrane stabilizing) antidysrhythmic agent; inhibits recovery after repolarization resulting in decreasing myocardial excitability and conduction velocity. Direct membrane depressant that decreases conduction velocity, prolongs refractoriness, decreases automaticity and reduces repolarization abnormalities
Indications — For the management of stable patients with regular, wide complex tachycardia
Contraindications — Hypersensitivity to procainamide or other ingredients, complete heart block, second- or third-degree AV block, systemic lupus erythematosus (SLE), torsades de pointes
RELATIVE CONTRAINDICATION: Patients with QT prolongation

Prochlorperazine
Name — Compazine®
Class — Antiemetic agent; antipsychotics, phenothiazine
Pharmacologic Action — Antiemetic: antidopaminergic effect, blocking dopamine receptors in the brain, blocking vagus nerve in GI tract. Antipsychotic: Blocking mesolimbic dopamine receptors, and blocking alpha-adrenergic receptors (D1 and D2) in brain
Indications — For the management of nausea and vomiting
Contraindications — Documented hypersensitivity to phenothiazines, coma, severe CNS depression, concurrent use of large amounts of CNS depressants, poorly controlled seizure disorder, subcortical brain damage, pediatric surgery, children less than 2 years or weighing less than 9 kg

Sildenafil
Name — Revatio®, Viagra®
Class — Pulmonary artery hypertension therapy, PDE-5 inhibitors; phosphodiesterase-5 enzyme inhibitor
Pharmacologic Action — Inhibits PDE-5, increasing cyclic guanosine monophosphate (cGMP) to allow smooth-muscle relaxation
Indications — As an adjunct to descent in the management of high-altitude pulmonary edema (HAPE) **Contraindications —** Concomitant use of organic nitrates in any form (e.g., nitroglycerin, isosorbide, illicit "poppers") either regularly or intermittently, increases risk of severe or potentially fatal hypotension, hypersensitivity
WARNING: Hypotension may occur due to vasodilation

Sodium Bicarbonate
Name — Bicarb
Class — Antidote, other
Pharmacologic Action — Increases blood and urinary pH by releasing a bicarbonate ion, which in turn neutralizes hydrogen ion concentrations
Indications — For the management of cardiac arrest in cases in which either hyperkalemia or tricyclic antidepressant (TCA) overdose are suspected as contributory, QRS prolongation in known or suspected TCA overdose
Contraindications — Documented hypersensitivity, severe pulmonary edema, known alkalosis, hypernatremia, or hypocalcemia

Sodium Nitrite
Name — Nithiodote®
Class — Cyanide antidote
Pharmacologic Action — Nitrites create methemoglobins to bind to cyanide
Indications — For the management of cyanide toxicity
Contraindications — Documented hypersensitivity, suspected or confirmed smoke inhalation and/or carbon monoxide poisoning
WARNING: There is a risk of worsening hypoxia due to methemoglobin formation. In addition, sodium nitrite can cause serious adverse reactions and death from hypotension and methemoglobin formation. Monitor to ensure adequate perfusion and oxygenation during treatment with sodium nitrite

Sodium Thiosulfate
Name— Nithiodote®
Class — Cyanide antidote
Pharmacologic Action — Thiosulfate is sulfur donor utilized by rhodanese to convert cyanide to less toxic thiocyanate
Indications — For the management of cyanide toxicity
Contraindications — Documented hypersensitivity

Sorbitol
Name — Sorbitol
Class — Laxatives, osmotic
Pharmacologic Action — Polyalcoholic sugar with hyperosmotic effects
Indications — Administered for the management of patients suffering from toxic ingestions
Contraindications — Acute abdominal pain, nausea, vomiting, or other symptoms of appendicitis or undiagnosed abdominal pain, documented hypersensitivity
WARNING: Sorbitol is no longer recommended to be given with activated charcoal

Tadalafil
Name — Cialis®, Adcirca®
Class — Pulmonary artery hypertension therapy, PDE—5 inhibitors; phosphodiesterase-5 enzyme inhibitor
Pharmacologic Action — Pulmonary arterial hypertension (PAH): inhibits PDE-5, increasing cyclic guanosine monophosphate (cGMP) to allow relaxation of pulmonary vascular smooth-muscle cells and vasodilation of pulmonary vasculature
Indications — As an adjunct to descent in the management of high-altitude pulmonary edema (HAPE) **Contraindications —** Concomitant use of any form of organic nitrates (e.g., nitroglycerin, isosorbide dinitrate, isosorbide mononitrate, illicit "poppers"), either regularly or intermittently; may potentiate hypotensive effect of nitrates. Hypersensitivity, including Stevens-Johnson syndrome and exfoliative dermatitis
WARNING: Hypotension may occur due to vasodilation

Ziprasidone
Name — Geodon®
Class — Second generation antipsychotic
Pharmacologic Action — Acts as antagonist at dopamine-2 and serotonin type 1 and 2 (5HT1D, 5HT2A) receptors; acts as agonist at serotonin 5HT1A receptor; moderately inhibits reuptake of norepinephrine and serotonin; has alpha-blocking and antihistaminic activity
Indications — For the management of agitated or violent patients suffering a behavioral emergency
Contraindications — Documented hypersensitivity, any drugs or conditions that prolong QT interval, recent acute myocardial infarction, uncompensated heart failure

ANNEX 11: Footnotes

I. Universal Documentation Protocol

Patient Care Goals

1. Support continuity of patient care and continuous performance improvement (CPI) of patient care through meeting minimum documentation standards for all EMS events where a patient was encountered
2. This Protocol defines minimum standards and inclusions used and referenced throughout this document under the "Quality Improvement" section of each Protocol
3. This Protocol can be used as a starting point for systems looking to more formally define documentation requirements

Patient Presentation

Inclusion Criteria

All EMS events where a patient was encountered, and one or more clinical Protocol was used to determine patient treatment and/or disposition.

Exclusion Criteria

None noted

Toolkit for Key Categories of Data Elements

Incident Demographics

1. Incident Demographics include the type of incident, location, time, dispatch information, response resources and patient/incident disposition of the EMS event
   a. This information will always apply and be available, even if the responding unit never arrives on scene (is cancelled) or never makes patient contact
   b. Incident demographics are important for filtering incident types and outcomes when doing CPI reviews, providing aggregate descriptive data, and billing for reimbursement
2. Minimum Incident Demographic Fields include:
   a. Incident Times
      i. eTimes.03—Unit Notified by Dispatch Date/Time *(mandatory)*
      ii. eTimes.05—Unit En Route Date/Time *(Unit responding)*
      iii. eTimes.06—Unit Arrived on Scene Date/Time *(If arrived)*
      iv. eTimes.07—Arrived at Patient Date/Time *(If patient contact made)*
      v. eTimes.09—Unit Left Scene Date/Time *(Unit Transporting Time, if applicable)*
      vi. eTimes.11—Patient Arrived at Destination Date/Time *(If applicable)*
      vii. eTimes.13—Unit Back in Service Date/Time *(NEMSIS mandatory)*
      b. eResponse.05—Type of Service Requested *(i.e., 911 vs interfacility)*
   c. eResponse.07—Primary Role of the Unit *(i.e., Transport or non-transport)*
   d. eDispatch.01—Complaint Reported by Dispatch *(Dispatch reason from EMD)*
   e. Crew Responding:
      i. eCrew.01—Crew Member ID *(Crew name or license # depending on software)*
      ii. eCrew.02—Crew Member Level *(License level for this call)*
      iii. eCrew.03—Crew Member Response Role *(i.e., Primary or secondary care giver)*
      f. eScene.09—Incident Location Type
      i. Used for multiple purposes, including CARES (Cardiac Arrest Registry to Enhance Survival)
   g. Response Modes *(e.g., lights and sirens)*
      i. eResponse.23—Response Mode to Scene
      ii. eResponse.24—Additional Response Mode Descriptors h. Delays:
      i. eResponse.09—Type of Response Delay
      ii. eResponse.10—Type of Scene Delay

Patient Demographics and Medical History

Patient demographics in this section include the minimum information required for CPI review and do not include protected health information (PHI) or patient identifiable information. Local systems may require additional PHI to support EMS reimbursement and link local level CPI reviews to specific incidents or outcome data.

1. Minimum Patient Demographic and History Fields include:
    a. ePatient.13—Gender
    b. ePatient.15—Age
    c. ePatient.16—Age Units
    d. eHistory.06—Medication Allergies
    e. eHistory.07—Environmental/Food Allergies
    f. eHistory.08—Medical/Surgical History
    g. eHistory.12—Current Medications
    h. eHistory.17—Alcohol/Drug Use Indicators
    i. eHistory.01—Barriers to Patient Care
    j. eExam.01—Estimated Body Weight in Kilograms
    k. eExam.02—Length-based Tape Measure

Patient Complaints and Symptoms

1. Patient and situational history for this EMS event generally addresses issues leading up to EMS being requested and include patient complaints, SAMPLE history, signs or symptoms, barriers and confounders, onset times, and trauma and cardiac arrest historical information
2. Patient Complaints, Signs and Symptoms, and Key Related Times:
    a. eSituation.02—Possible Injury
    b. Patient Complaint Group
        i. eSituation.03—Complaint Type
        Ii. eSituation.04 – Complaint
        iii. eSituation.05—Duration of Complaint
        iv. eSituation.06—Time Units of Duration of Complaint
        c. eSituation.07—Chief Complaint Anatomic Location
    d. eSituation.08—Chief Complaint Organ System
    e. Signs and Symptoms
        i. eSituation.01—Date/Time of Symptom Onset
        Ii. eSituation.09—Primary Symptom [Single Choice]
        iii. eSituation.10—Other Associated Symptoms [Choose All that Apply]
        f. eSituation.18—Date/Time Last Known Well (Stroke/CVA)

Situational History for this EMS Event

3. SAMPLE History

NOTE: Although many assessment Protocols refer to this history mnemonic, many electronic patient care report (ePCR) systems do not collect this information in a tool organized specifically in this group, but rather throughout the EMS record in the appropriate areas to the topics

a. **S**ymptoms
    i. eSituation.09—Primary Symptom **AND**
    ii. eSituation.10—Other Associated Symptoms
b. **A**llergies
    i. eHistory.06—Medication Allergies **AND**
    ii. eHistory.07—Environmental/Food Allergies
c. **M**edications
    i. eHistory.12—Current Medications
d. **P**ast medical and surgical history
    i. eHistory.08—Medical/Surgical History

e. **L**ast Oral Intake
   i. eHistory.19—Last Oral Intake *(if software configured to collect)* and/or
   ii. eNarrative.01—Patient Care Report Narrative

f. **E**vents leading to activation of EMS
   i. eSituation.17—Patient Activity and/or
   ii. eNarrative.01—Patient Care Report Narrative

4. Barriers and Situational Confounders
   a. eHistory.01—Barriers to Patient Care
   b. eHistory.17—Alcohol/Drug Use Indicators
5. Stroke
   a. eSituation.18—Date/Time Last Known Well (Stroke/CVA)
6. Trauma History and Situation
   a. eSituation.02—Possible Injury *(Yes/No—based on mechanism, not listing an actual injury)*
   b. eInjury.01—Cause of Injury
      i. Known to clinicians as *Mechanism of Injury*; values are from ICD-10
      ii. Intent is included where possible in ICD-10, but is no longer a separate field as it was in NEMSIS v2
   c. eInjury.03—Trauma Center Criteria *(per the ACS-COT 2022 National Protocol for Field Triage of Injured Patients)*
   d. eInjury.04—Vehicular, Pedestrian, or Other Injury Risk Factor *(per the ACS-COT 2022 National Protocol for Field Triage of Injured Patients)*
   e. eInjury.07—Use of Occupant Safety Equipment
   f. Destination Pre-Arrival Alerts (e.g., trauma alerts)
      i. eDisposition.24—Destination Team Pre-Arrival Alert or Activation
      ii. eDisposition.25—Date/Time of Destination Pre-Arrival Alert or Activation
7. Cardiac Arrest History and Situation

   NOTE: The following fields meet the needs of Utstein Criteria reports and many of the fields
   in CARES. CARES has additional custom fields that may be available from your software vendor.

   a. eArrest.01—Cardiac Arrest [Yes/No]
   b. eArrest.02—Cardiac Arrest Etiology
   c. eArrest.03—Resuscitation Attempted By EMS
   d. eArrest.04—Arrest Witnessed By
   e. eArrest.05—CPR Care Provided Prior to EMS Arrival
   f. eArrest.06—Who Provided CPR Prior to EMS Arrival
   g. eArrest.07—AED Use Prior to EMS Arrival
   h. eArrest.08—Who Used AED Prior to EMS Arrival
   i. eArrest.09—Type of CPR Provided
   j. eArrest.11—First Monitored Arrest Rhythm of the Patient
   k. eArrest.12—Any Return of Spontaneous Circulation
   l. eArrest.14—Date/Time of Cardiac Arrest
   m. eArrest.15—Date/Time Resuscitation Discontinued
   n. eArrest.16—Reason CPR/Resuscitation Discontinued
   o. eArrest.17—Cardiac Rhythm on Arrival at Destination
   p. eArrest.18—End of EMS Cardiac Arrest Event
   q. eScene.02—Other EMS or Public Safety Agencies at Scene
   r. eScene.03—Other EMS or Public Safety Agency ID Number
   s. eScene.04—Type of Other Service at Scene

Clinician Impressions and Incident/Patient Disposition

1. Clinician Impressions (Clinician Field Working Diagnosis)
   a. eSituation.11—Clinician's Primary Impression [Single Choice]
      i. The word "Primary" causes a great deal of understandable confusion with this field, this should be the diagnosis of the most acute (primary) problem *NOT NECESSARILY THE FIRST* problem that was wrong with the patient, or their initial complaint
   b. eSituation.12—Clinician's Secondary Impression [Choose all that Apply]
2. Incident/Patient Disposition
   a. eSituation.13—Initial Patient Acuity *(Intended to be prior to EMS care)*
   b. eDisposition.19—Final Patient Acuity *(Intended to be after EMS care)*
   c. eDisposition.12—Incident/Patient Disposition
   d. eDisposition.16—EMS Transport Method
   e. Transport Mode *(i.e., use of lights and sirens)*
      i. eDisposition.17—Transport Mode from Scene
      ii. eDisposition.18—Additional Transport Mode Descriptors f. eDisposition.01—Destination/Transferred To, Name
      i. Intended by NEMSIS to be the destination facility or the Agency transferred to, although many ePCR systems only collect this as the destination facility because of the complexity of mixing facilities and services in the same field

Assessments and Exams

1. Exams

   By definition, use of NEMSIS eExam fields is optional; they are, however, available for both state and local EMS system use.

   a. Many systems do not require use of these fields as they can be time-consuming to enter, often too detailed (i.e., there is no value for whole arm, it would need to be entered as shoulder, upper arm, elbow, forearm and wrist with separate exam findings for each component, meaning a single exam finding of paralysis for an arm would take ten steps to enter) and the same information is often reflected in the clinician's narrative.
   b. However, there *is* some utility in targeted use of these fields for certain situations such as stroke, spinal exams, and trauma without needing to enter all the fields in each record.

2. Capacity Assessment Group

   This can be used to support documentation of patient capacity for refusal of care and/or transport, participation in advanced spinal assessments, or support for treatment decisions by EMS clinicians. *NOTE: The Capacity Assessment Group does not provide a legal definition of capacity and should not be used as such. It is intended only to assist the EMS clinician in documenting the most basic exam and history findings in order to determine capacity. Many additional factors must be considered when determining capacity including the situation, patient medical history, medical conditions, and consultation with medical direction.*

   a. Barriers and situational confounders [Both only single entry]
      i. eHistory.01—Barriers to Patient Care
      ii. eHistory.17—Alcohol/Drug Use Indicators
   b. Glasgow Coma Score (GCS) Vitals Group *[see **Vitals** section]* [serial entries allowed]
   c. eVitals.26—Level of Responsiveness (AVPU) [serial entries allowed]
   d. eExam.19—Mental Status Assessment [serial entries allowed]
   e. eExam.20—Neurological Assessment [serial entries allowed]
3. Stroke Assessments
   a. Initial Vitals
   b. eSituation.18—Date/Time Last Known Well (Stroke/CVA)
   c. Stroke Score Group
   d. eExam.19—Mental Status Assessment

e. eExam.20—Neurological Assessment *(Speech, facial droop, arm drift, unilateral weakness)*
f. eVitals.31—Reperfusion Checklist *(May not apply if service area does not use due to lack of consensus on a standard reperfusion checklist, or acceptance by EMS if used)*

4. Spinal Injury/Exam
   a. Capacity Assessment Group
   b. Back and Spine Assessment Group
      i. eExam.13—Back and Spine Assessment Finding Location
      ii. eExam.14—Back and Spine Assessment
   c. Extremity Assessment Group
      i. eExam.15—Extremity Assessment Finding Location
      ii. eExam.16—Extremities Assessment
5. 12-lead EKG Acquisition
   a. eTimes.06—Unit Arrived on Scene Date/Time
   b. eTimes.07—Arrived at Patient Date/Time
   c. EKG Rhythm Group *[see **Vitals** section]*
   d. Attach 12-lead graphic ePCR (through direct integration linkage with EKG monitor or attachment of scanned printout as allowed/available in software)
   e. 12-lead-EKG Procedure-documented under Procedures Performed Group
6. Trauma/Injury

   The exam fields have many useful values for documenting trauma (deformity, bleeding, burns, etc.). Use of targeted documentation of injured areas can be helpful, particularly in cases of more serious trauma. Because of the endless possible variations where this could be used, specific fields will not be defined here. Note, however that the exam fields use a specific and useful Pertinent Negative called "Exam Finding Not Present." This can be used to document that the clinician actually performed the assessment but did not find any injury/abnormality.

Vitals

1. Vitals Date/Time Group
   a. eVitals.01—Date/Time Vital Signs Taken
   b. eVitals.02—Obtained Prior to this Unit's EMS Care
2. Glasgow Coma Score (GCS) Group
   a. Vitals Date/Time Group
   b. eVitals.19—Glasgow Coma Score-Eye
   c. eVitals.20—Glasgow Coma Score-Verbal
   d. eVitals.21—Glasgow Coma Score-Motor
   e. eVitals.22—Glasgow Coma Score-Qualifier
   f. eVitals.23—Total Glasgow Coma Score
3. EKG Rhythm Group
   a. Vitals Date/Time Group
   b. eVitals.03—Cardiac Rhythm/Electrocardiography (EKG)
   c. eVitals.04—EKG Type
   d. eVitals.05—Method of EKG Interpretation
4. Temperature Group
   a. Vitals Date/Time Group
   b. eVitals.24—Temperature
   c. eVitals.25—Temperature Method
5. Pain Scale Group
   a. Vitals Date/Time Group
   b. eVitals.27—Pain Scale Score
   c. eVitals.28—Pain Scale Type
6. Stroke Score Group
   a. Vitals Date/Time Group
   b. eVitals.29—Stroke Scale Score

c. eVitals.30—Stroke Scale Type

7. Additional Vitals Options

   All should have a value in the Vitals Date/Time Group and can be documented individually or as an add-on to basic, standard, or full vitals

   a. eVitals.09—Mean Arterial Pressure
   b. eVitals.13—Pulse Rhythm
   c. eVitals.15—Respiratory Effort
   d. eVitals.16—End Tidal Carbon Dioxide ($EtCO_2$)
   e. eVitals.17—Carbon Monoxide (CO)
   f. eVitals.18—Blood glucose Level
   g. eVitals.26—Level of Responsiveness (AVPU)
   h. Vitals.32—APGAR

8. Routine Vitals – Includes the following vital signs:

   a. Vitals Date/Time Group
   b. Blood Pressure
   c. eVitals.06—SBP (Systolic Blood Pressure)
   d. eVitals.07—DBP (Diastolic Blood Pressure)
   e. eVitals.10—Heart Rate
   f. eVitals.12—Pulse Oximetry
   g. eVitals.14—Respiratory Rate
   h. eVitals.26—Level of Responsiveness (AVPU)
   i. Pain Scale Group

9. Initial Vitals

   a. Routine Vitals
   b. eVitals.18—Blood glucose Level
   c. Glasgow Coma Score (GCS) Group
   d. Temperature Group

10. Full Vitals

   a. Initial Vitals
   b. eVitals.13—Pulse Rhythm
   c. eVitals.15—Respiratory Effort
   d. eVitals.16—End Tidal Carbon Dioxide ($EtCO_2$) *(If available and applicable)*
   e. EKG Rhythm Group *(If available and applicable)*

<u>Medications Given</u>

1. eMedications.01—Date/Time Medication Administered
2. eMedications.02—Medication Administered Prior to this Unit's EMS Care
3. eMedications.03—Medication Given
   a. Pertinent Negatives (medication qualifiers) allowed
      i. Contraindication Noted
      Ii. Medication Already Taken
      iii. Denied By Order
      iv. Refused
      v. Medication Allergy
      vi. Unable to Complete
4. eMedications.04—Medication Administered Route
5. eMedications.05—Medication Dosage
6. eMedications.06—Medication Dosage Units
7. eMedications.07—Response to Medication *[see **Definitions of Medication Response** below]*
8. eMedications.08—Medication Complication
9. eMedications.09—Medication Crew (Healthcare Professionals) ID *(Name or license #)*
10. eMedications.10—Role/Type of Person Administering Medication *(License level)*

Procedures Performed

1. eProcedures.01—Date/Time Procedure Performed
2. eProcedures.02—Procedure Performed Prior to this Unit's EMS Care
3. eProcedures.03 – Procedure
    a. Pertinent Negatives Allowed
    i. Contraindication Noted
    ii. Refused
    iii. Denied By Order
    iv. Unable to Complete
4. eProcedures.04—Size of Procedure Equipment
5. eProcedures.05—Number of Procedure Attempts *(This should always be "1" with each attempt at a procedure documented separately with appropriate date/time stamp)*
6. eProcedures.06—Procedure Successful
7. eProcedures.07—Procedure Complication
8. eProcedures.08—Response to Procedure *[see **Definitions for Response to Procedures** below]*
9. eProcedures.09—Procedure Crew Members ID
10. eProcedures.10—Role/Type of Person Performing the Procedure
11. eProcedures.13—Vascular Access Location *(If applicable)*

Narrative

The use of the narrative is essential to an effective and complete Patient Care Record. It summarizes the incident history and care in a manner that is easily digested between caregivers for continuity of care and provides a place for EMS to document facts that do not fit into fixed data fields [see **Narrative** Section under **Notes/Educational Pearls** (below) for more detail]

Notes/Educational Pearls

Documenting Signs and Symptoms Versus Clinician Impressions

1. Signs and Symptoms
    a. Signs and Symptoms should support the clinician impressions, treatment Protocols and overall care given. A symptom is something the patient experiences and tells the clinician; it is subjective. A sign is something the clinician sees; it is objective.
    b. Symptoms should not be confused with clinician impressions. The clinician impressions are the EMS working field diagnosis of the patient's actual medical condition.
2. Clinician Impressions
    a. There is often a great deal of confusion on the part of EMS clinicians about the difference between symptoms and clinician impressions. Clinician impressions should be *supported* by symptoms but not *be* the symptoms except on *rare* occasions where they may be the same (i.e., weakness when no etiology for the weakness can be determined by the EMS clinician).
    b. Correctly documenting impressions is essential to many aspects of EMS data use, such as EMS reimbursement, reports of incident types, specialty registries (e.g., CARES) and CPI reviews. EMS agencies could *literally lose money or equipment and staffing resources* if the clinicians are incorrectly entering clinician impressions. Addressing this issue should be an essential part of the record Quality Assurance and CPI process and documentation training.
    c. Example of documenting symptoms versus impressions:
        i. An opiate overdose patient who received naloxone and had a positive response. This patient would have possible *Symptoms* of altered mental status, unconscious, respiratory distress, and respiratory failure/apnea. All 4 of these symptoms are available as clinician impressions, however the correct impression for this patient would be whatever variation of "Drug Overdose Opiates or

Heroin" impression(s) are setup in the local ePCR system being used. This impression will specifically define the call as an overdose with opiates, rather than a case where one of the symptoms was also used as an impression when the use of naloxone and other assessments and diagnostic tools could not determine an etiology for the symptom(s).

Narrative

The various data fields within the ePCR are important as they provide a means of uniformly entering incident data that can be used for importing into billing software or hospital records, transmitting between EMS systems or creating descriptive reports, or conducting research. In most cases, at a local, state, or national level, if something wasn't documented in the appropriate data field, it didn't happen or exist. However, the Narrative plays several essential roles in the PCR.

1. Role of the Narrative
    a. Provides an efficient and effective means to share patient information for continuity of care between EMS services and EMS and hospital staff. The narrative summarizes the incident history and care in a manner that is easily digested between caregivers.
    b. Provides a place for EMS to document facts that do not fit into fixed data fields. Specifically, this would include the detailed history of the scene, what the patient may have done or said or other aspects that only the clinician saw, heard, or did. The Narrative is the place for the EMS clinician to "paint the picture" for all others to more fully understand the incident.
    c. Provides a standard means to add essential details about medical history, exams, treatments, patient response, and changes in patient condition that can't otherwise be effectively or clearly communicated.
2. Narrative Formats

    Documentation by EMS clinicians demonstrates a wide variation of training and practice reinforcement. Most training programs provide limited instruction on how to properly document operational and clinical processes, and almost no practice. Most clinicians learn this skill on the job, and often proficient mentors are sparse. Therefore, it is essential that the EMS clinician uses a standard format to ensure they are consistent and complete in their documentation. There are three standard formats for EMS documentation. EMS clinicians should choose the best match for them, master the format, and be consistent in its use.

    a. Medical Narrative: This format is the one most new EMS clinicians use as it is intuitive and easy to learn. Some more experienced clinicians use it as they find telling the story from start to finish works best to organize their thoughts. A drawback to this method is that it is easy to forget to include facts because of the lack of structure.
    b. SOAP: This format stands for **S**ubjective, **O**bjective, **A**ssessment, **P**lan. This is a format that is very common in the medical field.
    c. CHART: This format stands for **C**omplaint, **H**istory, **A**ssessment, **R**x (Treatment) and **T**ransport. Each section's content is clearly defined and consistent in format. It minimizes the likelihood of forgetting information and ensures documentation is consistent between records and clinicians. CHART is the format most recommended as best practice by EMS legal authorities and is considered the standard in many EMS systems. A variation is DCHART, where the "D" stands for **D**ispatch (reason).

Medications Given Showing Positive Action Using Pertinent Negatives

For medications that are required by protocol (i.e., aspirin for cardiac chest pain), *pertinent negatives* should be used to show that a medication protocol was considered but was satisfied by other than clinician action.

Example: *EMS is called to a patient for cardiac chest pain. The patient has already taken 324 mg of aspirin by the time EMS arrives per 911 pre-arrival instructions. EMS clinicians should document this as a medication given, prior-to-arrival, with the best estimated time, and qualify the medication as "Medication Already Taken" using the pertinent negative.*

Definitions for Response to Medications

1. Improved:
   a. The medication had its intended therapeutic effect and the patient's symptoms decreased or clinical condition improved or resolved (the word "effective" could generally be substituted for "improved").
   b. If a patient had the intended therapeutic response to the medication, but a side effect that caused a clinical deterioration in another body system, then "Improved" should be chosen and the side effects documented as a complication (i.e., nitroglycerin improved chest pain but dropped the blood pressure).
2. Unchanged:
   a. The medication was ineffective and had no intended therapeutic effect or had a sub-therapeutic and unnoticeable effect,
      AND
   b. The patient condition did not deteriorate.
3. Worse:
   a. The patient condition deteriorated or continued to deteriorate because either the medication:
      i. Was ineffective and had no intended therapeutic effect; **OR**
      ii. Had a sub-therapeutic effect that was unable to stop or reverse the decline in patient condition;
      OR
      iii. Was the wrong medication for the clinical situation and the therapeutic effect caused the condition to worsen (i.e., giving glucose to a patient with hyperglycemia/diabetic ketoacidosis).

Definitions for Response to Procedures

1. Not Applicable:
   The nature of the procedure has no direct expected clinical response (i.e., patient assessment, 12-lead EKG acquisition).
2. Improved:
   a. The procedure performed had the intended effective outcome and/or the patient's symptoms decreased, or clinical condition improved or resolved (i.e., defibrillation resolved VF into a perfusing rhythm; intubation controlled the airway and allowed effective management of breathing).
   b. An effective procedure that caused an improvement in the patient condition may also have resulted in a procedure complication and the complication should be documented (i.e., intubation caused minor airway trauma, but the intubation successfully secured the airway).
3. Unchanged:
   a. The procedure performed did not have the clinical effect intended, but did not directly worsen the patient's symptoms or clinical condition (i.e., attempted defibrillation and the person remained in VF); **or**
   b. Had a sub-therapeutic effect and the symptoms continued (i.e., a bandage applied to a bleeding wound failed to stop the bleeding);
      or
   c. The nature of the procedure has no direct expected clinical response (i.e., patient assessment).
      NOTE: "Not Applicable" would also be appropriate to choose for these cases 4.

Worse:

   a. The results of the procedure performed lead to a worsening of the patient's symptoms or condition (e.g., defibrillation converted VF into asystole, application of a splint caused significant increase in pain or loss of sensation and pulses).
   b. In the case of worsening condition, documentation of the procedure complications may also be appropriate.

c. NOTE: Just because a patient got worse, doesn't necessarily mean the clinician performed the procedure incorrectly.

NEMSIS Data Standards and Limitations

1. NEMSIS is a national dataset and standard used by all American EMS software systems. *(For additional information, go to www.nemsis.org.)* Similar datasets are used internationally in other high performance EMS systems. Currently there are three versions of the data standard available for documentation and in which data is stored:
   a. NEMSIS Version 2.2.1 (v2.2.1)
      i. Adopted in 2006, there have been no changes since release
      Ii. Most states or systems have used this standard since its release, and the majority of most states' data available since approximately 2016 is in this format.
      iii. NEMSIS accepted v2.2.1 data through 12/31/2016, and some states may continue to collect data in this standard until they transition to NEMSIS v3 standards.
   b. NEMSIS Version 3 (v3)
      i. NEMSIS v3 was created and finalized in 2011 to replace v2.2.1 in order to allow the dataset to become more flexible for updates and adopt technical standards making linkage to other health records possible.
         1. NEMSIS v3.3.4 was released in March 2014 and was the first version in production where live data was collected by services and states and subsequently submitted to NEMSIS. NEMSIS will continue to accept v3.3.4 data until 12/31/2017.
         2. NEMSIS v3.4, released in March 2015, included both changed elements and many added values to existing elements. NEMSIS has been accepting data from this version concurrently with V3.3.4 data. As of August 2021, v3.4 will be the only standard and V3.3.4 will be phased out. All documentation Protocols found in this document are based on the NEMSIS v3.4 dataset and standard.
2. Mandatory and Required Elements
   b. *Mandatory:* NEMSIS makes certain elements or fields mandatory so, if not included, the record cannot be properly stored or moved electronically. These fields require real data and do not accept Nil (Blank) values, Not Values, or Pertinent Negatives.
   c. *Required:* NEMSIS requires these elements or fields to be completed or the record cannot be properly stored or moved electronically. However, required fields allow Nil (blank) values, Not Values, or Pertinent Negatives to be entered and submitted.
3. Not Values, Nil, and Pertinent Negatives
   b. Not Values (NV), Nil, and Pertinent Negatives (PN) are values that are attributes of certain NEMSIS elements designed to clarify a null data entry or qualify data entry into the element with which the NV, Nil, or PN is associated.
   c. Not Values available are "Not Applicable" and "Not Recorded"
      i. Some NEMSIS rules require one of these values to be entered when data is imported/exported if there is no other data in a field (e.g., at least one medication given must have a value, if no medications are given, then the software system must insert "Not Applicable" in the medications field when exporting)
      Ii. At times the EMS clinician use of "Not Applicable" is appropriate documentation (e.g., using "Not Applicable" under *eInjury.03—Trauma Center Criteria*, per the ACS-COT 2022 National Protocol for the Field Triage of Injured Patients, when transporting a patient with a simple sprained ankle)
   d. Nil Values are blank values
      i. Values can be left blank, which can either be an accidental or purposeful omission of data.
      ii. Value fields can appropriately and purposefully be left blank if there was nothing to enter (e.g., a procedure field left blank if no patient was encountered).

e. Pertinent Negatives are attributes or qualifiers for both elements and fields. There are 11 possible Pertinent Negative values and the available list for each field varies as appropriate to the field. Two examples of the use of Pertinent Negatives are:
   i. Documenting non-administration of ASA for chest pain by the EMS clinician with the Pertinent Negative of "Medication Already Taken" to show evidence that this treatment requirement was met.
   ii. Documenting assessment of, and lack of a gunshot wound to the chest with the qualifier of "Chest --> gunshot wound --> Exam Finding Not Present" in the examination section (previously you could only document a positive finding of a gunshot wound with was no way to document that you looked and did not find one).

4. NEMSIS Element and Value Name Formats
   b. NEMSIS Elements/Fields are organized into groups with other related elements/fields
   i. There are two parent datasets: Demographic (designated by a "d") and EMS (designated by an "e"). The majority of the documentation in any ePCR falls in the "e" section. The Demographic dataset is intended to be descriptive of the EMS agencies and system characteristics for correlation at a larger research level, rather than for use in operational CPI reviews.
   ii. The element numbering structure reflects the dataset and the text group name of the element
5. Example: "eVitals.06—SBP (Systolic Blood Pressure)" where "e" is the EMS dataset and "Vitals" is the dataset grouping for all elements related to Vitals and the number is the number assigned to a specific element.
   b. "eVitals.06" is used to store the data in the background and "SBP (Systolic Blood Pressure)" is what clinicians and reviewers see.
   c. Values are designated by a code and text name.
      i. The codes are generally derived from various sources such as ICD-10, SNOMED, or RxNorm and are used to store and move the data in the system's background.
      ii. Codes are not seen by the EMS clinician in the ePCR, but rather the clinician will see text names.
      Some software systems allow the visible text name to be modified or relabeled to meet local standards or nomenclature; This feature can help improve data quality by making documentation easier for the clinician.
      iii. An example of a value code and name for cardiac chest pain, found under the element "eProtocols.01—Protocols Used" is "9914117 – Medical-Cardiac Chest Pain".
   d. All minimum general documentation Protocol requirements are identified using the NEMSIS element, values codes, and names to allow application across a variety of ePCR software labels for these fields.
6. Custom Elements/Fields and Values
   b. The NEMSIS Standard provides a data format for software vendors to create custom elements or values requested by states or local systems.
   c. States or local systems may create new elements or value extensions for existing NEMSIS elements to meet regional needs (e.g., adding additional protocol name values not on the NEMSIS list).

Airway Confirmation Fields

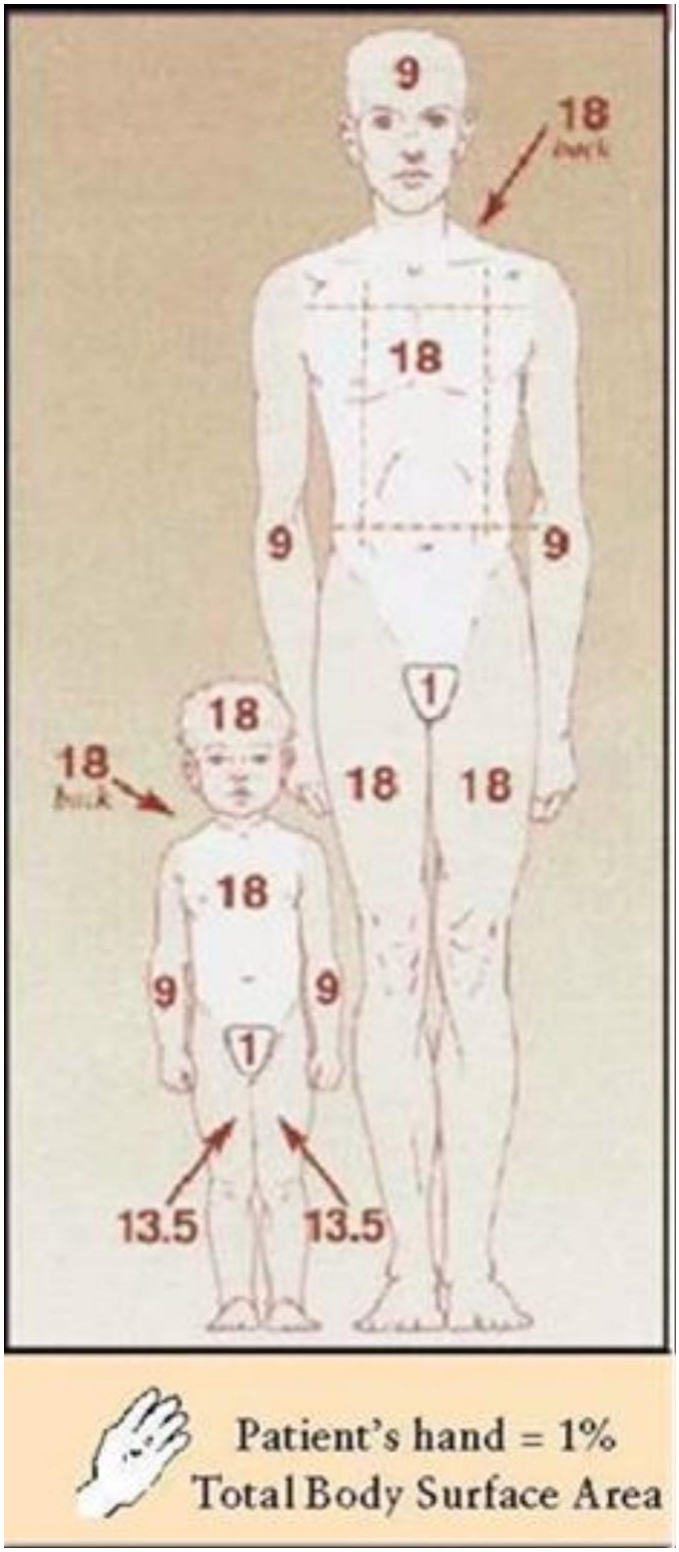
Specific use of the NEMSIS airway confirmation fields in documentation will not be detailed at this time due to current operational and technical challenges all states, local systems, and ePCR software vendors are experiencing.

The NEMSIS airway confirmation fields were closely modeled on the "Recommended Protocols for Uniform Reporting of Data from Out-of-Hospital Airway Management: Position Statement of the National Association of EMS Physicians" and the fields and values could provide excellent and appropriately useful data to evaluate airway management. However, the

technical structure of the fields has made their practical use limited as all the data is collected as a separate, self-contained group, rather than as part of the procedures group. This means EMS clinicians would need to enter much of the same information twice in the ePCR, in both the procedures area and airway confirmation section (when, who did it, what device was used, and complications). Furthermore, the airway group can only be entered once per ePCR, so the fields cannot be used again if more than one airway was required (e.g., one airway became ineffective and needed to be replaced with a different type of airway). Many states and ePCR software vendors have been struggling with how to make these fields functional for use by only using a portion of them or looking to add mirrored custom values that are directly linked to procedures performed. However, solutions are currently far from practical, functional, effective, or uniform in how they are being implemented or used across various systems

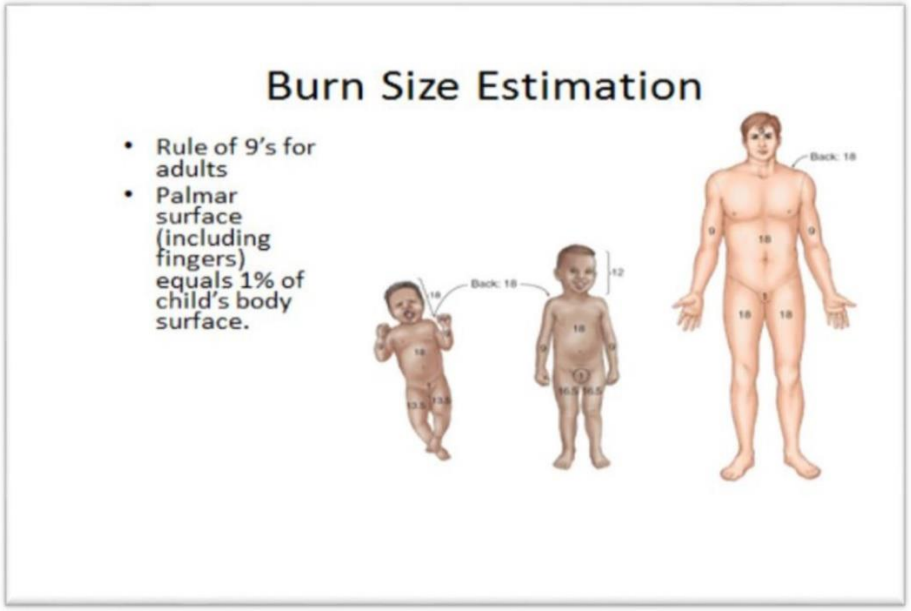
II. Burn and Burn Fluid Charts

Burn Size Chart 1



Source: Used with permission, University of Utah Burn Center

Burn Size Chart 2



Source: American Heart Association, *Pediatric Advanced Life Support* Textbook, 2013

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

Adult	
Anatomic Structure	**Surface Area**
Anterior head	4.5%
Posterior head	4.5%
Anterior torso	18%
Posterior torso	18%
Anterior leg, each	9%
Posterior leg, each	9%
Anterior arm, each	4.5%
Posterior arm, each	4.5%
Genitalia, perineum	1%

Child	
Anatomic Structure	**Surface Area**
Anterior head	9%
Posterior head	9%
Anterior torso	18%
Posterior torso	18%
Anterior leg, each	6.75%
Posterior leg, each	6.75%
Anterior arm, each	4.5%
Posterior arm, each	4.5%
Genitalia/perineum	1%

Adult– Obese 80 kg	
Anatomic Structure	**Surface Area**
Head and neck	2%
Anterior torso	25%
Posterior torso	25%
Leg, each	20%
Arm, each	5%
Genitalia/perineum	0%

Infant 10 kg	
Anatomic Structure	**Surface Area**
Head and neck	20%
Anterior torso	16%
Posterior torso	16%
Leg, each	16%
Arm, each	8%
Genitalia/perineum	1%

Parkland Formula

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.

Volume of Intravenous Fluid required in the first 24 hours (in mL) =
(4 X patient weight in kg) X (Percentage of total body surface area burned)

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.

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 Protocols listed above will provide assistance during the estimation of the percentage of total body surface area burned for patients of various ages and body habitus.

Burn Injury IV Fluid Rates
Infusion Rate > 30 KG

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

Wt (lbs)	Wt (kg)	% TBSA	/Hr for 1st 8 Hrs of care	60 gtt set, gtt/min	20 gtt set, gtt/min	15 gtt set, gtt/min	10 gtt set, gtt/min
66	30	10	75	75	25.0	18.8	12.5
66	30	20	150	150	50.0	37.5	25.0
66	30	30	225	225	75.0	56.3	37.5
66	30	40	300	300	100.0	75.0	50.0
66	30	50	375	375	125.0	93.8	62.5
66	30	60	450	450	150.0	112.6	75.0
88	40	10	100	100	33.3	25.0	16.7
88	40	20	200	200	66.7	50.0	33.3
88	40	30	300	300	100.0	75.0	50.0
88	40	40	400	400	133.3	100.0	66.7
88	40	50	500	500	166.7	125.00	83.3
88	40	60	600	600	200.0	150.0	100.0
110	50	10	125	125	41.7	31.3	20.8
110	50	20	250	250	83.3	62.5	41.7
110	50	30	375	375	125.0	93.8	62.5
110	50	40	500	500	166.7	125.0	83.3
110	50	50	625	625	208.3	156.3	104.2
110	50	60	750	750	250.0	187.6	125.0
132	60	10	150	150	50.0	37.5	25.0
132	60	20	300	300	100.0	75.0	50.0
132	60	30	450	450	150.0	112.5	75.0
132	60	40	600	600	200.0	150.0	100.0
132	60	50	750	750	250.0	187.5	125.0
132	60	60	900	900	300.0	225.0	150.0
154	70	10	175	175	58.3	43.8	29.2
154	70	20	350	350	116.7	87.5	58.3
154	70	30	525	525	175.0	131.3	87.5
154	70	40	700	700	233.3	175.0	116.7
154	70	50	875	875	291.7	218.8	145.8
154	70	60	1050	1050	350.0	262.6	175.0
176	80	10	200	200	66.7	50.0	33.3
176	80	20	400	400	133.3	100.0	66.7
176	80	30	600	600	200.0	150.0	100.0
176	80	40	800	800	266.7	200.0	133.3
176	80	50	1000	1000	333.3	250.0	166.7
176	80	60	1200	1200	400.0	300.0	200.0
198	90	10	225	225	75.0	56.3	37.5
198	90	20	450	450	150.0	112.5	75.0
198	90	30	675	675	225.0	168.8	112.5
198	90	40	900	900	300.0	225.0	150.0
198	90	50	1125	1125	375.0	281.3	187.5
198	90	60	1350	1350	450.0	337.6	225.0
220	100	10	250	250	83.3	62.5	41.7
220	100	20	500	500	166.7	125.0	83.3
220	100	30	750	750	250.0	187.5	125.0
220	100	40	1000	1000	333.3	250.0	166.7
220	100	50	1250	1250	416.7	312.5	208.3
220	100	60	1500	1500	500.0	375.0	250.0
242	110	10	275	275	91.6	68.7	45.9
242	110	20	550	550	183.4	137.5	91.6
242	110	30	825	825	275	206.2	137.5
242	110	40	1100	1100	366.6	275.0	183.4
242	110	50	1375	1375	458.4	343.7	229.1
242	110	60	1650	1650	550.0	412.4	275
264	120	10	300	300	99.9	74.9	50.1
264	120	20	600	600	200.1	150.0	99.9
264	120	30	825	825	300.0	224.9	150.0
264	120	40	1200	1200	399.9	300.0	200.1
264	120	50	1500	1500	500.1	374.9	249.9
264	120	60	1650	1650	600.0	449.8	300

Burn Injury IV Fluid Rates Fluid
Infusion Rate < 30 KG

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

Wt (lbs)	Wt (kg)	% TBSA	/Hr for 1st 8 Hrs of care	60 gtt set, gtt/min	20 gtt set, gtt/min	15 gtt set, gtt/min	10 gtt set, gtt/min
11	5	10	12.5	12.5	4.2	3.2	2.1
11	5	20	25	25	8.3	6.3	4.2
11	5	30	37.5	37.5	12.5	9.5	6.3
11	5	40	50	50	16.7	12.5	8.3
11	5	50	62.5	62.5	20.8	15.7	10.5
11	5	60	75	75	25	18.7	12.5
22	10	10	25	25	8.4	6.4	4.1
22	10	20	50	50	16.6	12.5	8.4
22	10	30	75	75	25	18.9	12.5
22	10	40	100	100	33.3	25	16.6
22	10	50	125	125	41.6	31.4	20.9
22	10	60	150	150	50	37.4	25
27.5	12.5	10	31.3	31.3	10.5	7.5	5.2
27.5	12.5	20	62.5	62.5	20.8	15.7	10.5
27.5	12.5	30	93.8	93.8	31.3	23.6	15.7
27.5	12.5	40	125	125	41.7	31.7	21
27.5	12.5	50	156.2	156.2	52.1	39.8	26.3
27.5	12.5	60	187.4	187.4	62.5	47.9	31.6
33	15	10	37.5	37.5	12.6	8.5	6.2
33	15	20	75	75	25	18.8	12.6
33	15	30	112.5	112.5	37.5	28.3	18.8
33	15	40	150	150	50	37.5	25
33	15	50	187.5	187.5	62.5	46.7	31.2
33	15	60	225	225	75	55.9	37.4
38.5	17.5	10	43.8	43.8	14.7	10.6	7.3
38.5	17.5	20	87.5	87.5	29.2	21.9	14.7
38.5	17.5	30	131.3	131.3	43.8	33	21.9
38.5	17.5	40	175	175	58.3	44.2	29.2
38.5	17.5	50	218.7	218.7	72.8	55.4	36.5
38.5	17.5	60	262.4	262.4	87.3	66.6	43.8
44	20	10	50	50	16.7	12.6	8.3
44	20	20	100	100	33.3	25	16.7
44	20	30	150	150	50	37.6	25
44	20	40	200	200	66.7	50	33.3
44	20	50	250	250	83.3	62.6	41.7
44	20	60	300	300	100	75	50
49.6	22.5	10	56.3	56.3	18.8	14.2	9.4
49.6	22.5	20	112.5	112.5	37.5	28.1	18.8
49.6	22.5	30	168.8	168.8	56.3	42.3	28.2
49.6	22.5	40	225	225	75	56.4	37.6
49.6	22.5	50	281.2	281.2	93.7	70.5	47
49.6	22.5	60	337.4	337.4	112.5	84.6	56.4
55.1	25	10	62.5	62.5	20.9	15.7	10.4
55.1	25	20	125	125	41.7	31.2	20.9
55.1	25	30	187.5	187.5	62.5	47	31.3
55.1	25	40	250	250	83.4	62.5	41.8
55.1	25	50	312.5	312.5	104.2	78	52.3
55.1	25	60	375	375	125	93.5	62.8
60.6	27.5	10	68.8	68.8	23	17.3	11.5
60.6	27.5	20	137.5	137.5	45.9	34.4	23
60.6	27.5	30	206.2	206.2	68.8	51.7	34.4
60.6	27.5	40	274.9	274.9	91.7	79.7	53.3
60.6	27.5	50	343.6	343.6	114.6	96.9	64.8
60.6	27.5	60	412.4	412.4	137.5	114.1	76.3
66	30	10	75	75	25.0	18.8	12.5
66	30	20	150	150	50.0	37.5	25.0
66	30	30	225	225	75.0	56.3	37.5
66	30	40	300	300	100.0	75.0	50.0
66	30	50	375	375	125.0	93.8	62.5
66	30	60	450	450	150.0	112.6	75.0

Source: Used with permission, University of Utah Burn Center (https://crisisstandardsofcare.utah.edu).

III. Neurologic Status Assessment

Neurologic status assessment involves establishing a baseline and then trending any change in patient neurologic status. Glasgow Coma Score (GCS) is frequently used, but there are often errors in applying and calculating this score. With this in consideration, Glasgow Coma Score may not be more valid than a simpler field approach. Either AVPU (Alert, Verbal, Painful, Unresponsive) or only the motor component of the GCS may more effectively serve in this capacity.

Glasgow Coma Score

	Points	Pediatric	Adult
Eyes	1	No eye opening	
	2	Eye opening to pain	
	3	Eye opening to verbal	
	4	Eyes open spontaneously	
Verbal	1	No vocalization	No verbal response
	2	Inconsolable, agitated	Incomprehensible sounds
	3	Inconsistently consolable, moaning	Inappropriate words
	4	Cries but consolable, inappropriate interactions	Confused
	5	Smiles, oriented to sounds, follows objects, interacts	Oriented
Motor	1	No motor response	
	2	Extension to pain	
	3	Flexion to pain	
	4	Withdraws from pain	
	5	Localizes pain	
	6	Obeys commands	

AVPU

A: The patient is alert
V: The patient responds to verbal stimulus
P: The patient responds to painful stimulus
U: The patient is completely unresponsive

IV. Abnormal Vital Signs

Abnormal Vital Signs

Age	Heart Rate	Respiratory Rate	Systolic BP	Temp (°C)
0 d – 1 mo	>205	>60	<60	<36 or >38
≥ 1 mo – 3 mo	>205	>60	<70	<36 or >38
≥ 3 mo – 1 yr	>190	>60	<70	<36 or >38.5
≥ 1 yr – 2 yr	>190	>40	<70 + (age in yr x 2)	<36 or >38.5
≥ 2 yr – 4 yr	>140	>40	<70 + (age in yr x 2)	<36 or >38.5
≥ 4 yr – 6 yr	>140	>34	<70 + (age in yr x 2)	<36 or >38.5
≥ 6 yr – 10 yr	>140	>30	<70 + (age in yr x 2)	<36 or >38.5
≥ 10 yr – 13 yr	>100	>30	<90	<36 or >38.5
> 13 yr	>100	>16	<90	<36 or >38.5

V. Evidence-Based Protocols: GRADE Methodology

An Overview of GRADE Methodology

Although engagement in quality EMS research has increased significantly, the demand for evidence-based quality prehospital research continues to exceed its availability. The need for evidence-based prehospital patient care protocols was clearly recognized by the Institute of Medicine of the National Academies and clearly stated in 2007 in *The Future of Emergency Care: Emergency Medical Services at the Crossroads.*

The Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) methodology is a transparent process where the available research is reviewed and assessed by a panel of subject matter experts. Following this thorough review process, the available research is reviewed and graded for its validity based upon the assessment of the workgroup, and an evidence-based Protocol (EBG) is developed based upon the outcome of the workgroup.

The Federal Interagency Committee on Emergency Medical Services (FICEMS) and the National EMS Advisory Council (NEMSAC) approved a National Prehospital Evidence-based Protocol Model Process for the development, implementation, and evaluation of evidence-based Protocols. This Model Process recommends the use of the GRADE methodology for the Protocol development tool. The six process steps of the GRADE EBG development tool are:

- Assemble the expert panel and provide GRADE training
- Define the EBG content area and establish the specific clinical questions to address in patient, intervention, comparison, and outcome (PICO) format
- Prioritize outcomes to facilitate systematic literature searches
- Create GRADE tables (or evidence profiles) for each PICO question
- Vet and endorse GRADE evidence tables and draft recommendations
- Synthesize recommendations into an EMS protocol and visual algorithm

Some evidence-based Protocols cited in this document were created for and released by NHTSA; however, the GRADE methodology is not proprietary to NHTSA or any other organization. Local, regional, and state EMS agencies and EMS systems are encouraged to support the ongoing need for quality prehospital care, improved patient outcome, and the growing demand for EBGs for EMS.

VI. 2022 National Protocol for the Field Triage of Injured Patients

National Guideline for the Field Triage of Injured Patients

RED CRITERIA

High Risk for Serious Injury

Injury Patterns	Mental Status & Vital Signs
• Penetrating injuries to head, neck, torso, and proximal extremities • Skull deformity, suspected skull fracture • Suspected spinal injury with new motor or sensory loss • Chest wall instability, deformity, or suspected flail chest • Suspected pelvic fracture • Suspected fracture of two or more proximal long bones • Crushed, degloved, mangled, or pulseless extremity • Amputation proximal to wrist or ankle • Active bleeding requiring a tourniquet or wound packing with continuous pressure	All Patients • **Unable to follow commands (motor GCS < 6)** • **RR < 10 or > 29 breaths/min** • Respiratory distress or need for respiratory support • **Room-air pulse oximetry < 90%** Age 0–9 years • **SBP < 70mm Hg + (2 x age years)** Age 10–64 years • **SBP < 90 mmHg or** • **HR > SBP** Age ≥ 65 years • SBP < 110 mmHg or • **HR > SBP**

Patients meeting any one of the above RED criteria should be transported to the highest-level trauma center available within the geographic constraints of the regional trauma system

YELLOW CRITERIA

Moderate Risk for Serious Injury

Mechanism of Injury	EMS Judgement
• **High-Risk Auto Crash** – Partial or complete ejection – Significant intrusion (including roof) • >12 inches occupant site OR • **>18 inches any site OR** • Need for extrication for entrapped patient – Death in passenger compartment – Child (Age 0–9) unrestrained or in unsecured child safety seat – Vehicle telemetry data consistent with severe injury • Rider separated from transport vehicle with significant impact (eg, motorcycle, ATV, horse, etc.) • Pedestrian/bicycle rider thrown, run over, or with significant impact • Fall from height > 10 feet (all ages)	**Consider risk factors, including:** • Low-level falls in young children (age ≤ 5 years) or older **adults (age ≥ 65 years) with significant head impact** • **Anticoagulant use** • Suspicion of child abuse • Special, high-resource healthcare needs • **Pregnancy > 20 weeks** • Burns in conjunction with trauma • Children should be triaged preferentially to pediatric capable centers **If concerned, take to a trauma center**

Patients meeting any one of the YELLOW CRITERIA WHO DO NOT MEET RED CRITERIA should be preferentially transported to a trauma center, as available within the geographic constraints of the regional trauma system (need not be the highest-level trauma center)