National Model EMS Clinical Guidelines

March 2022

VERSION 3.0

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

NASEMSO Medical Directors Council
www.nasemso.org

Contents

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Introduction

We are honored to present the third edition of the National Association of State EMS Officials (NASEMSO) National Model EMS Clinical Guidelines and want to thank the entire EMS community for contributing to its evolution. The inaugural edition, released in September 2014, has been warmly welcomed by EMS clinicians, agencies, medical directors, and healthcare organizations in our nation as well as abroad. The creation of this document is a pinnacle event in the practice of EMS medicine as it fulfilled a recommendation in *The Future of Emergency Care: Emergency Medical Services at the Crossroads* published by the Institute of Medicine (now the National Academies of Sciences) in 2007. Specifically, this report states "NHTSA, in partnership with professional organizations, should convene a panel of individuals with multidisciplinary expertise to develop evidence-based model prehospital care protocols for the treatment, triage, and transport of patients."

The National Association of State EMS Officials (NASEMSO) recognizes the need for national EMS clinical guidelines to help state EMS systems ensure a more standardized approach to the practice of patient care now and, as experience dictates, the adoption of future practices. The value of EMS clinicians to the patient has no boundaries as magnified by the historic 2019 novel coronavirus pandemic as well as other interjurisdictional and global responses. Model EMS clinical guidelines promote uniformity in EMS medicine which, in turn, fosters a more consistent skilled practice as EMS clinicians move across healthcare systems. They also provide a standard to EMS medical directors upon which to base practice. Supported by initial and subsequent grant funding from NHTSA's Office of Emergency Medical Services (OEMS) and the Health Resources and Services Administration (HRSA) Maternal and Child Health Bureau's EMS for Children program, NASEMSO continues to authorize its Medical Directors Council to partner with national stakeholder organizations with expertise in EMS medical direction and subject matter experts to create a unified set of patient care guidelines. For those aspects of clinical care where evidence-based guidelines derived in accordance with the national evidence-based guideline model process were not available, consensus-based clinical guidelines are developed utilizing current available research.

The NASEMSO Model EMS Clinical Guidelines are not mandatory, are not meant to be all-inclusive, nor are they meant to determine local scope of practice. The focus of these guidelines is solely patient-centric. As such, they are designed to provide a resource for EMS clinical practice, appropriate patient care, safety of patients and clinicians, and outcomes regardless of the existing resources and capabilities within an EMS system. This document provides a clinical standard that can be used as is or adapted for use on a state, regional, local, or organizational level to enhance patient care and to set benchmark performance of EMS practice. The Guidelines should be adapted to align with federal, state, regional, and jurisdictional laws and regulations. NASEMSO's ongoing support of this project underlines the critical evolution of the model EMS clinical guidelines as new EMS research and evidence-based patient care measures emerge.
We are most grateful to be able to partner with a group of talented, committed individuals in this worthwhile endeavor.

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Purpose and Notes

These guidelines are intended to help state EMS systems ensure a more standardized approach to the practice of patient care, and to encompass evidence-based guidelines (EBG) as they are developed. The long-term goal is to develop a full range of evidence-based clinical guidelines for the practice of EMS medicine. However, until there is a sufficient body of evidence to fully support this goal, there is a need for this interim expert, consensus-based step.

The National Model EMS Clinical Guidelines can fill a significant gap in uniform clinical guidance for EMS patient care, while also providing input to the evidence-based guideline (EBG) development process. These guidelines will be maintained by the Medical Directors Council of the National Association of State EMS Officials (NASEMSO) and will be reviewed and updated periodically. As EBG material is developed, it will be substituted for the consensus-based guidelines now comprising the majority of the content of this document. In the interim, additional consensus-based guidelines will also be added as the need is identified. For guidelines to be considered for inclusion, they must be presented in the format followed by all guidelines in the document.

Universal Care and Poisoning/Overdose Universal Care guidelines are included to reduce the need for extensive reiteration of basic assessment and other considerations in every guideline. The appendices contain material such as neurologic status assessment and burn assessment tools to which many guidelines refer to increase consistency in internal standardization and to reduce duplication. While some specific guidelines have been included for pediatric patients, considerations of patient age and size (pediatric, geriatric, and bariatric) have been interwoven in the guidelines throughout the document. Where IV access and drug routing are specified, it is intended to include IO access and drug routing when IV access and drug routing is not possible.

Generic medication names are utilized throughout the guidelines. A complete list of these, along with respective brand names, may be found in Appendix III. “Medications”.

Accurate and quality data collection is crucial to the advancement of EMS and a critical element of EMS research. The National EMS Information System (NEMSIS) has the unique ability to unify EMS data on a national scope to fulfill this need. Each guideline, therefore, is also listed by the closest NEMSIS Version 3 Label and Code corresponding to it, listed in parentheses below the guideline name.

Quality assurance (QA) and/or continued performance improvement (CPI) programs are an indispensable element of medical direction as they facilitate the identification of gaps and potential avenues of their resolution within an EMS system. The National EMS Quality Alliance (NEMSQA) Performance Measures is a resource for these programs. This edition of the NASEMSO National Model EMS Clinical Guidelines incorporates many of the NEMSQA performance measures into the key performance measures associated with each clinical guideline.

Target Audience

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

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

Any set of guidelines must determine a balance between education and patient care. This document purposefully focuses on the patient care aspect of EMS response. This does not preclude the individual medical director from using these guidelines and including additional education as well as incorporation of state, local, or jurisdictional operational procedures.

What is New in the 2022 Edition

All of the 2017 guidelines have been reviewed and updated, and additional guidelines and new evidence-based guidelines have been added to this edition. While some of the new material has been added as guidelines in the appropriate chapter, other topics have been incorporated into a previously existing guideline. New guidelines have been added to the 2022 edition for the following clinical conditions or scenarios:

- Brief Resolved Unexplained Event (BRUE) & Acute Events in Infants
- Resuscitation in Traumatic Cardiac Arrest
- Tracheostomy Management
- Trauma Mass Casualty Incident

In addition, with the permission and assistance of the American College of Surgeons – Committee on Trauma, we have included the 2022 National Guideline for the Field Triage of Injured Patients as Appendix IX.

Acknowledgements

The authors of this document are NASEMSO Medical Director Council members partnered with representatives of seven EMS medical director stakeholder organizations. The stakeholder organizations are the American Academy of Emergency Medicine (AAEM), the American Academy of Pediatrics (AAP), the American College of Emergency Physicians (ACEP), the American College of Surgeons Committee on Trauma (ACS-COT), the Air Medical Physician Association (AMPA), and the National Association of EMS Physicians (NAEMSP).
In honor and gratitude, the authors of the inaugural NASEMSO National Model EMS Clinical Guidelines are also included. Their invaluable contributions and expertise to build the foundation of this evolutionary document will always be deeply respected and appreciated.

Universal Care

Universal Care Guideline

Aliases

Patient assessment
Patient history
Physical assessment
Primary survey
Secondary survey

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

All patient encounters with and care delivery by EMS personnel

Exclusion Criteria

None

Patient Management

Assessment

1. Assess scene safety
    a. Evaluate for hazards to EMS personnel, patient, 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
    f. Consider declaration of mass casualty incident if needed
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 suspected. [See Spine Care Guideline]
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 **M**assive 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 Guideline
   i. Patient is unable to maintain airway patency—open airway
      1. Head tilt/chin lift
      2. Jaw thrust
      3. Suction
      4. Consider use of the appropriate airway management adjuncts and devices: oral airway, nasal airway, supraglottic airway device or endotracheal tube
      5. 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 (SPO_2) based upon clinical presentation and assessment of ventilation (e.g., $EtCO_2$)
   iii. Apnea (not breathing) – go to Airway Management Guideline
c. Circulation
   i. Control any major external bleeding [See General Trauma Management Guideline and/or Extremity Trauma/External Hemorrhage Management Guideline]
   ii. Assess pulse
      1. If none – go to Resuscitation Section
      2. Assess 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** (**A**lert, **V**erbal, **P**ainful, **U**nresponsive)
   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 Guideline
   iv. If acute stroke suspected – go to Suspected Stroke/Transient Ischemic Attack Guideline
e. Expose patient for exam as appropriate to complaint
   i. Be considerate of patient modesty
   ii. Keep patient warm

6. Assess for 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-oropharynx
      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 Appendix VII. 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 more simple 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 Guideline
      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 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 obtain their contact phone number to provide to ED care team

<u>Treatment and Interventions</u>

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

<u>Transfer of Care</u>

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 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 guideline
6. Medical direction should be contacted when mandated or as needed
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
   a. Although the defined age varies by state, 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
   b. 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 by state, the geriatric population is generally defined as those patients who are 65 years old or more
   a. 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) or hepatic disease (i.e., severe cirrhosis or end-stage liver disease)
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 (e.g., non-invasive positive airway pressure devices)
   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 the American College of Surgeons Committee on Trauma (ACS-COT) *2022 National Guideline for the Field Triage of Injured Patients* 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)
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 federal, state, local or jurisdictional officials

Pertinent Assessment Findings
Refer to individual guidelines

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
- 9914075 – General - Universal Patient Care/Initial Patient Contact

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 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
- Compliance with provision of critical information during patient transfer of care
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*

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 appendix 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*			

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Functional Needs

Aliases

Developmental delay	Disabled	Handicapped
Impaired	Mental Illness	Intellectual Disability
Special needs		

Patient Care Goals

To meet and maintain the additional support required for patients with functional needs 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 that have experienced a decrement in health resulting in some degree of disability. According to the U.S. Department of Health and Human Services, this includes, but is not limited to, individuals with physical, sensory, mental health, and cognitive and/or intellectual disabilities affecting their ability to function independently without assistance

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
2. **Service Animals**
    As defined by the **American Disabilities Act**, "any guide dog, signal dog, or other animal individually trained to do work or perform tasks for the benefit of an individual with a disability, including, but not limited to guiding individuals with impaired vision, alerting individuals with

impaired hearing to intruders or sounds, providing minimal protection or rescue work, pulling a wheelchair, or fetching dropped items”

a. Services animals are not classified as a pet and should, by law, always be permitted to accompany the patient with the following exceptions:
    i. A public entity may ask an individual with a disability to remove a service animal from the premises if:
        1. The animal is out of control and the animal's handler does not take effective action to control it; or
        2. The animal is not housebroken
b. Service animals are not required to wear a vest or a leash. It is illegal to make a request for special identification or documentation from the service animal’s partner. EMS clinicians may only ask the patient if the service animal is required because of a disability and the form of assistance the animal has been trained to perform.
c. EMS clinicians are not responsible for the care of the service animal. If the patient is incapacitated and cannot personally care for the service animal, a decision can be made whether to transport the animal in this situation.
d. Animals that solely provide emotional support, comfort, or companionship do not qualify as service animals

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914063 – General - Individualized Patient Protocol
- 9914165 – Other

Key Documentation Elements

- Document all barriers in the NEMSIS element “eHistory.01 – Barriers to Patient Care” (NEMSIS Required National Element)
- Document specific physical barriers in the appropriate exam elements (e.g., “blind” under Eye Assessment; or paralysis, weakness, or speech problems under Neurological Assessment)
- Document any of the following, as appropriate in the narrative:
    - Language barriers:
        - The patient’s primary language of fluency
        - The identification of the person assisting with the communication
        - The methods through which the patient augments his/her communication skills
    - Sensory barriers:
        - The methods through which the patient augments his/her communication skills
        - Written communication between the patient and the EMS professional is part of the medical record, even if it is on a scrap sheet of paper, and it should be retained with the same collation, storage, and confidentiality policies and procedures that are applicable to the written or electronic patient care report
    - Assistance adjuncts (devices that facilitate the activities of life for the patient)

Performance Measure

- Accuracy of key data elements (chief complaint, past medical history, medication, allergies)
- Utilization of the appropriate adjuncts to overcome communication barriers

- Documentation of the patient's functional need and avenue exercised to support the patient
- Documentation of complete and accurate transfer of information regarding the functional need to the receiving facility
- Barriers documented under "eHistory.01—Barriers to Patient Care"

References

1. International classification of functioning, disability, and health. Presented at: 54th World Health Assembly, WHA 54.21, Agenda Item 13.9; May 21, 2001
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Revision Date

March 11, 2022

Patient Refusals

Aliases

Against medical advice
Refusal of treatment
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. However, state laws vary in the definition of competency and its impact upon authority. Therefore, one should consult with the respective state EMS office for clarification on legal definitions and patient rights.

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
3. If patient has capacity, clearly explain to the individual and all responsible parties the possible risks and overall concerns with regards to refusing care and that they may reengage the EMS system if needed
4. Perform appropriate medical care with the consent of the individual
5. Complete the patient care report clearly documenting the initial assessment findings and the discussions with all involved individuals regarding the possible consequences of refusing additional prehospital care and/or transportation

Notes/Educational Pearls

Key Considerations

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

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 released at the scene. Mental illness, drugs, alcohol intoxication, or physical/mental impairment may significantly impair an individual's decision-making capacity. Individuals who have attempted suicide, verbalized suicidal intent, or 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
   a. All states allow healthcare clinicians to provide emergency treatment when a parent is not available to provide consent. This is known as the emergency exception rule or the doctrine of implied consent. For minors, this doctrine means that the 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 emergent 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
- 9914189 – General - Refusal of Care

Key Documentation Elements
- Document patient capacity with:
  - All barriers to patient care in the NEMSIS element "eHistory.01—Barriers to Patient Care" (a Required National Element of NEMSIS)
  - Exam fields for "eExam.19—Mental Status" and "eExam.20—Neurological Assessment"
  - Vitals for level of responsiveness and Glasgow Coma Scale
  - Alcohol and drug use indicators

    - Blood glucose level (as appropriate to situation and patient history)
- Patient Age
- Minors who are not emancipated 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 as indicated by EMS agency protocol
- Guardians contacted or efforts to contact the guardians for minor patients who are not or cannot be confirmed to be emancipated

References
1. Patient Autonomy and Destination Factors in Emergency Medical Services (EMS) and EMS-Affiliated Mobile Integrated Healthcare/Community Paramedicine Programs. Acep.org. https://www.acep.org/globalassets/new-pdfs/policy-statements/patient-autonomy-and-destination-factors-in-ems.pdf Revised October 2015. Accessed March 11, 2022

Revision Date
March 11, 2022

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".
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 Guideline)
2. Patients with ongoing mental status changes or coma should be treated per the Altered Mental Status Guideline
3. Patients with persistent new neurologic deficit [See Suspected Stroke/Transient Ischemic Attack Guideline]

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)
      1. Syncope that occurs during exercise often indicates an ominous cardiac cause. Patients should be evaluated in the emergency department
   ii. Patient complaints before or after the event including prodromal symptoms
   iii. 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
   iv. Occult blood loss (gastrointestinal (GI)/genitourinary (GU))
   v. Palpitations
   vi. 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. Heart, lung, abdominal, and extremity exam
   v. Additional Evaluation:
      1. Cardiac monitoring
      2. Oxygen saturation (SPO_2)
      3. Ongoing vital signs
      4. 12-lead EKG
      5. 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 guideline)

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 Guideline]

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, 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914149 – Medical – Syncope

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Stroke — 01: Suspected Stroke Receiving Prehospital Stroke Assessment*

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1. Anderson JB, Willis M, Lancaster H, Leonard K, Thomas C. The evaluation and management of pediatric syncope. *Pediatr Neurol*. 2016; 55:6–13 https://doi.org/10.1016/j.pediatrneurol.2015.10.018
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Revision Date
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Chest Pain/Acute Coronary Syndrome (ACS)/ST-segment Elevation Myocardial Infarction (STEMI)

Aliases

Heart attack
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 Guideline

Exclusion Criteria

None noted

Patient Management

Assessment, Treatment, and Interventions

1. 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 Guideline]
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 q (quaque, 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 or pressor
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

1. 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
4. Consider configuring monitor/defibrillator to allow automatic VT/VF alert
5. 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.

Go To TOC

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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914117 – Medical - Cardiac Chest Pain
- 9914143 – Medical - ST-Elevation Myocardial Infarction (STEMI)

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 contact 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)

**NOTE: These measures can only be evaluated if EMS documentation can be combined with information provided by the receiving hospital*

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Bradycardia

Aliases
Heart block
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 I
      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 Guideline and Hyperglycemia Guideline

f. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:
   i. Atropine 1 mg IV q 3–5 minutes (maximum total dose of 3 mg)
   ii. Vasopressor medications (in order of preference)
      1. Epinephrine IV drip 0.02–0.2 mcg/kg/min titrated to a MAP greater than 65 mmHg **OR**
      2. Epinephrine 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 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 Guideline
   g. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:
      i. Epinephrine 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 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

<u>Patient Safety Considerations</u>
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 guideline 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
9. Although dopamine is often recommended for the treatment of symptomatic bradycardia, recent research suggests that patients in cardiogenic or septic shock treated with norepinephrine have a lower mortality rate compared to those treated with dopamine
10. **Caution: Norepinephrine can theoretically cause reflex bradycardia**

Pertinent Assessment Findings

None noted

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914115 – Medical - Bradycardia

Key Documentation Elements

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

- History of event supporting treatment of underlying causes

Performance Measures

- Blood sugar obtained
- Correct medication(s) and dose given for patient condition, age, and weight
- Correct application and use of cardiac pacing
- Use of sedation or pain management with cardiac pacing
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Hypoglycemia—01: Treatment Administered for Hypoglycemia*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date

March 11, 2022

Implantable Ventricular Assist Devices

Aliases

Biventricular assist device (BiVAD)
Right ventricular assist device (RVAD)
Left ventricular assist device (LVAD)
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
    b. May repeat up to 3 times based on patient's condition and clinical impression for a total cumulative dose not to exceed 3 L
8. If patient is in full cardiac arrest:
    a. CPR should not be performed if there is any evidence the pump is still functioning. The decision whether to perform CPR should be made based upon best clinical judgment in consultation with the patient's VAD-trained companion and the VAD coordinator (or direct medical oversight if VAD coordinator unavailable)
    b. CPR may be initiated only where:
        i. You have confirmed the pump has stopped and troubleshooting efforts to restart it have failed, and
        ii. The patient is unresponsive and has no detectable signs of life

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
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914065 – General - Indwelling Medical Devices/Equipment
- 9914069 – General - Medical Device Malfunction

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

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Revision Date

March 11, 2022

Tachycardia with a Pulse

Aliases

Atrial fibrillation (A-FIB)
Atrial flutter
Supraventricular tachycardia (SVT)
Multifocal atrial tachycardia (MAT)
Torsades
Ventricular tachycardia (VT)

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)
    c. History of dysrhythmia
    d. 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 Guideline
    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 Guideline
f. Consider the following additional therapies if tachycardia and symptoms or hemodynamic instability continue:

i. **Regular Narrow Complex Tachycardia – Stable** (SVT)
1. Perform vagal maneuvers
2. 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914147 – Medical - Supraventricular Tachycardia (including A-FIB)
- 9914151 – Medical - Ventricular Tachycardia (with pulse)
- 9914199 – Medical-Tachycardia

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Hypoglycemia—01: Treatment Administered for Hypoglycemia*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date

March 11, 2022

Suspected Stroke/Transient Ischemic Attack

Aliases

Cerebrovascular accident (CVA)
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 Guideline
2. If trauma and Glasgow Coma Score (GCS) less than or equal to 13, treat per the Head Injury Guideline and General Trauma Management Guideline

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 Appendix VII. 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 Guideline
4. Check blood glucose level (BGL)
   a. Treat only if glucose less than 60 mg/dL
5. Acquire 12-lead EKG, if possible
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 4½ 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914145 – Medical - Stroke/TIA

Key Documentation Elements

- "Last known well" must be specific
  - 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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Stroke—01: Suspected Stroke Receiving Prehospital Stroke Assessment*
    NOTE: This measure can only be evaluated if EMS documentation can be combined with information provided by the receiving hospital

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Revision Date

March 11, 2022

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 Management Guideline]
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 Guideline
2. Obtain vital signs including pulse, blood pressure, respiratory rate, neurologic status assessment
3. Obtain blood glucose if hyperglycemia is suspected per Hyperglycemia Guideline
4. Provide evaluation and management of pain per the Pain Management Guideline
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. Abdominal pain with motion or palpation of the abdomen
        iii. Fever
        iv. Bloody stool
        v. Nausea and vomiting
        vi. Absence of passage of stool or gas
        vii. 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 Shock Guideline
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 Guideline
    b. Administer antiemetics per the Nausea-Vomiting Guideline
    c. Provide transport to an appropriate receiving facility. Consider specialty destination centers for conditions such as suspected abdominal aortic aneurysm 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
3. Consider transport to a specialty surgical center if aortic aneurysm or aortic dissection is suspected

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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914109 – Medical - Abdominal Pain

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 Guideline

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Revision Date

March 11, 2022

Abuse and Maltreatment

Aliases

Maltreatment of vulnerable populations
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 state guidelines

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 themself, 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 Guideline]

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:
   a. Multiple bruises in various stages of healing. A complete skin exam can help identify suggestive findings that would otherwise be missed
   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. 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 immediately, in accordance with state law, including:
    a. Caregivers impeding your ability to assess/transport patient
    b. Caregivers refusing care for the patient
4. For patients transported, report concerns to hospital and/or law enforcement personnel (including Child Protective Services agencies where appropriate) per mandatory reporting laws

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
3. In situations of parental or religious objections to life-saving medical care when EMS suspects abuse, law enforcement should be notified for assistance

Notes/Educational Pearls

Key Considerations

1. All states have specific mandatory reporting laws that dictate which specific crimes such as suspected abuse or maltreatment must be reported and to whom they must be reported. It is important to be familiar with the specific laws in your state including specifically who must make disclosures, what the thresholds are for disclosures, and to whom the disclosures must be made
2. Clues to abuse or maltreatment can vary depending on the age group of the patient and on the nature of the abuse. Remember that not all abuse or maltreatment involves physical harm. 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
3. Abuse and maltreatment can happen to patients of all ages
4. 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
5. 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914187 – General - Neglect or Abuse Suspected

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

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Revision Date

March 11, 2022

Agitated or Violent Patient/Behavioral Emergency

Aliases

Acute psychosis
Patient restraint

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 sole 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 (Limited data available, optimal dose not established)
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
e. Antihistamines
i. Diphenhydramine
1. **Adults:** 25–50 mg IM/IV/PO
2. **Pediatrics**: 1 mg/kg IM/IV/PO (maximum dose of 25 mg)
2. 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
   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) 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. Mydriasis (dilated pupils)
   c. Ataxia
   d. Cessation of perspiration
   e. Dry mucous membranes
   f. 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
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914053 – General - Behavioral/Patient Restraint

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date

March 11, 2022

Anaphylaxis and Allergic Reaction

(Adapted from an evidence-based guideline created using the National Prehospital Evidence-Based Prehospital Guideline 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 Appendix VIII. 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 administration is the primary treatment for anaphylaxis. If signs of anaphylaxis, administer epinephrine 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 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 1 mg/mL, 5 mL nebulized
4. If stridor is present, consider administering epinephrine 1 mg/mL, 5 mL nebulized
5. If signs of anaphylaxis and hypoperfusion persist following the first dose of epinephrine, additional IM epinephrine 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 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 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 delivery
2. Concentration of epinephrine 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 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
7. There is no proven benefit to using steroids in the management of allergic reactions and/or anaphylaxis
8. There is controversy among experts with very low-quality evidence to guide management for the use of empiric IM epinephrine after exposure to a known allergen in asymptomatic patients with a history of prior anaphylaxis

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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914111 – Medical - Allergic Reaction/Anaphylaxis

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)
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date

March 11, 2022

Altered Mental Status

Aliases

Altered level of consciousness
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 SPO_2, $EtCO_2$, 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, social indicators of neglect, carbon monoxide exposures, multiple casualties with same complaint

Treatment and Interventions

1. Oxygen [Refer to Universal Care Guideline]
2. Glucose [Refer to Hypoglycemia Guideline or Hyperglycemia Guideline]

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

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 Guideline]

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
   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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914113 – Medical - Altered Mental Status

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
    - Blood glucose level obtained
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Hypoglycemia—01: Treatment Administered for Hypoglycemia*
- 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

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Revision Date
March 11, 2022

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 Guideline]
3. Back pain from suspected labor [See OB/GYN Section]

Patient Management

Assessment

1. Perform airway assessment and management, per the Airway Management Guideline
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 Guideline
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 Guideline
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 Guideline
    b. Administer antiemetics, per Nausea-Vomiting Guideline
    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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914051 – General - Back Pain

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 Guideline

References

None noted

Revision Date

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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 Guideline]
    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. Morphine 1–5

mg IV, IM or SQ initially and repeat as needed. If symptoms are unrelieved, follow written hospice orders or contact medical direction for additional doses to administer

d. Anxiolytic if needed for anxiety, lorazepam 1 mg SL (pediatric 0.1 mg/kg) If not avail, consider the administration of diazepam or midazolam.

7. If the patient has nausea [See Nausea-Vomiting Guideline]
8. If the patient has excessive secretions or aspiration, provide suctioning
9. If the patient is anxious or has delirium, in addition to nonpharmacologic interventions such as creating a quiet environment, frequent reassurance, touch and verbal orientation, consider:
   a. Benzodiazepines (diazepam, lorazepam, midazolam)
      OR
   b. Haloperidol 5 mg PO/IM/IV (pediatric: 0.5-1 mg)
      OR
   c. Ziprasidone 20 mg IM (pediatric 5 years old or older 0.2 mg/kg IM
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
    c. Consider administration of normal saline at 10–20 mL/kg IV
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-life care
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914169 – Cardiac Arrest - Do Not Resuscitate
- 9914171 – Cardiac Arrest - Special Resuscitation Orders
- 9914177 – General - Exception Protocol

Key Documentation Elements

- Interaction with hospice or end-of-life care clinician
- Confirmation of advanced directive or other advanced care documentation

- Pain score if applicable

Performance Measures

- If patient in pain, pain score change
- If patient is nauseated, symptom relief
- If patient is dehydrated, symptom relief or vital sign change

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Revision Date

March 11, 2022

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 Guideline]
2. Adult or pediatric patient with stroke symptoms (e.g., hemiparesis, dysarthria) [See Suspected Stroke/Transient Ischemic Attack Guideline]
3. Adult or pediatric patient with seizure [See Seizures Guideline]
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 Shock Guideline]
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 Guideline, Suspected Stroke/Transient Ischemic Attack Guideline, or Shock Guideline 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 Guideline.
      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 Guideline.
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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914121 – Medical - Hyperglycemia

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date

March 11, 2022

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 Guideline]
3. Patients with stroke symptoms (e.g., hemiparesis, dysarthria) [See Suspected Stroke/Transient Ischemic Attack Guideline]
4. Patients with seizure [See Seizures Guideline]
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 Guideline or Suspected Stroke/Transient Ischemic Attack Guideline 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 own airway:
   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% dextrose IV
         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% dextrose IV
         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 be completed

a. 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

2. 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 noted above
3. 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 of patient. 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. For neonates and infants less than 1 month of age, dextrose concentration of no more 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/kg) = 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914125 – Medical - Hypoglycemia/Diabetic Emergency

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) when indicated

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Hypoglycemia—01: Treatment Administered for Hypoglycemia*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date
March 11, 2022

Nausea-Vomiting

Aliases

Emesis
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 and Interventions

1. Antiemetic medication administration
    a. Isopropyl alcohol: Allow patient to inhale vapor from isopropyl alcohol wipe 3 times q (quaque, 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 than 12 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914131 – Medical - Nausea/Vomiting

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
- ***EMS®*** **NEMSQA** ***Measure*** *(for additional information, see www.nemsqa.org)*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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Revision Date

March 11, 2022

Pain Management

Aliases
Analgesia
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 guidelines 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. 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 Guideline]
9. If indicated based on pain assessment, and vital signs allow, repeat pain medication administration (excluding acetaminophen 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 (SPO_2 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914071 – General - Pain Control

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
  - *Trauma—01: Pain Assessment of Injured Patients*

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.

Table 2. Universal Pain Assessment Tool

Wong- Baker FACES®						
Verbal Descriptor Scale	0 1 2 3 4 5 6 7 8 9 10					
	No Pain	Mild Pain	Moderate Pain	Severe Pain	Very Severe Pain	Excruciating Pain
Descriptive Scale	Alert Smiling	No Humor Serious, Flat	Furrowed Brow Pursed Lips Breath Holding	Wrinkled Nose Raised Upper Lip Rapid Breathing	Slow Blink Open Mouth	Eyes Closed Moaning Crying
Activity Tolerance Scale	No Pain	Can be Ignored	Interferes with Tasks	Interferes with Concentration	Interferes with Basic Needs	Bed Rest Required
Spanish	Nada de Dolor	Un Poquito de Dolor	Un Dolor Leve	Dolor Fuerte	Dolor Desmasiado Fuerte	Un Dolor Insoportable

Source: Hybrid of scales by authors. Wong-Baker FACES® Pain Scale Rating license grants this use. Reproduction of the Wong-Baker FACES® material requires licensing at www.wongbakerfaces.org.

Pediatric-Appropriate Pain Assessment Tools

Table 3. Faces, Legs, Activity, Cry, Consolability (FLACC) Behavioral Scale

Categories	Appropriate age for use (per guideline): less than 4 years		
	Scoring		
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to, distractible	Difficult to console or comfort
Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Consolability is scored from 0–2, which results in a total score between zero and ten.			

Source: © 2002, The Regents of the University of Michigan. All Rights Reserved.

Instructions:

- **Patients who are awake:** Observe for at least 1–2 minutes. Observe legs and body uncovered. Reposition patient or observe activity, assess body for tenseness and tone. Initiate consoling interventions if needed
- **Patients who are asleep:** Observe for at least 2 minutes or longer. Observe body and legs uncovered. If possible, reposition the patient. Touch the body and assess for tenseness and tone.

Face

- Score 0 point if patient has a relaxed face, eye contact and interest in surroundings
- Score 1 point if patient has a worried look to face, with eyebrows lowered, eyes partially closed, cheeks raised, mouth pursed
- Score 2 points if patient has deep furrows in the forehead, with closed eyes, open mouth and deep lines around nose/lips

Legs

- Score 0 points if patient has usual tone and motion to limbs (legs and arms)
- Score 1 point if patient has increase tone, rigidity, tense, intermittent flexion/extension of limbs
- Score 2 points if patient has hyper tonicity, legs pulled tight, exaggerated flexion/extension of limbs, tremors

Activity

- Score 0 points if patient moves easily and freely, normal activity/restrictions
- Score 1 point if patient shifts positions, hesitant to move, guarding, tense torso, pressure on body part
- Score 2 points if patient is in fixed position, rocking, side-to-side head movement, rubbing body part

Cry

- Score 0 points if patient has no cry/moan awake or asleep
- Score 1 point if patient has occasional moans, cries, whimpers, sighs
- Score 2 points if patient has frequent/continuous moans, cries, grunts

Consolability

- Score 0 points if patient is calm and does not require consoling
- Score 1 point if patient responds to comfort by touch or talk in ½ – 1 minute
- Score 2 points if patient require constant consoling or is unconsoled after an extended time

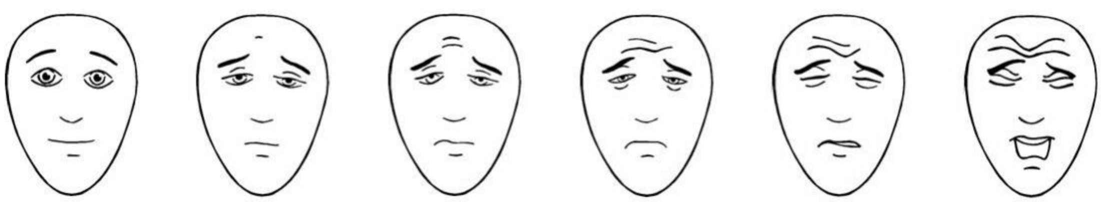
Whenever feasible, behavioral measurement of pain should be used in conjunction with self-report. When self-report is not possible, interpretation of pain behaviors and decision-making regarding treatment of pain requires careful consideration of the context in which the pain behaviors were observed.

Each category is scored on a 0–2 scale, which results in a total score of 0–10

Assessment of Behavioral Score:
0 = Relaxed and comfortable
1–3 = Mild discomfort
4–6 = Moderate pain
7–10 = Severe discomfort/pain

Source: *The FLACC: A behavioral scale for scoring postoperative pain in young children*, by S Merkel and others, 1997, *Pediatr Nurse* 23(3), p. 293–297.

Graphic 1. Faces Pain Scale – Revised (FPS-R)



In the following instructions, say "hurt" or "pain", whichever seems right for a particular child. "These faces show how much something can hurt. This face [point to face on far left] shows no pain. The faces show more and more pain [point to each from left to right] up to this one [point to face on far right] — it shows very much pain. Point to the face that shows how much you hurt [right now]."
Score the chosen face 0, 2, 4, 6, 8, or 10, counting left to right, so “0” = “no pain” and “10” = “very much pain”. Do not use words like “happy” or “sad.” This scale is intended to measure how children feel inside, not how their face looks.
Source: Permission for Use. Copyright of the FPS-R is held by the International Association for the Study of Pain (IASP) ©2001. This material may be photocopied for non-commercial clinical, educational and research use. For reproduction of the FPS-R in a journal, book or web page, or for any commercial use of the scale, request permission from IASP online at https://www.iasp-pain.org/publications/copyright-permissions/.

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Revision Date
March 11, 2022

Seizures

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

Aliases

Convulsions
Eclampsia
Febrile seizure
Status epilepticus

Patient Care Goals

1. Prompt cessation of seizures in the prehospital setting
2. Minimizing adverse events in the treatment of seizures in the prehospital setting
3. Minimizing seizure recurrence during transport

Patient Presentation

Seizures due to trauma, pregnancy, hyperthermia, or toxic exposure should be managed according to those condition-specific guidelines

Inclusion Criteria

Seizure activity upon arrival of prehospital personnel or new/recurrent seizure activity lasting greater than 5 minutes

Exclusion Criteria

None noted

Patient Management

Assessment

1. History
   a. Duration of current seizure
   b. Prior history of seizures, diabetes, or hypoglycemia
   c. Typical appearance of seizures
   d. Baseline seizure frequency and duration
   e. Focality of onset, direction of eye deviation
   f. Concurrent symptoms of apnea, cyanosis, vomiting, bowel/bladder incontinence, or fever
   g. Bystander administration of medications to stop the seizure
   h. Current medications, including anticonvulsants
   i. Recent dose changes or non-compliance with anticonvulsants
   j. History of trauma, pregnancy, heat exposure, or toxin exposure
2. Exam
   a. Airway patency
   b. Breath sounds, respiratory rate, and effectiveness of ventilation
   c. Signs of perfusion (pulses, capillary refill, color)
   d. Neurologic status (GCS, nystagmus, pupil size, focal neurologic deficit, or signs of stroke)

Treatment and Interventions

1. If signs of airway obstruction are present and a chin-lift, jaw thrust, positioning, and/or suctioning does not alleviate it, place oropharyngeal airway (if gag reflex is absent) or nasopharyngeal airway
2. Place pulse oximeter and/or waveform capnography to monitor oxygenation/ventilation
3. Administer oxygen as appropriate with a target of achieving 94–98% saturation. Use bag-valve-mask (BVM) ventilation if oxygenation/ventilation are compromised
4. Assess perfusion
5. Assess neurologic status
6. Routes for treatment
    a. IN/IM routes are preferred over IV or IO routes (if not already established) and rectal (PR) route as an alternative
        i. If no other route of delivery (IM/IV/IO/IN), diazepam 0.2 mg/kg PR (maximum dose 20 mg)
    b. IV placement is not necessary for treatment of seizures, but could be obtained if needed for other reasons
7. Anticonvulsant Treatment
    a. If vascular access is absent
        i. Midazolam 0.2 mg/kg (maximum dose 10 mg), IM preferred, or IN
    b. If vascular access (IV or IO) is present:
        i. Diazepam 0.2 mg/kg IV or IO, maximum 10 mg
        ii. Lorazepam 0.1 mg/kg IV or IO, maximum 4 mg
        iii. Midazolam 0.1 mg/kg IV or IO, maximum 4 mg
8. Glucometry
    a. If still actively seizing, check blood glucose level
    b. If less than 60 mg/dL, treat per the Hypoglycemia Guideline
9. Administer magnesium sulfate in the presence of seizure in the third trimester of pregnancy or postpartum [See Eclampsia/Pre-eclampsia Guideline]
10. For febrile seizures, consider the following interventions after stopping the seizure. Please note that the administration of nonsteroidal anti-inflammatory medications is contraindicated in infants less than 6 months of age. The following interventions provide symptomatic relief for fevers, but do not stop the seizure:
    b. Acetaminophen 15 mg/kg, maximum dose 650 mg, PR/IV/IO (if unable to swallow) or PO (if able to swallow)
    AND/OR
    c. Ketorolac 1 mg/kg, maximum dose 15 mg, IV (if unable to swallow) OR Ibuprofen 10 mg/kg, maximum dose 600 mg, PO (if able to swallow)
    AND/OR
    d. Removing excessive layers of clothing
    AND/OR
    e. Applying cool compresses to the body
11. Consider acquiring a 12-lead EKG following cessation of seizure in patients without a history of seizure to determine possible cardiac cause

Patient Safety Considerations

1. Trained personnel should be able to give medication without contacting medical direction, however, more than two doses of benzodiazepines are associated with high-risk of airway compromise
    a. Use caution, weigh risks/benefits of deferring treatment until hospital, and/or consider consultation with medical direction if patient has received two doses of benzodiazepines by bystanders and/or prehospital clinicians
2. Hypoglycemic patients who are treated in the field for seizure should be transported to hospital, regardless of whether they return to baseline mental status after treatment

Notes/Educational Pearls

Key Considerations

1. Many airway/breathing issues in seizing patients can be managed without intubation or placement of an advanced airway. Reserve these measures for patients that fail less invasive maneuvers as noted above
2. For children with convulsive status epilepticus requiring medication management in the prehospital setting, trained EMS personnel should be allowed to administer medication without medical direction
3. For new onset seizures or seizures that are refractory to treatment, consider other potential causes including, but not limited to, trauma, stroke, electrolyte abnormality, toxic ingestion, pregnancy with eclampsia, hyperthermia
4. A variety of safe and efficacious doses for benzodiazepines have been noted in the literature for seizures
    a. The doses for anticonvulsant treatment noted above are those that are common to the forms and routes of benzodiazepines noted in this guideline
    b. One dose, rather than a range, has been suggested to standardize a common dose in situations when an EMS agency may need to switch from one type of benzodiazepine to another due to cost or resource limitations
5. Recent evidence supports the use of midazolam IM as an intervention that is at least as safe and effective as intravenous lorazepam for prehospital seizure cessation

Pertinent Assessment Findings

The presence of fever with seizure in children less than 6 months old and greater than 6 years old is not consistent with a simple febrile seizure, and should prompt evaluation for meningitis, encephalitis, or other cause

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914141 – Medical - Seizure

Key Documentation Elements

- Actively seizing during transport and time of seizure onset/cessation
- Onset, focality, direction of eye deviation
- Concurrent symptoms of apnea, cyanosis, vomiting, bowel/bladder incontinence, or fever
- Medication amounts/routes given by bystanders or prehospital clinicians

- Neurologic status (GCS, nystagmus, pupil size, focal neurologic deficit, or signs of stroke)
- Blood glucose level

Performance Measures

- Frequency of performing glucometry
- Time to administration of anticonvulsant medication
- Rate of respiratory failure
- Rate of seizure recurrence

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Revision Date

March 11, 2022

Shock

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

Aliases

None noted

Patient Care Goals

1. Initiate early fluid resuscitation and vasopressors to maintain/restore adequate perfusion to vital organs
2. Differentiate between possible underlying causes of shock to promptly initiate additional therapy

Patient Presentation

Inclusion Criteria

1. Signs of poor perfusion (due to a medical cause) such as one or more of the following:
   a. Altered mental status
   b. Delayed capillary refill (> 3 seconds)
   c. Flash capillary refill (> 1 second) seen in early septic shock
   d. Decreased urine output
   e. Respiratory rate greater than 20 breaths per minute in adults or elevated in children (See normal vital signs table)
   f. Hypotension for age (lowest acceptable systolic blood pressure in mmHg):
      i. Less than 1 years of age: 60
      ii. 1–10 years old: (age in years) (2) + 70
      iii. Greater than 10 years old: 90
   g. Tachycardia or bradycardia for age, out of proportion to temperature [See Appendix VIII. Abnormal Vital Signs]
   h. Weak, decreased or bounding pulses
   i. Cool/mottled or flushed/ruddy skin
2. Potential etiologies of shock:
   a. Hypovolemic (hemorrhagic or non-hemorrhagic)
   b. Distributive (sepsis, anaphylaxis, neurogenic, overdose, endocrine)
   c. Cardiogenic (cardiomyopathy, dysrhythmia, valve disorder)
   d. Obstructive (pulmonary embolism (PE), tension pneumothorax, cardiac tamponade)
   e. Combined (one form causing another)

Exclusion Criteria

Shock due to suspected trauma [See Trauma Section]

Patient Management

Assessment

1. History
   a. History of GI bleeding

   b. Cardiac problems
   c. Stroke
   d. Fever
   e. Nausea/vomiting, diarrhea
   f. Frequent or no urination
   g. Syncopal episode
   h. Allergic reaction
   i. Immunocompromise (malignancy, transplant, asplenia)
   j. Adrenal insufficiency
   k. Presence of a central line or port
   l. Other risk of infection (spina bifida or other genitourinary anatomic abnormality)
   m. Overdose
2. Exam
   a. Airway/breathing (airway edema, rales, wheezing, pulse oximetry, respiratory rate)
   b. Circulation (heart rate, blood pressure, capillary refill)
   c. Abdomen (hepatomegaly)
   d. Mucous membrane hydration
   e. Skin (turgor, rash)
   f. Neurologic (GCS, sensorimotor deficits)
3. Determination of type of shock
   a. Cardiogenic
   b. Distributive (neurogenic, septic, anaphylactic)
   c. Hypovolemic
   d. Obstructive (e.g., pulmonary embolism, cardiac tamponade, tension pneumothorax)

Treatment and Interventions

1. Check vital signs
2. Administer oxygen as appropriate with a target of achieving 94–98% saturation
3. Cardiac monitor
4. Pulse oximetry and $EtCO_2$ (reading of less than 25 mmHg may be sign of poor perfusion)
5. Check blood sugar, and correct if less than 60 mg/dL
6. EKG
7. Check lactate, if available (greater than 2 mmol/L is abnormal)
8. Establish IV access. If unable to obtain within two attempts or less than 90 seconds, place an IO needle
9. IV fluid volume goal attained by giving boluses that are pressure infused over less than 15 minutes each based on patient's condition and clinical impression. Fluid volume goal to achieve a mean arterial pressure (adults) or other targets (pediatrics). Mean Arterial Pressure is calculated: (MAP = [(2X diastolic) + (systolic]/3)
   a. Adult
      i. Physiologic target: MAP goal 65 mmHg
      ii. Fluid goal of up to 30 mL/kg of isotonic fluid by administering rapid, predetermined boluses (e.g., 500 mL) unless the MAP goal is achieved, or pulmonary edema develops.
      iii. If available, the administration of packed red blood cells or whole blood may be indicated for hemorrhagic shock
   b. Pediatric

        i. Physiologic targets: Systolic blood pressure at least fifth percentile for age, strong distal pulses, warm skin perfusion, capillary refill less than 2 seconds and improving mental status.
        ii. Fluid goal of up to a total of 60 mL/kg or 1 liter of isotonic fluid by giving 20 mL/kg of isotonic fluid by administering rapid boluses (for cardiogenic shock give 10 mL/kg boluses)
        iii. If available, the administration of packed red blood cells or whole blood may be indicated for hemorrhagic shock

10. If there is a history of adrenal insufficiency, long-term steroid dependence, or fluid-refractory shock requiring vasopressors give:
    a. Hydrocortisone succinate, 2 mg/kg (maximum 100 mg) IV/IM (preferred)
       OR
    b. Methylprednisolone 2 mg/kg IV (maximum 125 mg)
       OR
    c. Dexamethasone 0.6 mg/kg IV/IM (maximum dose of 16 mg)
11. Vasopressors (shock unresponsive to IV fluids) titrated to physiologic targets
    a. Cardiogenic, hypovolemic, obstructive shock and distributive shock:
        i. Norepinephrine 0.05–0.5 mcg/kg/minute
            1. Preference in both neurogenic and infectious (sepsis) causes of distributive shock
        ii. Epinephrine, 0.05–0.3 mcg/kg/minute
            1. Alternative to a drip, push dose epinephrine may be administered:
                a. Prepare 10 mcg/mL by diluting 1 mL of epinephrine 0.1 mg/mL (1:10,000) in 9 mL of normal saline
                b. Administer 0.01 mg/kg (0.1 mL/kg) up to a maximum single dose of 10 mcg (1 mL) q 3–5 minutes titrated to maintain goal MAP. An example is shown below:
                    - 10 kg child receives 1 mL of the diluted epinephrine
                    - 20 kg child receives 2 mL of the diluted epinephrine
                    - 30 kg child receives 3 mL of the diluted epinephrine
        iii. Dopamine, 2–20 mcg/kg/minute if norepinephrine or epinephrine is not available or for other specific causes of shock.
12. For anaphylactic shock, treat per the Anaphylaxis and Allergic Reaction Guideline
13. Provide advanced notification to the hospital
14. Consider empiric antibiotics for suspected septic shock if transport time is anticipated to be prolonged, if blood cultures can be obtained in advance, and/or EMS has coordinated with regional receiving hospitals about choice of antibiotic therapy
15. Antipyretics for fever – nonsteroidal anti-inflammatory agents are contraindicated in infants less than 6 months of age
    a. Acetaminophen (15 mg/kg; maximum dose of 1000 mg)
    b. Ibuprofen (10 mg/kg; maximum dose of 800 mg)

Patient Safety Considerations

Recognition of cardiogenic shock - If the patient condition deteriorates after fluid administration, rales or hepatomegaly develop, then consider cardiogenic shock and withholding further fluid administration

Notes/Educational Pearls

Key Considerations

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

Pertinent Assessment Findings

1. Decreased perfusion manifested by altered mental status, or abnormalities in capillary refill or pulses, decreased urine output (1 mL/kg/hr):
    a. **Cardiogenic, hypovolemic, obstructive shock**: capillary refill greater than 2 seconds, diminished peripheral pulses, mottled cool extremities
    b. **Distributive shock**: flash capillary refill, bounding peripheral pulses

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914127 – Medical - Hypotension/Shock (Non-Trauma)

Key Documentation Elements

- Medications administered
- Full vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) with reassessment q 15 minutes or more frequently as appropriate
- Lactate level (if available)
- Neurologic status assessment [See Appendix VII. Neurologic Status Assessment]
- Amount of fluids given

Performance Measures

- Percentage of patients who have full vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment), temperature and O_2 saturation) documented
- Presence of a decision support tool (laminated card, a protocol, or electronic alert) to identify patients in shock
- Percentage of patients with suspected shock for whom advanced notification to the hospital was provided
- Mean time from abnormal vitals to initiation of a fluid bolus
- Percentage of patients who receive pressors for ongoing hypotension after receiving 30 mL/kg isotonic fluid in the setting of shock

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Revision Date

March 11, 2022

Sickle Cell Pain Crisis

Aliases
None noted

Patient Care Goals
1. Identify potentially life-threatening complications of a sickle cell disease
2. Improve patient comfort

Patient Presentation

Inclusion Criteria
Patient with known sickle cell disease experiencing a pain crisis

Exclusion Criteria
1. Pain due to acute traumatic injury [See Trauma Section]
2. Abdominal pain due to or related to pregnancy [See OB/GYN Section]
3. Patients with sickle cell trait

Patient Management

Assessment
1. Perform airway assessment and management per the Airway Management Guideline
2. Obtain vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) and pulse oximetry
3. Provide evaluation and management of altered mental status per the Altered Mental Status Guideline
4. Provide evaluation and management of pain per the Pain Management Guideline
5. Obtain vascular access as necessary to provide analgesia and/or fluid resuscitation
6. Assess for potentially serious complications other than pain crisis which may include:
    a. Acute chest syndrome
        i. Hypoxia
        ii. Chest pain
        iii. Fever
    b. Stroke [See Suspected Stroke/Transient Ischemic Attack Guideline]
        i. Focal neurologic deficits
    c. Meningitis
        i. Headache
        ii. Altered mental status
        iii. Fever
    d. Septic arthritis
        i. Severe pain in a single joint
        ii. Fever
    e. Splenic sequestration crisis (usually young pediatric patients)
        i. Abdominal pain, LUQ
        ii. Splenic enlargement (examine with care)
        iii. Hypotension, tachycardia

f. Severe anemia
   i. Pallor
   ii. Fatigue
   iii. Dyspnea or dyspnea on exertion
   iv. Shock
g. Infections
   i. Pneumonia (cough, fever, sputum shortness of breath)
h. Priapism
   i. Painful, prolonged erection in the absence of sexual activity
i. Venous thromboembolism
   i. Calf pain, tenderness, swelling, chest/back pain especially with inspiration, shortness of breath

7. Assess for signs of shock – If shock is present, treat per Shock Guideline

Treatment and Interventions

1. Medication Administration:
   a. Provide analgesia per the Pain Management Guideline
   b. Start oxygen by nasal cannula if hypoxic
   c. Start an IV and provide saline 10 mL/kg normal saline bolus (up to 1 L)
   d. Provide transport to an appropriate receiving facility.
   e. Reassess vital signs and response to therapeutic interventions throughout transport
2. Comfort measures:
   a. Keep patient warm and dry
   b. Transport in a position of comfort unless clinical condition requires otherwise

Patient Safety Considerations

None noted

Notes/Educational Pearls

Key Considerations

1. Assess for life-threatening complications of sickle cell disease – these patients have significantly higher risk of numerous complications in addition to pain crises
2. Provide appropriate treatment for pain, respiratory distress, and shock
3. These patients may have a higher tolerance to narcotic pain medications if they are taking them on a regular basis
4. These patients will tolerate acute blood loss poorly due to baseline anemia
5. Patients with sickle cell trait can have acute pain crises in extreme conditions (e.g., heat exhaustion, dehydration) and several college athlete deaths have been linked to sickle cell trait

Pertinent Assessment Findings

1. Lung exam and assessment of respiratory distress
2. Altered mental status
3. Focal neurologic deficits
4. Inability to move a joint

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914165 – Other

Key Documentation Elements

- Documentation of normal respiratory and neuro status
- Documentation of how this pain crisis compares with others in terms of location, severity, and triggers
- Documentation of home pain medications used

Performance Measures

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

Reference

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Revision Date

March 11, 2022

Resuscitation

Cardiac Arrest (VF/VT/Asystole/PEA)

Aliases

Arrest | Full arrest | 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 field 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 Guideline]
2. Patients with identifiable Do Not Resuscitate (or equivalent such as POLST) order [See Do Not Resuscitate Status/Advance Directive/Healthcare Power of Attorney (POA) Status Guideline]
3. Patients in arrest due to traumatic etiology [See General Trauma Management Guideline]

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
      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 Guideline]
    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 dose is 100 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 Guideline
10. If resuscitation remains ineffective, consider termination of resuscitation [See Termination of Resuscitative Efforts Guideline]

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 ($EtCO_2$) should be used to monitor effectiveness of chest compressions
   a. If $EtCO_2$ 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 (SpO_2) 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 Guideline
    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 PSAP/dispatch centers to review opportunities to assure optimal recognition of possible cardiac arrest cases and provision of dispatch-assisted CPR (including hands-only CPR when appropriate)

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914011 – Cardiac Arrest - Asystole
- 9914013 – Cardiac Arrest - Hypothermia-Therapeutic
- 9914015 – Cardiac Arrest - Pulseless Electrical Activity
- 9914017 – Cardiac Arrest - Ventricular Fibrillation/Pulseless Ventricular Tachycardia)
- 9914055 – General - Cardiac Arrest
- 9914087 – Injury - Cardiac Arrest

Key Documentation Elements

- Should be tailored to any locally utilized data registry but may include as a minimum the following elements:
    - Resuscitation attempted and all interventions performed
    - Arrest witnessed
    - Location of arrest
    - First monitored rhythm
    - CPR before EMS arrival
    - Outcome
    - Any ROSC
    - Presumed etiology
        - Presumed cardiac
        - Trauma
        - Submersion
        - Respiratory
        - Other non-cardiac
        - Unknown

Performance Measures

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

References

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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, $EtCO_2$ 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 $EtCO_2$ of 35–45 mmHg.
6. For hypotension (SBP less than 90 mmHg or MAP less than 65 in adults) see Shock Guideline
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 Guideline
    b. If hyperglycemic, notify hospital on arrival

10. If patient seizes, treat per [Seizures Guideline]
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 $EtCO_2$ 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 Guideline] 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914019 – Cardiac Arrest - Post Resuscitation Care

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

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Determination of Death/Withholding Resuscitative Efforts

Aliases
None noted

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

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

Inclusion/Exclusion Criteria:
1. Resuscitation should be started on all patients who are found apneic and pulseless unless the following conditions exist (does not apply to victims of lightning strikes, drowning, or hypothermia):
   a. Medical cause or traumatic injury or body condition clearly indicating biological death (irreversible brain death), limited to:
      i. Decapitation: the complete severing of the head from the remainder of the patient's body
      ii. Decomposition or putrefaction: the skin is bloated or ruptured, with or without soft tissue sloughed off. The presence of at least one of these signs indicated death occurred at least 24 hours previously
      iii. Transection of the torso: the body is completely cut across below the shoulders and above the hips through all major organs and vessels. The spinal column may or may not be severed
      iv. Incineration: 90% of body surface area with full thickness burns as exhibited by ash rather than clothing and complete absence of body hair with charred skin
      v. Injuries incompatible with life (such as massive crush injury, complete exsanguination, severe displacement of brain matter)
      vi. Futile and inhumane attempts as determined by agency policy/protocol related to "compelling reasons" for withholding resuscitation
      vii. In blunt and penetrating trauma, if the patient is apneic, pulseless, and without other signs of life upon EMS arrival including, but not limited to spontaneous movement, EKG activity, or pupillary response
      viii. Nontraumatic arrest with obvious signs of death including dependent lividity or rigor mortis

   OR

   b. A valid DNR order (form, card, bracelet) or other actionable medical order (e.g., Physician Orders for Life-Sustaining Treatment (POLST)/Medical Orders for Life-Sustaining Treatment (MOLST) form) is present, and it:
      i. Conforms to the state specifications for color and construction
      ii. Is intact: it has not been cut, broken, or shows signs of being repaired
      iii. Displays the patient's name and, if required by state law or regulation, the physician's name

Patient Management

Assessment

Assess for dependent lividity with rigor mortis and/or other inclusion criteria

Treatment and Interventions

1. If all the components above are confirmed, no CPR is required
2. If CPR has been initiated but all the components above have been subsequently confirmed, CPR should be discontinued, and medical direction contacted as needed
3. If any of the findings are different than those described above, clinical death is not confirmed, and resuscitative measures should be immediately initiated or continued. The Termination of Resuscitative Efforts Guideline should then be implemented
4. Do Not Resuscitate (DNR) order (DNR/MOLST/POLST) with signs of life:
    a. If there is a DNR bracelet or DNR transfer form and there are signs of life (pulse and respirations), provide standard appropriate treatment under existing protocols matching the patient's condition
    b. To request permission to withhold treatment under these conditions for any reason contact medical direction
    c. If there is documentation of a Do Not Intubate (DNI/MOLST/POLST) advanced directive, the patient should receive full treatment per protocols except for any intervention specifically prohibited in the patient's advanced directive
    d. If for any reason an intervention that is prohibited by an advanced directive is being considered, contact medical direction

Patient Safety Considerations

In cases where the patient's status is unclear and the appropriateness of withholding resuscitation efforts is questioned, EMS personnel should initiate CPR immediately and then contact medical direction

Notes/Educational Pearls

Key Considerations

1. For scene safety and/or family wishes, clinician may decide to implement CPR even if all the criteria for death are met
2. At a likely crime scene, disturb as little potential evidence as possible

Pertinent Assessment Findings

None noted

Quality improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914169 – Cardiac Arrest - Do Not Resuscitate
- 9914201 – Cardiac Arrest - Determination of Death/Withholding Resuscitative Efforts

Key Documentation Elements

- Clinical/situational details that may be available from bystanders/caregivers

- Documentation of details surrounding decision to determine death
    - Time of contact with medical direction
    - Time of death determination
- Names/contact information for significant bystanders

Performance Measures

None noted

References

1. 'Do Not Attempt Resuscitation' in the Out-of-Hospital Setting. American College of Emergency Physicians; October 2003. ACEP Policy Statement
2. Millin MG, Galvagno SM, Khandker SR, Malki A, Bulger EM. Withholding and termination of resuscitation of adult cardiopulmonary arrest secondary to trauma: resource document to the joint NAEMSP-ACSCOT position statements. *J Trauma Acute Care Surg*. 2013;75(3):459–67
3. National Guidelines for Statewide Implementation of EMS "Do Not Resuscitate" (DNR) Programs National Association of Emergency Medical Services Directors and the National Association of Emergency Medical Services Physicians. *Prehosp Disaster Med.* 1994;9(2):197–9
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Do Not Resuscitate Status/Advance Directives/Healthcare Power of Attorney (POA) Status

Aliases

Comfort care
Do Not Resuscitate (DNR)

Patient Care Goals

To acknowledge and maintain the variety of ways that patients can express their wishes about cardiopulmonary resuscitation or end-of-life decision making

Patient Presentation

Inclusion/Exclusion Criteria

1. Patients must have one of the following documents or a valid alternative (such as identification bracelet indicating wishes) immediately available. Note that some specifics can vary widely from state to state:
   a. Physician Orders for Life Sustaining Treatment (POLST) or Medical Orders for Life Sustaining Treatment (MOLST) – explicitly describes acceptable interventions for the patient in the form of medical orders, must be signed by a physician or other empowered medical clinician to be valid
   b. Do Not Resuscitate (DNR) order – identifies that CPR and intubation are not to be initiated if the patient is in arrest or peri-arrest. The interventions covered by this order and the details around when to implement them can vary widely
   c. Advance directives – document that describes acceptable treatments under a variable number of clinical situations including some or all the following: what to do for cardiac arrest, whether artificial nutrition is acceptable, organ donation wishes, dialysis, and other parameters. The directives frequently do not apply to emergent or potentially transient medical conditions
   d. As specified from state to state, in the absence of formal written directions (MOLST, POLST, DNR, advanced directives), and in the presence of a person with power of attorney for healthcare or healthcare proxy, that person may prescribe limits of treatment
2. One of the documents above is valid when it meets all the following criteria:
   a. Conforms to the state specifications for color and construction
   b. Is intact: it has not been cut, broken or shows signs of being repaired
   c. Displays the patient's name and, if required by state law or regulation, the physician's name
3. If there is question about the validity of the form/instrument, the best course of action is to proceed with the resuscitation until additional information can be obtained to clarify the best course of action
4. If a patient has a valid version of one of the above documents, it will be referred to as a "valid exclusion to resuscitation" for the purposes of this protocol

Patient Management

Assessment

1. If the patient has a valid exclusion to resuscitation, then no CPR or airway management should be attempted, however this does not exclude comfort measures including medications for

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pain as appropriate

2. If CPR has been initiated and a valid exclusion to resuscitation has been subsequently verified, CPR may be discontinued, and medical direction contacted as needed

Treatment and Interventions

1. If there is a valid exclusion to resuscitation and there are signs of life (pulse and respirations), EMS clinicians should provide standard appropriate treatment under existing protocols according to the patient's condition
   a. If the patient has a MOLST or POLST, it may provide specific guidance on how to proceed in this situation
   b. Directives should be followed as closely as possible and medical direction contacted as needed
2. The patient should receive full treatment per protocols with the exception of any intervention specifically prohibited in the patient's valid exclusion to resuscitation
3. If for any reason an intervention that is prohibited by an advanced directive is being considered, medical direction should be contacted

Patient Safety Considerations

In cases where the patient's status is unclear and the appropriateness of withholding resuscitation efforts is questioned, EMS personnel should initiate CPR immediately and contact medical direction

Notes/Educational Pearls

Key Considerations

1. If there is a personal physician present at the scene who has an ongoing relationship with the patient, that physician may decide if resuscitation is to be initiated
2. If there is a registered nurse from a home healthcare or hospice agency present at the scene who has an ongoing relationship with the patient and who is operating under orders from the patient's private physician, that nurse (authorized nurse) may decide if resuscitation is to be initiated
3. If the physician or nurse decides resuscitation is to be initiated, usual medical direction procedures will be followed
4. Special Consideration: For scene safety and/or family wishes, the EMS clinician may decide to implement CPR even if all the criteria for death are met

Pertinent Assessment Findings

None noted

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914201 – Cardiac Arrest - Determination of Death/Withholding Resuscitative Efforts
- 9914169 – Cardiac Arrest - Do Not Resuscitate
- 9914171 – Cardiac Arrest - Special Resuscitation Orders

Key Documentation Elements

- Detailed description of the valid exclusion to resuscitation documentation used to guide resuscitation including a copy of the document if possible
- Names/contact information for significant bystanders

Performance Measures

None noted

References

1. 'Do Not Attempt Resuscitation' in the Out-of-Hospital Setting. American College of Emergency Physicians; October 2003. ACEP Policy Statement
2. National Guidelines for Statewide Implementation of EMS "Do Not Resuscitate" (DNR) Programs National Association of Emergency Medical Services Directors and the National Association of Emergency Medical Services Physicians. *Prehos Disaster Med.* 1994;9(2):197–9

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Termination of Resuscitative Efforts

Aliases

Call the code

Patient Care Goals

1. When there is no response to prehospital cardiac arrest treatment, it is acceptable and often preferable to cease futile resuscitation efforts in the field
2. In patients with cardiac arrest, prehospital resuscitation is initiated with the goal of returning spontaneous circulation before permanent neurologic damage occurs. In most situations, ALS clinicians are capable of performing an initial resuscitation that is equivalent to an in-hospital resuscitation attempt, and there is usually no additional benefit to emergency department resuscitation in most cases
3. CPR that is performed during patient packaging and transport is much less effective than CPR done at the scene. Additionally, EMS clinicians risk physical injury while attempting to perform CPR in a moving ambulance while unrestrained. In addition, continuing resuscitation in futile cases places other motorists and pedestrians at risk, increases the time that EMS crews are not available for another call, impedes emergency department care of other patients, and incurs unnecessary hospital charges. Lastly, return of spontaneous circulation is dependent on a focused, timely resuscitation. The patient in arrest should be treated as expeditiously as possible, including quality, uninterrupted CPR and timely defibrillation as indicated
4. When cardiac arrest resuscitation becomes futile, the patient's family should become the focus of the EMS clinicians. Families need to be informed of what is being done and that transporting all cardiac arrest patients to the hospital is not supported by evidence. This practice also inconveniences the family by requiring a trip to the hospital where they must begin grieving in an unfamiliar setting. Most families understand the futility of the situation and are accepting of ceasing resuscitation efforts in the field
5. Consider potential for organ donation if feasible.

Patient Presentation

Patient in cardiac arrest

Inclusion Criteria

1. Any cardiac arrest patient that has received resuscitation in the field but has not responded to treatment
2. When resuscitation has begun and it is found that the patient has a DNR order or other actionable medical order (e.g., POLST/MOLST form)

Exclusion Criteria

Consider continuing resuscitation for patients in cardiac arrest associated with medical conditions that may have a better outcome despite prolonged resuscitation, including hypothermia (although under certain circumstances, medical direction may order termination of resuscitation in these conditions)

Patient Management

Resuscitation may be terminated under the following circumstances:

1. Non-traumatic arrest
    a. Patient is at least 18 years of age
    b. Patient is in cardiac arrest at the time of arrival of advanced life support (ALS)
        i. No pulse
        ii. No respirations
        iii. No evidence of meaningful cardiac activity (e.g., asystole or wide complex PEA less than 60 BPM, no heart sounds)
    c. ALS resuscitation is administered appropriate to the presenting and persistent cardiac rhythm.
        i. Resuscitation may be terminated in asystole and slow wide complex PEA if there is
            1. No return of spontaneous circulation after 20 minutes in the absence of hypothermia
            AND
            2. The $EtCO_2$ is less than 20 mmHg
        ii. Narrow complex PEA with a rate above 40 or refractory and recurrent ventricular fibrillation/ventricular tachycardia:
            1. Consider resuscitation for up to 60 minutes from the time of dispatch.
            2. Termination efforts may be ceased before 60 minutes based on factors including, but not limited to, $EtCO_2$ less than 20 mmHg, age, co-morbidities, distance from, and resources available at the closest hospital. Termination before this timeframe should be done in consultation with online medical direction
    d. There is no return of spontaneous pulse and no evidence of neurological function (non-reactive pupils, no response to pain, no spontaneous movement)
    e. No evidence or suspicion of hypothermia
    f. All EMS clinicians involved in the patient's care agree that discontinuation of the resuscitation is appropriate
    g. Consider contacting medical direction before termination of resuscitative efforts
2. Traumatic arrest
    a. Patient is at least 18 years of age
    b. Resuscitation efforts may be terminated in any blunt trauma patient who, based on thorough primary assessment, is found apneic, pulseless, and asystolic on an EKG or cardiac monitor upon arrival of emergency medical services at the scene
    c. Victims of penetrating trauma found apneic and pulseless by EMS should be rapidly assessed for the presence of other signs of life, such as pupillary reflexes, spontaneous movement, response to pain, and electrical activity on EKG
        i. Resuscitation may be terminated by contacting medical direction oversight if these signs of life are absent
        ii. If resuscitation is not terminated, transport is indicated
    d. Cardiopulmonary arrest patients in whom mechanism of injury does not correlate with clinical condition, suggesting a non-traumatic cause of arrest, should have standard ALS resuscitation initiated
    e. All EMS personnel involved in the patient's care agree that discontinuation of the resuscitation is appropriate
    f. Consider contacting medical direction before termination of resuscitative efforts

<u>Assessment</u>

1. Pulse

2. Respirations
3. Neurologic status assessment [See Appendix VII. Neurologic Status Assessment; purposeful movement, pupillary response]
4. Cardiac activity (cardiac auscultation, cardiac monitoring, and/or, if available, ultrasonography)
5. Quantitative capnography

Treatment and Interventions

1. Focus on continuous, quality CPR that is initiated as soon as possible
2. Focus attention on the family and/or bystanders. Explain the rationale for termination
3. Consider support for family members such as other family, friends, clergy, faith leaders, or chaplains
4. For patients that are less than 18 years of age, consultation with medical direction is recommended

Patient Safety Considerations

All patients who are found in ventricular fibrillation or whose rhythm changes to ventricular fibrillation should in general have full resuscitation continued on scene

Notes/Educational Pearls

Key Considerations and Pertinent Assessment Findings

1. Recent evidence has shown that, to capture over 99% of potential survivors from medical cardiac arrest (especially VF and pulseless VT arrests), resuscitation should be continued for approximately 40 minutes. This does not imply, however, that all resuscitations should continue this long (e.g., asystolic rhythms)
2. In remote or wilderness situations, EMS clinicians should make every effort to contact medical direction, but resuscitation may be terminated in the field without contacting medical direction when the following have occurred:
   a. There has been no return of pulse despite greater than 30 minutes of CPR (this does not apply in the case of hypothermia)
   b. Transport to an emergency department will take greater than 30 minutes (this does not apply in the case of hypothermia)
   c. EMS clinicians are exhausted, and it is physically impossible to continue the resuscitation
3. Logistical factors should be considered, such as collapse in a public place, family wishes, and safety of the crew and public
4. Survival and functional neurologic outcomes are unlikely if ROSC is not obtained by EMS. It is dangerous to crew, pedestrians, and other motorists to attempt to resuscitate a patient during ambulance transport
5. Quantitative $EtCO_2$ measurements of less than 10 mmHg or falling greater than 25% despite resuscitation indicates a poor prognosis and provide additional support for termination

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914055 – General - Cardiac Arrest
- 9914087 – Injury - Cardiac Arrest
- 9914169 – Cardiac Arrest - Do Not Resuscitate

- 9914171 – Cardiac Arrest - Special Resuscitation Orders
- 9914201 – Cardiac Arrest - Determination of Death/Withholding Resuscitative Efforts

Key Documentation Elements

- All items (a–f in Non-traumatic or Traumatic arrest) listed under patient management must be clearly documented in the EMS patient care report in addition to the assessment findings supporting this medical decision making
- If resuscitation is continued for special circumstance or despite satisfying the criteria in this guideline, the rationale for such decision making must be documented

Performance Measures

- Time to CPR
- Time to AED application if applicable
- Review of CPR quality
- Duration of resuscitative efforts
- Review of biometric data/CPR quality if available
- Appropriateness of termination
- Review of every patient transport from scene with patient in arrest

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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 Guideline
3. In victims of blunt or penetrating trauma with rigor mortis, lividity, or evidence of injuries incompatible with life (including decapitation, hemicorporectomy). In such cases, refer to Determination of Death/Withholding Resuscitative Efforts Guideline
4. Resuscitation efforts may be withheld in any **blunt** trauma patient who, based on thorough primary assessment, is found apneic, pulseless, and asystolic on an EKG or cardiac monitor upon arrival of emergency medical services at the scene. In such cases, refer to the Determination of Death/Withholding Resuscitative Efforts Guideline
5. Resuscitation efforts may be withheld in victims of **penetrating** trauma found apneic, pulseless, and without other signs of life including pupillary reflexes, respiratory effort, spontaneous movement, response to pain, and electrical activity on EKG. In such cases, refer to the Determination of Death/Withholding Resuscitative Efforts Guideline

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

1. Manage massive hemorrhage. Refer to General Trauma Management Guideline 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 Guideline
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
7. Consider the duration of resuscitation and transport, contact online medical direction if available to discuss. If termination of resuscitation is advised, refer to the Termination of Resuscitation Efforts Guideline

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
None noted

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
        - *Weight value in kilograms or length-based weight entered for patients less than 15 years old when Type of Service Requested = 2205001—911 Response (Scene)*

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Revision Date

March 11, 2022

Pediatric-Specific Guidelines

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 Guideline]
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 Guideline]
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 Guideline]
    b. Suction excessive secretions from the nose and/or mouth (using bulb syringe or suction catheter) [See Pediatric Respiratory Distress (Bronchiolitis) Guideline]
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 guidelines
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 guidelines
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914197 – Medical - Apparent Life-Threatening Event (ALTE)

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

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Pediatric Respiratory Distress (Bronchiolitis)

(Adapted from an evidence-based guideline created using the National Prehospital Evidence-Based Guideline 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 O_2 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 ($EtCO_2$) 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 SpO_2 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 Guideline)
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914221 – Medical - Respiratory Distress-Bronchiolitis
  - Protocol Age Category: 3602005 - Pediatric Only

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
- Mental status
- Color

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, O_2 saturation and capnography values)
- Time to administration of specified interventions in the protocol
- Number of advanced airway attempts
- Mortality

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Revision Date

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Pediatric Respiratory Distress (Croup)

(Adapted from an evidence-based guideline created using the National Prehospital Evidence-Based Guideline 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 O_2 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 $EtCO_2$ 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 SPO_2 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914223 – Medical - Respiratory Distress-Croup
  - Protocol Age Category: 3602005 - Pediatric Only

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

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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: SPO_2 at 10 minutes is 85–95%
        ii. Consider endotracheal intubation per local guidelines
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% FiO_2 (fraction of inspired oxygen) if blender available, otherwise 100% FiO_2 until heart rate normalizes
    c. Consider endotracheal intubation or supraglottic airway per local guidelines 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 guidelines
    e. Administer epinephrine (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 Guideline 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

5. Measuring the pulse oximetry on the right hand provides the most accurate oxygen saturation (SpO_2) 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%

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%

6. Both hypoxia and excess oxygen administration can result in harm to the infant. If prolonged oxygen use is required, titrate to maintain an SPO_2 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914133 – Medical - Newborn/Neonatal Resuscitation

Key Documentation Elements

- Historical elements
  - Prenatal complications
  - Delivery complications
  - Date and time of birth
  - Estimated gestational age
- Physical exam findings
  - Heart rate
  - Respiratory rate
  - Respiratory effort
  - Appearance
  - **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

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Revision Date

March 11, 2022

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
3. Plan for resources based on number of anticipated patients (e.g., mother and child or multiple births)
4. Assist with uncomplicated delivery of term newborn
5. Recognize complicated delivery situations (e.g., nuchal or prolapsed umbilical cord, breech delivery, shoulder dystocia) and plan for management and appropriate transport destination
6. 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 Guideline]
2. Emergencies in first or second trimester of pregnancy [See Obstetrical/Gynecological Conditions Guideline]
3. Seizure from eclampsia [See Obstetrical/Gynecological Conditions Guideline and Eclampsia/Pre-Eclampsia Guideline]

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 popping out
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, 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 Guideline 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) 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. If the loop is too tight to slip over the head, attempt to slip the cord over the shoulders and deliver the body through the loop
   iii. 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 Guideline (VF/VT/Asystole/PEA) for resuscitation care (defibrillation and medications should be given for same indications and doses as if non-pregnant patient)
   iii. 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914133 – Medical - Neonatal/Newborn Resuscitation
- 9914155 – OB/GYN - Childbirth/Labor/Delivery
- 9914161 – OB/GYN - Pregnancy Related Disorders
- 9914163 – OB/GYN - Postpartum Hemorrhage

Key Documentation Elements

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

Performance Measures

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

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Revision Date

March 11, 2022

Eclampsia/Pre-Eclampsia

Aliases

Pregnancy induced hypertension
Toxemia of pregnancy
Pregnant seizures

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 Guideline, 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914157 – OB/GYN - Eclampsia
- 9914159 – OB/GYN - Gynecological Emergencies
- 9914161 – OB/GYN - Pregnancy Related Disorders

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

References

1. American College of Obstetricians and Gynecologists Committee on Obstetric Practice Emergent Therapy for Acute-onset, Severe Hypertension During Pregnancy and the Postpartum Period. Committee opinion no 767: *Obstet Gynecol.* 2019;133(2): 174–180
2. American College of Obstetricians and Gynecologists Committee on Obstetric Practice Magnesium sulfate use in obstetrics. Committee opinion no 652: *Obstet Gynecol.* 2016;127(1): e52–3
3. American College of Obstetrics and Gynecologists Task Force on Hypertension in Pregnancy. Report of the American College of Obstetricians and Gynecologists' task force on hypertension in pregnancy. Obstet Gynecol. 2013;122(5):1122–31
4. Cuero M, Varelas P. Neurologic complications in pregnancy. *Crit Care Clin.* 2016;32(1):43–59
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Revision Date

March 11, 2022

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 Guideline]
2. Postpartum hemorrhage [See Childbirth Guideline]

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 Guideline]
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 Guideline]
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914159 – OB/GYN - Gynecological Emergencies
- 9914161 – OB/GYN - Pregnancy Related Disorders

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

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Revision Date
March 11, 2022

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 Guideline)
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 Guideline]

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, tracheostomyscar 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 Guideline)
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 Guideline

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

if available. See Mechanical Ventilation (Invasive) Guideline.

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.
    c. Pediatric endotracheal intubation has unclear benefit in the prehospital setting.
    d. 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 Guideline):
    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 ≥ 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. Endotracheal tube sizes (cuffed tubes preferred in pediatrics)

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

   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

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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) Guideline]
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 guideline
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914001 – Airway
- 9914133 – Medical - Newborn/Neonatal Resuscitation

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Respiratory—01: Respiratory Assessment*

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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 O_2 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 Guideline 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 $EtCO_2$ 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 Guideline 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 $EtCO_2$ (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, 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 $EtCO_2$ compared to COPD. $EtCO_2$ 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 Guideline

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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914137 – Pulmonary Edema/CHF
- 9914139 – Respiratory Distress/Asthma/COPD/Croup/Reactive Airway

Key Documentation Elements

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

- Respiratory rate

- Oxygen saturation
- $EtCO_2$/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, SPO_2 less than 90%)
- Percentage of patients with abnormal pulse oximetry, respiratory rate, $EtCO_2$ 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 SPO_2 and/or decreased respiratory rate
- Normalizing change in vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, O_2 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

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<u>Revision Date</u>

March 11, 2022

Go To TOC

Mechanical Ventilation (Invasive)

Patient Care Goals

1. Maintain adequate oxygenation
2. Maintain adequate minute ventilation and capnography targets based on patient pathophysiology
3. Prevent or limit risk of short- and long-term invasive airway and ventilator-associated complications including barotrauma, pneumothorax, aspiration, over-ventilation

Patient Presentation

Inclusion Criteria

Adult patients with invasive airway requiring mechanical ventilation

Exclusion Criteria

1. Interfacility transfer patients with established vent settings
2. Patients with suspected untreated pneumothorax or large airway injury
3. Patients in cardiac arrest

Patient Management

Assessment

1. Confirm airway placement with ventilation and auscultation over epigastrium and assess for symmetric bilateral lung sounds
2. Verify that airway (ETT, SGA) is securely held in place (by holder or other method)
3. Assess oxygen delivery and confirm that FiO_2 meets patients' needs and maintains desired oxygen saturation (SpO_2)
    a. If oxygen will be needed during transport calculate the duration of supply needed (O_2 tank time (min) = tank pressure (psi) x tank conversion factor/flow rate (L/min)
4. Assess blood pressure to assure SBP greater than 90 mmHg or resuscitate to SBP >=90 mmHg or MAP >=60 mmHg
5. Assess mental status, level of consciousness, Richmond Agitation Sedation Scale (RASS) or similar sedation score

Treatment and Interventions

1. Set up ventilator and circuit, program initial ventilator settings as below. Suggested general guidelines for adults with EMS initiation of mechanical ventilation:
    a. Consider and modify based on any underlying acute or chronic lung pathology (COPD, asthma, CHF)
    b. Volume mode is generally preferred initially in adults
    c. Select an appropriate ventilator mode: Assist Control (AC) is acceptable for most patients

i. Initial settings:

Tidal volume	6–8 mL/kg ideal body weight	Go to ARDSNET table of height and Predicted Body Weight and Tidal volumes. Use 6–8 mL/kg as a starting point. Patients with known acidosis should start with 9 mL/kg
Respiratory rate	12–14 (or 8–12) breaths/min	Adjust for target minute ventilation based on $EtCO_2$
Inspiratory time	1 second	Adjust 0.7–1.2 seconds to maintain desired I:E ratio (inspiration-expiration) ratio of 1:2 and patient comfort
PEEP	5 cmH_20	
FiO_2	60%	Titrate to achieve target O_2 saturation (94–98%)
Sensitivity	-2 cmH_20	

ii. Set the heat moisture exchange (HME) at circuit Y.
iii. Plateau pressure (PPlat) goal is less than 30 cmH_20

Patient Safety Considerations

1. Ventilators have different capabilities and features. Users must be familiar with the device they use and must be properly educated on its use and application in the specific population being treated
2. Ensure that all vent alarms are set appropriately, and patient is continually monitored with pulse oximetry and waveform capnography
   a. Set all alarms that involve high pressure, low pressure, minute volume, and apnea
   b. Plateau pressure (PPlat) goal is less than 30 cmH_20
   c. Set high pressure alarm 10 cmH2O above resting PIP
   d. Set low pressure alarm 5 cmH2O below resting PIP
   e. Set low minute volume alarm 25% below resting minute volume
3. During transport of a critically ill patient only necessary adjustments should be made to the ventilator. Focus on maintaining adequate oxygenation, minute volume and patient comfort.
4. An increase in the respiratory rate shortens the expiratory time. If changing rate, also check the I:E ratio (the proportions of each breath cycle devoted to the inspiratory and expiratory phases) and adjust the inspiratory time if necessary
5. The inspiratory time can be adjusted slightly to ensure greater patient comfort, however any change in inspiratory time will affect the I:E ratio. Rarely should an inspiratory time be less than 0.7 for an adult
6. Assure proper sedation level for patient to tolerate ventilator
7. Assure patient does not have auto-PEEP
8. Asthmatics and patients with severe bronchoconstriction require different initial settings: for example, PEEP of 0, FiO_2 100%, tidal volume 5 mL/kg, rate 10, I:E of 1:4 – 1:6 to allow full exhalation and limit breath stacking/auto-PEEP. Hemodynamic instability may indicate increased intrathoracic pressure and require either manual chest wall compression to promote full exhalation or possibly needle chest decompression for pneumothorax

Notes/Educational Pearls

Key Considerations

1. It is important to understand the patient's underlying pulmonary status to choose the appropriate type of ventilation (volume or pressure) and mode (AC or SIMV most common)
    a. Volume control ventilation is generally preferred initially in adults with compliant lungs (PPlat less than 30) because of better control of minute ventilation
    b. Pressure control ventilation can be used in patients with non-compliant lungs and elevated PPlat
    c. Assist Control (AC) mode is acceptable for most patients and provides best control of minute ventilation. Synchronized Intermittent Mandatory Ventilation (SIMV) is an alternative option

Pertinent Assessment Findings

1. Perform a pre-ventilator use inspection including a circuit check on the ventilator prior to placing it on a patient
2. Assess values during transport, including:
    a. Peak inspiratory pressure (PIP) Compare against baseline value to monitor for compliance changes or obstruction in the circuit
    b. Respiratory rate. Compare with baseline value, rapid increases could indicate leaks. Overbreathing may require vent setting adjustment
    c. Exhaled tidal volume. Compare against baseline, if extreme fluctuations, check for leaks in circuit and in ET tube
    d. Monitor the I:E ratio. 1:2 or 1:3 for normal lungs, longer E times may be needed for patients with obstructive or restrictive lung disease

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
None noted

Key Documentation Elements

Documentation of ventilator settings and monitored values should include:
1. Ventilator Settings: Volume or pressure breaths; mode; respiratory rate; inspiratory time; tidal volume or pressure, PEEP, FiO_2; sensitivity
2. Patient Values (baseline and repeated): Peak inspiratory pressure (PIP); exhaled tidal volume; respiratory rate; I:E ratio; minute volume; $EtCO_2$; SPO_2

Performance Measures

None noted

Adult Male Patients							
		Lung-Protective		**Resuscitative**		**Metabolic**	
		6 ml/kg		10 ml/kg		8 ml/kg	
Height	**IBW kg**	Vt	Initial f	Vt	Initial f	Vt	Initial f
5'0"	50	300	12	500	12	400	20
5'1"	52	314	12	523	12	418	20
5'2"	55	328	12	546	12	437	20
5'3"	57	341	12	569	12	455	20
5'4"	59	355	12	592	12	474	20
5'5"	62	369	12	615	12	492	20
5'6"	64	383	12	638	12	510	20
5'7"	66	397	12	661	12	529	20
5'8"	68	410	12	684	12	547	20
5'9"	71	424	12	707	12	566	20
5'10"	73	438	12	730	12	584	20
5'11"	75	452	12	753	12	602	20
6'0"	78	466	12	776	12	621	20
6'1"	80	479	12	799	12	639	20
6'2"	82	493	12	822	12	658	20
6'3"	85	507	12	845	12	676	20
6'4"	87	521	12	868	12	694	20
6'5"	89	535	12	891	12	713	20
6'6"	91	548	12	914	12	731	20
Source: NIH-NHLBI ARDS Network							

Adult Female Patients							
		Lung-Protective		**Resuscitative**		**Metabolic**	
		6 ml/kg		10 ml/kg		8 ml/kg	
Height	**IBW kg**	Vt	Initial f	Vt	Initial f	Vt	Initial f
5'0"	46	273	12	455	12	364	20
5'1"	48	287	12	478	12	382	20
5'2"	50	301	12	501	12	401	20
5'3"	52	314	12	524	12	419	20
5'4"	55	328	12	547	12	438	20
5'5"	57	342	12	570	12	456	20
5'6"	59	356	12	593	12	474	20
5'7"	62	370	12	616	12	493	20
5'8"	64	383	12	639	12	511	20
5'9"	66	397	12	662	12	530	20
5'10"	69	411	12	685	12	548	20
5'11"	71	425	12	708	12	566	20
6'0"	73	439	12	731	12	585	20
6'1"	75	452	12	754	12	603	20
6'2"	78	466	12	777	12	622	20
6'3"	80	480	12	800	12	640	20
6'4"	82	494	12	823	12	658	20
6'5"	85	508	12	846	12	677	20
6'6"	87	521	12	869	12	695	20
Source: NIH-NHLBI ARDS Network							

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Revision Date

March 11, 2022

Tracheostomy Management

Aliases

None

Patient Care Goals

1. Meet airway management goals in a patient with a tracheostomy
    a. Assure patent airway, understand how to troubleshoot tracheostomy in a patient with respiratory distress
    b. Assure adequate oxygenation and ventilation

Patient Presentation

Inclusion Criteria

Any adult or pediatric patient with an existing tracheostomy *greater than* 7 days post placement and a mature stoma tract

Exclusion Criteria

Adult or pediatric patient with tracheostomy *less than* 7 days post placement (i.e., no mature stoma tract)

Patient Management

Assessment

1. Evaluate patient respiratory status as per Airway Management Guideline
2. In a patient with respiratory distress, evaluate for DOPE:
    a. **D**islodgement or misplaced tracheostomy (e.g., decannulation)
        i. Assess for subcutaneous air in the neck which may indicate the tracheostomy is not in the trachea
        ii. Directly visualize the tracheostomy and the stoma (i.e., remove anything obstructing direct view of stoma including clothing/bandages/sponges etc.) to assure it remains properly seated in the stoma
    b. **O**bstruction or secretions in tracheostomy
        i. Assure tracheostomy is patent. Especially in pediatric tracheostomy patients with significant respiratory distress, plugging or dislodgement/decannulation of the tracheostomy is the problem until proven otherwise
        ii. Auscultate breath sounds, consider potential for plugging of large airways in patients with significant respiratory distress
    c. **P**neumothorax
    d. **E**quipment connection problems
3. As with any patient with respiratory distress, appropriate monitoring with pulse oximetry and waveform capnography should be provided as per Airway Management Guideline

Treatment and Troubleshooting Interventions

1. In patient with **mild respiratory distress and adequate oxygenation**:
    a. **Suctioning/clearing obstruction:**

i. If the patient is not on a ventilator, remove any cap, filter, or speaking valve that may be connected to the tracheostomy
ii. Provide passive oxygenation with high flow oxygen over nose/mouth and stoma to avoid hypoxia during procedure
iii. Remove inner cannula if present
iv. If needed, use 1–3 mL sterile saline directly into the tracheostomy to loosen secretions and help clear obstruction
v. Pass appropriately sized suction catheter through tracheostomy
vi. Once obstruction is cleared, assist ventilations as needed with BVM to tracheostomy tube, provide passive oxygenation or return patient to ventilator if patient on chronic ventilator via tracheostomy

2. In patient with **significant/severe respiratory distress and/or inadequate oxygenation**:
   a. If patient on ventilator, remove from vent and attempt BVM ventilation
   b. **Suctioning/clearing obstruction**:
      i. If the patient is not on a ventilator, remove any cap, filter, or speaking valve that may be connected to the tracheostomy
      ii. Provide passive oxygenation with high flow oxygen over nose/mouth and stoma to avoid hypoxia during procedure
      iii. Remove inner cannula if present
      iv. Attempt to pass appropriately sized suction catheter through tracheostomy
      v. If needed, use 1–3 mL sterile saline directly into the tracheostomy to loosen secretions and help clear obstruction
      vi. If suction catheter will not pass, the tracheostomy needs to be changed emergently due to obstruction. (See below)
      vii. Once obstruction is cleared, assist ventilations as needed with BVM to tracheostomy tube, provide passive oxygenation or return patient to ventilator if patient on chronic ventilator via tracheostomy tube
   c. **Emergent tracheostomy change:** determine size of tracheostomy needed from imprint on existing tracheostomy flange/collar. If no replacement tracheostomy is available, an endotracheal tube of the same size or smaller may be used
      i. Ventilate or provide passive oxygenation during procedure. Attempt to ventilate from the upper airway or direct high flow O_2 to stoma during attempts.
      ii. Deflate cuff (if present)
      iii. Remove ties and obstructed tracheostomy
      iv. Immediately replace with new (lubricated) tracheostomy, remove obturator, and begin BVM ventilation. Never use force. For difficult replacement, the following strategies can be attempted:
         a. Reposition patient with neck extended
         b. Ensure proper lubrication and re-attempt approach at a 90-degree angle from long axis of neck (i.e., from the side) to enter the stoma and then rotate back along the long axis to complete insertion
         c. Attempt reinsertion with a smaller sized tracheostomy or endotracheal tube
      v. Confirm correct placement with waveform capnography, breath sounds, oxygen saturation, chest rise
      vi. Secure tracheostomy with tracheostomy ties or tube with appropriate holder
3. Consider use of humidified air or oxygen in any patient with a tracheostomy

4. Cuff may need to be inflated to provide adequate oxygenation and ventilation when positive pressure ventilation is required. However, cuff should never be inflated if positive pressure ventilation is not being performed, or in patients with a Passy-Muir (teal colored) speaking valve in place

Patient Safety Considerations

1. Especially in pediatric tracheostomy patients with significant respiratory distress, plugging or dislodgement of the tracheostomy is the problem until proven otherwise. Signs and symptoms of respiratory distress, cyanosis, ventilator alarms sounding, decreased level of consciousness, decreased SpO_2 or cardiac arrest in patients with a tracheostomy, as well as bradycardia in pediatric tracheostomy patients should be presumed due to a tracheostomy obstruction
2. Laryngectomy patients and some patients with congenital or surgical airway abnormalities cannot be orally intubated. Patients with tracheostomy alone (e.g., for mechanical ventilation) and no airway abnormalities should be able to be orally intubated
3. For recent tracheostomy patients who present with bleeding from the tracheostomy in the early (up to 3 weeks) postoperative period, a tracheoinnominate arterial bleed is an uncommon and life-threatening complication (0.7% incidence and a 90% mortality rate)
    a. 50% of these patients present initially with a smaller sentinel bleed/hemoptysis which appears to have stopped
    b. Inflation of the tracheostomy balloon to the maximum is a potential temporizing measure until definitive care can be provided, even overinflation may be needed. If the tracheostomy is uncuffed, it can be replaced with a cuffed endotracheal tube and the balloon maximally inflated
    c. Any patient in the early postoperative period (within a month of surgery) with hemoptysis or bleeding from a tracheostomy should be transported for evaluation, even if bleeding has stopped
4. Prompt tracheostomy replacement is important. Delays allow for narrowing of the stoma and can make recannulation more difficult

Notes/Educational Pearls

Key Considerations

1. Tracheostomy tube components
    a. Outer cannula: the tracheostomy size is stamped on the collar
    b. Inner cannula: not found in all tracheostomies
        i. Not commonly used in pediatric patients
        ii. Removed by gently twisting a quarter turn to the left and pulling out
    c. Balloon cuff: protects lower airway from secretions/blood from above, allows for better mechanical ventilation
    d. Collar: includes imprint of tube size and attachment for umbilical tape/tracheostomy ties
    e. Obturator: stiffens and provides shape to tracheostomy tube to facilitate insertion. Must be removed for ventilation
2. To determine the appropriate size suction catheter, double the size of the tracheostomy (number on collar of tracheostomy tube)
3. A bougie may aid in the placement of an endotracheal tube into a mature stoma
4. An inner cannula may be required to ventilate through the tracheostomy tube

5. Uncuffed and fenestrated cuffed tracheostomy tubes may not protect the patient from aspiration
6. If transporting a patient with a tracheostomy either in an emergency or routine transport, the patients home tracheostomy equipment (e.g., “Go bag”) should accompany them. The equipment that needs to be at the bedside to ensure safety includes appropriately sized French suction catheters, operating suction system, and spare tracheostomy tubes. Sterile saline, sterile gloves and water-soluble medical lubrication packets should also be available. Most tracheostomy patients will maintain a kit with these supplies to travel with
7. Inadvertent tracheostomy decannulation incidence is the second most frequent life-threatening pediatric tracheostomy complication, occurring at rates of 0.35–15%, with the vast majority occurring more than 7 days postoperatively
8. Tracheostomy obstruction can occur for several reasons, including mucus plugging, abnormal/excess granulation tissue, tracheomalacia causing collapse of the tracheal wall around the tube
9. Do not replace a heat moisture exchange (HME) filter cap if soiled or wet as it can impede airflow

Pertinent Assessment Findings

1. Adequate oxygenation without respiratory distress suggests that the tracheostomy is patent and functioning correctly
2. Inadequate oxygenation and ventilation, respiratory distress, air hunger in a patient with a tracheostomy should first be presumed to be due to tracheostomy obstruction
3. Neck or chest crepitus on palpation suggests tracheostomy misplacement outside the trachea

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914001 – Airway
- 9914003 – Airway - Failed
- 9914005 – Airway - Obstruction/Foreign Body

Key Documentation Elements

- For any tracheostomy patient with respiratory distress, visual verification of correct location of tracheostomy in the stoma and auscultation of breath sounds
- Continuous pulse oximetry and preferably continuous waveform capnography (or if unavailable, repeated capnometry measurements) should be documented for every patient. [eAirway.03: 4003015]

Performance Measures

None noted

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March 11, 2022

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 Guideline]
    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 Appendix VII. Neurologic Status Assessment and Head Injury Guideline]
      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 Guideline]
   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 Guideline and Spinal Care Guideline]
   b. Consider airway adjuncts as appropriate avoiding nasal airway adjuncts in patents with oral or other facial injuries. [See Airway Management Guideline]
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
   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 2 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 Appendix VIII. 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
2. Disability/Head/Hypothermia
   a. If clinical signs of traumatic brain injury [See Head Injury Guideline]
   b. Avoid/treat hypothermia
      i. Remove wet clothing
      ii. Cover patient to warm and/or prevent further heat loss
3. **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
4. Repeat primary assessment or secondary assessment should be conducted en route to the trauma center
5. Decisions regarding transport destination should be based on the *ACS-COT 2022 National Guideline 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 Guideline
      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 Guideline

ii. Chest – See Initial Treatment
1. Palpate for instability/crepitus
2. Listen to breath sounds
3. Inspect for penetrating or soft tissue injuries

iii. Abdomen
1. Palpate for tenderness
2. Inspect for penetrating or soft tissue injuries
3. Cover eviscerated abdominal contents with moist dressings

iv. Pelvis
1. Inspect for penetrating or soft tissue injuries
2. Palpate once for instability by applying medial pressure on the iliac crests bilaterally

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

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

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

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

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 Appendix VII. 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 Guideline]
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 Guideline 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 Appendix VII. 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

Traumatic Arrest: Withholding and Termination of Resuscitative Efforts

Resuscitative efforts should be withheld for trauma patients with the following:

1. Decapitation
2. Hemicorpectomy
3. Signs of rigor mortis or dependent lividity
4. Blunt trauma: apneic, pulseless, no organized cardiac activity on monitor
   a. **Note – Adult and Pediatric:** Resuscitative efforts may be terminated in patients with traumatic arrest who have no return of spontaneous circulation after 15–30 minutes of resuscitative efforts, including airway management, evaluation/treatment for possible tension pneumothorax, fluid bolus, and minimally interrupted CPR

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914207 – Injury - General Trauma Management

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
    - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

March 11, 2022

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 Guideline]
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 Appendix VII: 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 Guideline]
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 Guideline]
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 Guideline
        ii. If the patient is burned, administer normal saline (NS) or lactated Ringer's (LR) per the Burns Guideline
5. Disability:
    a. If evidence of head injury, treat per the Head Injury Guideline
    b. Apply spinal precautions, per the Spinal Care Guideline
    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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914045 – Exposure - Explosive/Blast Injury

Key Documentation Elements

- Airway status and intervention
- Breathing status:
  - Quality of breath sounds (equal bilaterally)
  - Adequacy of respiratory effort
  - Oxygenation
- Documentation of burns, including **T**otal **B**urn **S**urface **A**rea (**TBSA**) [See Burns Guideline]
- 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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
  - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

March 11, 2022

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 Guideline
3. If evidence of possible airway burn, consider aggressive airway management
4. Consider spinal precautions for those that qualify per the Spinal Care Guideline
5. Estimate TBSA burned and depth of burn
    a. Use "Rule of 9's" [See burn related tables in Appendix VI. 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 Guideline
    b. If patient not in shock:
        i. Begin fluids based on estimated TBSA [See Appendix VI. 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 Guideline
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 Guideline]
5. For specific chemical exposures (cyanide, hydrofluoric acid, other acids, and alkali) [See Topical Chemical Burn Guideline]
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.

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914085 – Injury - Burns-Thermal

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

- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
    - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

March 11, 2022

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 Guideline
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 Guideline]
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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914089 – Injury - Crush Syndrome

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

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Revision Date

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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 Guideline]

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 Guideline]
    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

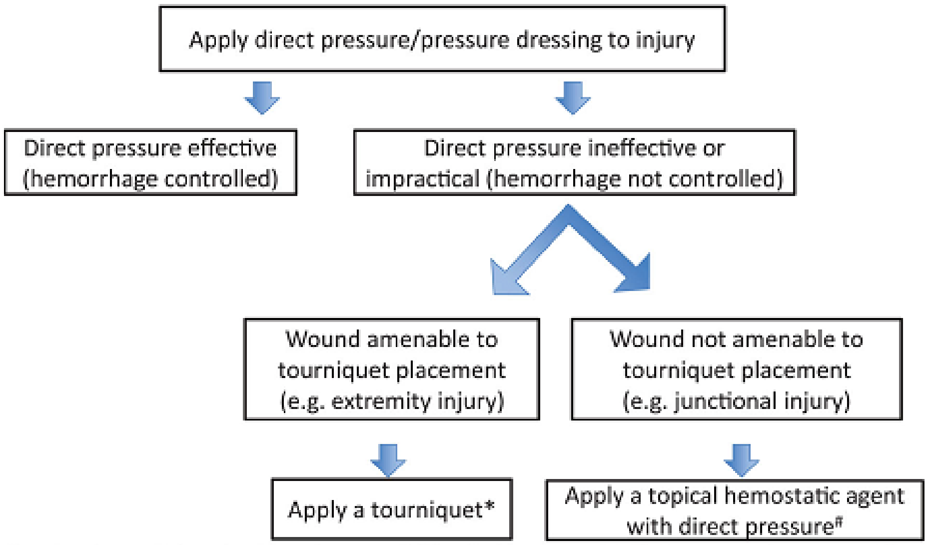
Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
- 9914083 – Injury - Bleeding/Hemorrhage Control
- 9914097 – Injury - Extremity

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
    - *Trauma—01: Pain Assessment of Injured Patients*

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 in a standardized laboratory injury model
***Source:** Bulger et al. 2014*

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Revision Date

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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 Guideline]
2. Burn trauma [See Burns Guideline]

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 Guideline]
6. Mental status assessment for possible traumatic brain injury [See Head Injury Guideline]
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 Guideline
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 Guideline]
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 Guideline) 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 Guideline]

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914057 – Injury - Facial Trauma
- 9914099 – Injury - Eye
- 9914205 – General - Dental Problems

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
  - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

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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 Guideline]
2. Primary survey per the General Trauma Management Guideline
3. Monitoring:
    a. Continuous pulse oximetry
    b. Frequent systolic and diastolic blood pressure measurement
    c. Initial neurologic status assessment [See Appendix VII. 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 Guideline
   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 guideline:
   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 Appendix VII. 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914101 – Injury - Head

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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
    - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

March 11, 2022

High Threat Considerations/Active Shooter Scenario

Aliases

None noted

Definitions

- **Hot Zone/Direct Threat Zone**: an area within the inner perimeter where active threat and active hazards exists.
- **Warm Zone/Indirect Threat Zone**: an area within the inner perimeter where security and safety measures are in place. This zone may have potential hazards, but no active hazards exist.

Patient Care Goals

1. Assess scene
2. Mitigating further harm
3. Accomplish mission with minimal additional injuries

Patient Presentation

Inclusion Criteria

High threat environment – when greater than normal conditions exist that could cause threat to clinician or patient

Exclusion Criteria

No significant threat exists to clinician or patient allowing for the performance of routine care

Patient Management

Assessment, Treatment, and Interventions

1. Hot Zone/Direct Threat care considerations:
    a. Mitigate threat as able to minimize risk to patients and clinicians, move to a safer position and recognize that threats are dynamic and may be ongoing, requiring continuous assessment of threat
    b. Defer in depth medical interventions if engaged in ongoing direct threat (e.g., active shooter, unstable building collapse, improvised explosive device, hazardous material threat)
    c. Triage should be deferred to when no longer in a hot zone/direct threat care zone
    d. Prioritization for extraction is based on resources available and the situation encountered
    e. Encourage patients to provide self-first aid or instruct uninjured bystanders to provide aid
    f. Consider hemorrhage control:
        i. Tourniquet application is the primary "medical" intervention to be considered in Hot Zone/Direct Threat Zone. Tourniquet choice should be guided by expected ability to perform in the desired patient population (pediatrics)
        ii. Consider instructing patient to apply direct pressure to the wound if no tourniquet available (or application is not feasible)
        iii. Consider quickly placing or directing patient to be placed in position to protect airway, if not immediately moving patient

2. Warm Zone/Indirect Threat care considerations:
    a. Maintain situational awareness
    b. Ensure safety of both responders and patients by rendering equipment and environment safe (firearms, vehicle ignition)
    c. Conduct primary survey, per the General Trauma Management Guideline, and initiate appropriate life-saving interventions
        i. Hemorrhage control
            1. Tourniquet
            2. Wound packing if feasible
        ii. Maintain airway and support ventilation [See Airway Management Guideline]
    d. Maintain body temperature and prevent hypothermia
    e. **Do not delay** patient extraction and evacuation for non-life-saving interventions
    f. Consider establishing a casualty collection point if multiple patients are encountered
    g. Unless in a fixed casualty collection point, triage in this phase of care should be limited to the following categories:
        i. Uninjured and/or capable of self-extraction
        ii. Deceased/expectant
        iii. All others

Patient Safety Considerations

1. Anticipate unique threats based on situation
2. During high threat situations, clinician safety should be considered in balancing the risks and benefits of patient treatment

Notes/Educational Pearls

Key Considerations

1. In high threat situations clinician and patient safety will need to be simultaneously considered
2. During high threat situations, an integrated response with other public safety entities may be warranted
3. Risks taken and threats to responder safety must be weighed in relations to the expected benefit to patient safety and outcome
4. During these situations, maintaining communications and incident management concepts may be crucial to maximizing efficiency and mitigating dangers

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
None noted

Key Documentation Elements

- Traditional documentation may not be appropriate during Hot Zone/Direct Threat and Warm Zone/Indirect Threat care
- Documentation of key intervention should be relayed:
    - Time of tourniquet application
    - GCS for patients with suspected head injury

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Revision Date

March 11, 2022

Spinal Care

(Adapted from an evidence-based guideline created using the National Prehospital Evidence-Based Guideline 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

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 a football helmet needs to be removed, it is recommended to remove the face mask followed by manual removal (rather than the use of automated devices) of the helmet while keeping the neck manually immobilized — occipital and shoulder padding should be applied, as needed, with the patient in a supine position 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, in accordance with the *American College of Surgeons Committee on Trauma (ACS COT) 2022 National Guideline for the Field Triage of Injured Patients*
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 Guideline 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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914073 – General - Spinal Precautions/Clearance

- 9914107 – Injury - Spinal Cord

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:
  - All barriers to patient care in the NEMSIS element "Barriers to Patient Care" (eHistory.01—required of all software systems)
  - Exam fields for Mental Status and Neurological Assessment
  - Vitals for Level of Responsiveness and Glasgow Coma Scale
  - 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
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*
  - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

March 11, 2022

Trauma Mass Casualty Incident

Aliases
Disaster
Mass casualty incident (MCI)
Trauma triage for multiple casualties overwhelming EMS resources

Patient Care Goals
1. Save life and limb for greatest number given resources available
2. Triage and transport most critical requiring immediate in-hospital care first

Patient Presentation

Inclusion Criteria
Trauma MCI overwhelming immediately available resources

Exclusion Criteria
Routine EMS response for non-MCI for trauma

Patient Management
Special circumstances may occur in any incident in which the resources of the emergency medical services are overwhelmed by the number and severity of casualties.

Triage and Treat
1. Ensure scene safety for EMS clinicians
2. Senior EMS clinician rapidly assesses scene and assigns roles and responsibilities to EMS personnel
3. Sort patients using a locally agreed upon MCI triage process such as SALT (Sort, Assess, Lifesaving Interventions, Treatment/Transport), START/JUMP-START (Simple Triage and Rapid Transport), MUCC (Model Uniform Core Criteria), etc.
4. Identify those in need of immediate life-saving intervention
5. Triage categories are recommended and should be guided by local protocols: immediate, delayed, minimal, expectant, dead
6. Triage new patients as identified
7. Re-triage frequently for duration of MCI
8. **Immediate life-saving interventions for immediate patients**
    a. Treat hemorrhage with tourniquets, direct pressure with assistance from other patients or other devices
    b. Ensure patent airway by opening airway and using rapid adjuncts
    c. Decompress tension pneumothorax
    d. Use autoinjector antidotes if needed

Transport
1. First transport immediate patients
    a. Those requiring immediate in-hospital care for life and limb, particularly surgical care (suspected torso hemorrhage, uncontrollable junctional or extremity hemorrhage)

   b. Those with injuries temporized that required immediate transport (received airway intervention, decompressed tension pneumothorax, effective tourniquets for extremity hemorrhage or amputations)
2. Second, transport delayed patients
   a. Continue to re-triage continuously
   b. Continue life-saving interventions
   c. Initiate urgent required therapy
3. Assess minimal patients for appropriate transport decision

Patient Safety Considerations

1. Ensure patients remain in safe area
2. Re-assess scene safety as incident progresses as needed

Notes/Educational Pearls

Key Considerations

1. The most experienced EMS clinician should perform triage.
2. Another experienced EMS clinician should be assigned to immediate patient area and perform life-saving interventions as well as continuous triage.
3. Prioritize patients within immediate group for transport.
4. If available, another EMS clinician should be assigned to delayed area and perform urgent interventions if patient condition changes. Continuously triage and prioritize within the delayed patient group for transport.
5. Patient triage category may change with subsequent triage. If need for up-triage occurs, perform life-saving interventions, and move patient to appropriate triage area (delayed or immediate).
6. EMS system leaders within a defined area should work collaboratively to agree upon a common triage tool.
7. Evidence is limited on the highest performing triage tool. Available evidence suggests that the SALT triage tool was most likely to correctly triage adult emergency department patients, but all tested triage tools demonstrated relatively high rates of under triage.

Pertinent Assessment Findings

None noted

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
None noted

Key Documentation Elements

- Document pertinent patient information per local EMS protocol when able and before transport

Performance Measures

- Rapidly triage, treat and transport immediate life-threatening injuries
- Maintain scene safety for EMS clinicians and patients

- Continue triage and treat for all patients until relieved, until all patients transported or dispositioned, and until incident completion

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March 11, 2022

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)
4. Identify antidote or mitigating agent
5. 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

Go To TOC

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
d. Injection:
   i. Local pain
   ii. Puncture wounds
   iii. Reddening skin
   iv. Local edema
   v. Numbness
   vi. Tingling
   vii. Nausea
   viii. Vomiting
   ix. Diarrhea
   x. Altered mental status
   xi. Abdominal pain
   xii. Seizures
   xiii. Muscle twitching
   xiv. Hypoperfusion
   xv. Respiratory depression
   xvi. 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. **D**iarrhea
ii. **U**rination
iii. **M**iosis/**M**uscle weakness
iv. **B**ronchospasm/**B**ronchorrhea/**B**radycardia (*the killer Bs*)
v. **E**mesis
vi. **L**acrimation
vii. **S**alivation/**S**weating

c. Opioids
i. Respiratory depression
ii. Miosis (pinpoint pupils)
iii. Altered mental status
iv. Decreased bowel sounds

d. Sedative Hypnotic
i. Central nervous system depression
ii. Ataxia (unstable gait or balance)
iii. Slurred speech
iv. 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 re-cover to assure retention of body heat
4. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, and O_2 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 ($EtCO_2$) 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 re- check
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 guideline if not listed below)

a. 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
        1. As ASA is erratically absorbed, charcoal is highly recommended to be administered early
        2. 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
        1. **Adult**: diphenhydramine 25–50 mg IV or IM
        2. **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 0.1 mg/kg in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg — reduce by 50% for patients 69 years old or older
g. Opiate overdose, treat per the Opioid Poisoning/Overdose Guideline
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 acetaminophen) *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 (SSRIs)
    i. Consider early airway management
    ii. Treat arrhythmias following Advanced Cardiac Life Support (ACLS) guidelines
    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 Guideline]
    vi. For agitation, consider midazolam
        1. **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
            a. Reduce by 50% for patients 69 years or older
        2. **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 Guideline
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 Guideline]
    v. For agitation, consider midazolam
        1. **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
            a. Reduce by 50% for patients 69 years or older
        2. **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 Guideline

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, $EtCO_2$ 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 **national 24-hour toll-free telephone number to poison control centers is (800) 222- 1222**, and it is a resource for free, confidential expert advice from anywhere in the United States

Notes/Educational Pearls

Key Considerations

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

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914135—General - Overdose/Poisoning/Toxic Ingestion

Key Documentation Elements

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

Performance Measures

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

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Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

Aliases

Acetylcholinesterase inhibitor
Carbamate
Insecticide
Nerve agent
Organophosphate
Pesticide
Weapons of mass destruction (WMD)

Patient Care Goals

1. Rapid recognition of the signs and symptoms of confirmed or suspected acetylcholinesterase inhibitor (AChEI) agents such as carbamates, nerve agents, or organophosphates exposure followed by expeditious and repeated administration of atropine, the primary antidote
2. Carbamates and organophosphates are commonly active agents in commercial insecticides
3. Accidental carbamate exposure rarely requires treatment

Patient Presentation

Inclusion Criteria

1. 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
   a. **D**iarrhea
   b. **U**rination
   c. **M**iosis/**M**uscle weakness
   d. **B**ronchospasm/**B**ronchorrhea/**B**radycardia (*the killer Bs*)
   e. **E**mesis
   f. **L**acrimation
   g. **S**alivation/**S**weating

Exclusion Criteria

None noted

Patient Management

1. Don the appropriate PPE
2. Remove the patient's clothing and wash the skin with soap and warm water
   a. Acetylcholinesterase inhibitor agents can be absorbed through the skin
   b. Contaminated clothing can provide a source of continued exposure to the toxin
3. Rapidly assess the patient's respiratory status, mental status, and pupillary status
4. Administer the antidote atropine immediately for confirmed or suspected acetylcholinesterase inhibitor agent exposure
5. Administer oxygen as appropriate with a target of achieving 94–98% saturation and provide airway management
6. Establish intravenous access (if possible)
7. Apply a cardiac monitor (if available)
8. The heart rate may be normal, bradycardic, or tachycardic

9. Clinical improvement should be based upon the drying of secretions and easing of respiratory effort rather than heart rate or pupillary response
10. Continuous and ongoing patient reassessment is critical

Assessment

1. Acetylcholinesterase inhibitor agents are highly toxic chemical agents and can rapidly be fatal
2. Patients with low-dose chronic exposures may have a more delayed presentation of symptoms
3. Antidotes (atropine and pralidoxime) are effective if administered before circulation fails
4. The patient may develop:
   a. Miosis (pinpoint pupils)
   b. Bronchospasm
   c. Bradycardia
   d. Vomiting
   e. Excessive secretions in the form of:
      i. Tearing
      ii. Salivation
      iii. Rhinorrhea
      iv. Diarrhea
      v. Urination
      vi. Bronchorrhea
5. Penetration of an acetylcholinesterase inhibitor agent into the central nervous system (CNS) will cause:
   a. Headache
   b. Confusion
   c. Generalized muscle weakness
   d. Seizures
   e. Lethargy or unresponsiveness
6. Estimated level of exposure based upon signs and symptoms
   a. Mild
      i. Miosis alone (while this is a primary sign in vapor exposure, it may not be present is all exposures)
      ii. Miosis and severe rhinorrhea
   b. Mild to moderate (in addition to symptoms of mild exposure)
      i. Localized swelling
      ii. Muscle fasciculations
      iii. Nausea and vomiting
      iv. Weakness
      v. Shortness of breath
   c. Severe (in addition to symptoms of mild to moderate exposure)
      i. Unconsciousness
      ii. Convulsions
      iii. Apnea or severe respiratory distress requiring assisted ventilation
      iv. Flaccid paralysis
7. Onset of symptoms can be immediate with an exposure to a large amount of the acetylcholinesterase inhibitor

   a. There is usually an asymptomatic interval of minutes after liquid exposure before these symptoms occur
   b. Effects from vapor exposure occur almost immediately
8. Signs and symptoms with large acetylcholinesterase inhibitor agent exposures (regardless of route)
   a. Sudden loss of consciousness
   b. Seizures
   c. Copious secretions
   d. Apnea
   e. Death
9. Obtain an accurate exposure history (as patient may become unconscious before arrival at the 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
   e. Pertinent cardiovascular history or other prescribed medications for underlying disease
10. The patient can manifest any of the signs and symptoms of the toxidrome based on the route of exposure, agent involved, and concentration of the agent:
   a. Vapor exposures will have a direct effect on the eyes and pupils causing miosis
   b. Patients with isolated skin exposures will have normally reactive pupils
   c. Certain acetylcholinesterase inhibitor agents can place the patient at risk for both a vapor and skin exposure

Treatment and Interventions (See dosing tables)

1. **Medications**:
   a. Atropine
      i. Atropine is the primary antidote for organophosphate, carbamate, or nerve agent exposures, and repeated doses should be administered liberally to patients who exhibit signs and symptoms of exposure or toxicity
      ii. Atropine may be provided in multi-dose vials, pre-filled syringes, or auto-injectors
   b. Pralidoxime chloride (2-PAM)
      i. Pralidoxime chloride is a secondary treatment and should be given concurrently to reactivate acetylcholinesterase
      ii. Pralidoxime chloride may be provided in a single dose vial, pre-filled syringes, or auto-injectors
      iii. Auto-injectors typically contain 600 mg of pralidoxime chloride
      iv. To be beneficial to the victim, a dose of pralidoxime chloride should be administered shortly after the nerve agent or organophosphate poisoning as it has minimal clinical effect if administration is delayed
   c. Benzodiazepines
      i. Benzodiazepines are administered as an anticonvulsant for those patients who exhibit seizure activity [See Seizures Guideline for doses and routes of administration]
      ii. Lorazepam, diazepam, and midazolam are the most frequently used benzodiazepines in the prehospital setting; midazolam may have the fastest

onset of action

iii. Benzodiazepines may be provided in multi-dose or single-dose vials, pre-filled syringes, or auto-injectors
iv. CANA® (Convulsive Antidote Nerve Agent) is a commercially available auto-injector that contains 10 mg of diazepam

d. Duodote®
   i. Acommercially available auto-injector of nerve agent/organophosphate antidote
   ii. Duodote® is one auto-injector that contains 2.1 mg of atropine and 600 mg of pralidoxime chloride
e. ATNAA® (Antidote Treatment Nerve Agent Auto-injector)
   i. An auto-injector of nerve agent/organophosphate antidote that is typically in military supplies
   ii. ATNAA® is one auto-injector that contains 2.1 mg of atropine and 600 mg of pralidoxime chloride
   iii. ATNAA®may be seen in civilian supplies assets when Duodote® is unavailable or in short supply
f. CHEMPACK
   i. Federal cache of nerve agent antidotes that is managed by the Centers for Disease Control and Prevention (CDC) and offered to states that voluntarily agree to maintain custody and security of CHEMPACK assets
   ii. These are forward-deployed at sites determined by states that are part of the program such as hospitals and EMS centers
   iii. Deployment of CHEMPACKs is reserved for events where the nerve agent/organophosphate exposure will deplete the local or regional supply of antidotes
   iv. There are two types of CHEMPACK containers:
      1. **EMS Containers**: CHEMPACK assets for EMS contain a large portion of auto-injectors for rapid administration of antidotes by EMS clinicians of all levels of licensure/certification. They contain enough antidote to treat roughly 454 patients
      2. **Hospital Containers**: CHEMPACK assets contain a large portion of multidose vials and powders for reconstitution — they contain enough antidote to treat roughly 1,000 patients

2. **Medication Administration**:
   a. Atropine, in large and potentially multiple doses, is the antidote for an acetylcholinesterase inhibitor agent poisoning
   b. Atropine should be administered immediately followed by repeated doses until the patient' s secretionsresolve
   c. Pralidoxime chloride (2-PAM) is a secondary treatment and, when possible, should be administered concurrently with atropine
   d. The stock of atropine and pralidoxime chloride available to EMS clinicians is usually not sufficient to fully treat the victim of an acetylcholinesterase inhibitor agent exposure; however, EMS clinicians should initiate the administration of atropine and, if available, pralidoxime chloride
   e. Seizures should be treated with benzodiazepines. There is some emerging evidence that, for midazolam, the intranasal route of administration may be

preferable to the intramuscular route. However, intramuscular absorption may be more clinically efficacious than the intranasal route in the presence of significant rhinorrhea

f. The patient should be emergently transported to the closest appropriate medical facility as directed by medical direction

3. **Recommended Doses** (See dosing tables)

   The medication dosing tables that are provided below are based upon the severity of the clinical signs and symptoms exhibited by the patient. There are several imperative factors to note:

   a. For organophosphate or severe acetylcholinesterase inhibitor agent exposure, the required dose of atropine necessary to dry secretions and improve the respiratory status may exceed 20 mg. Atropine should be administered rapidly and repeatedly until the patient's clinical symptoms diminish. Atropine must be given until the acetylcholinesterase inhibitor agent has been metabolized.
   b. Because Duodote® auto-injectors contain pralidoxime chloride, they should not be used for additional dosing of atropine beyond the recommended administered dose of pralidoxime chloride
   c. All the medications below can be administered intravenously in the same doses cited for the intramuscular route. However, due to the rapidity of onset of signs, symptoms, and potential death from acetylcholinesterase inhibitor agents, intramuscular administration is highly recommended to eliminate the inherent delay associated with establishing intravenous access
   d. The antidotes can be administered via the intraosseous route. However, due to the rapidity of onset of signs, symptoms, and potential death from acetylcholinesterase inhibitor agents, intramuscular administration remains the preferable due to the inherent delay associated with establishing intraosseous access and the limited use of this route of administration for other medications

Table 1. Mild Acetylcholinesterase Inhibitor Agent Exposure

Patient	Atropine Dose (Weight) IM or via Auto-injector
Infant: 0–2 years of age	0.05 mg/kg IM or via auto-injector (i.e., *0.25 and/or 0.5 mg auto-injector(s))*
Child: 3–7 years of age (13–25 kg)	1 mg IM or via auto-injector (i.e., *one 1 mg or two 0.5 mg auto-injectors)*
Child: 8–14 years of age (26–50 kg)	2 mg IM or via auto-injector (i.e., *one 2 mg or two 1 mg auto-injectors)*
Adolescent/Adult	2 mg IM or via auto-injector
Pregnant Women	2 mg IM or via auto-injector
Geriatric/Frail	1 mg IM or via auto-injector
Adapted from: *U.S. Department of Health and Human Services, ASPR, National Library of Medicine, Chemical Hazards Emergency Medical Management: Nerve Agents— Prehospital Management,* *https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=523&toxid=93*	

Table 2. Mild to Moderate Acetylcholinesterase Inhibitor Agent Exposure

Patient (Weight)	Atropine Dose IM or via Auto-injector	Pralidoxime Chloride Dose IM or via 600 mg Auto-injector
Infant: 0–2 years of age	0.05 mg/kg IM or via auto-injector (i.e., *0.25 mg and/or 0.5 mg auto-injector)*	15 mg/kg IM
Child: 3–7 years of age (13–25 kg)	1 mg IM or via auto-injector (i.e., *one 1 mg auto-injector or two 0.5 mg auto-injectors)*	15 mg/kg IM **OR** One auto-injector (600 mg)
Child: 8–14 years of age (26–50 kg)	2 mg IM or via auto-injector (i.e., *one 2 mg auto-injector or two 1 mg auto-injectors)*	15 mg/kg IM **OR** One auto-injector (600 mg)
Adolescent/ Adult	2–4 mg IM or via auto-injector	600 mg IM **OR** One auto-injector (600 mg)
Pregnant Women	2–4 mg IM or via auto-injector	600 mg IM **OR** One auto-injector (600 mg)
Geriatric/Frail	2 mg IM or via auto-injector	10 mg/kg **IM** **OR** One auto-injector (600 mg)
Adapted from: *U.S. Department of Health and Human Services, ASPR, National Library of Medicine, Chemical Hazards Emergency Medical Management: Nerve Agents— Prehospital Management,* *https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=523&toxid=93*		

Table 3. Severe Acetylcholinesterase Inhibitor Agent Exposure

Patient (Weight)	Atropine Dose IM or via 600 mg Auto-injector	Pralidoxime Chloride Dose IM or via Auto-injector
Infant: 0–2 years of age	0.1 mg/kg IM or via auto-injector (i.e., *0.25 mg and/or 0.5 mg auto-injector)*	45 mg/kg **IM**
Child: 3–7 years of age (13–25 kg)	0.1 mg/kg IM **OR** 2 mg via auto-injector (i.e., one 2 mg auto-injector or four 0.5 mg auto-injectors)	45 mg/kg **IM OR** One auto-injector (600 mg)
Child: 8–14 years of age (26–50 kg)	4 mg IM or via auto-injector (i.e., *two 2 mg auto-injectors or four 1 mg auto-injectors)*	45 mg/kg **IM OR** Two auto-injectors (1200 mg)
Adolescent: 14 years of age or older	6 mg IM or via auto-injector (i.e., *three 2 mg auto-injectors)*	Three auto-injectors (1800 mg)
Adult	6 mg IM or via auto-injector (i.e., *three 2 mg auto-injectors)*	Three auto-injectors (1800 mg)
Pregnant Women	6 mg IM or via auto-injector (i.e., *three 2 mg auto-injectors)*	Three auto-injectors (1800 mg)
Geriatric/Frail	2–4 mg IM or via auto-injector (i.e., *one to two 2 mg auto-injectors)*	25 mg/kg IM **OR** two to three auto-injectors (1200 mg–1800 mg)

Adapted from: *U.S. Department of Health and Human Services, ASPR, National Library of Medicine, Chemical Hazards Emergency Medical Management: Nerve Agents— Prehospital Management, https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=523&toxid=93*

Table 4. Guidance for the Treatment of Seizures Secondary to Acetylcholinesterase Inhibitor Agent Exposure

Patient	Diazepam	Midazolam
Infant (0–2 y/o)	0.2–0.5 mg/kg IM Repeat q 2–5 minutes	0.2 mg/kg IM Repeat prn in 10 minutes
	0.2–0.5 mg/kg IV q 15–30 minutes May repeat twice as needed	May repeat dose once
	Total maximum dose: 5 mg	Total maximum dose: 0.4 mg/kg
Child (3–13 y/o)	0.2–0.5 mg/kg IM Repeat q 2–5 minutes	0.2 mg/kg IM Not to exceed 10 mg Repeat prn in 10 minutes
	0.2–0.5 mg/kg IV q 15–30 minutes May repeat dose twice if needed	May repeat dose once
	Total maximum dose: 5 mg if less than 5 years	Total maximum dose: 0.4 mg/kg Not to exceed 20 mg
	Total maximum dose: 10 mg if age 5 years or older 1 CANA® auto-injector	
Adolescent: 14 y/o or older	2–3 CANA® auto-injectors	0.2 mg/kg IM Total maximum dose of 10 mg Repeat prn in 10 minutes
	5–10 mg IV q 15 minutes	May repeat dose once
	Total maximum dose: 30 mg	Total maximum dose: 20 mg
Adult	2–3 CANA® auto-injectors	10 mg IM Repeat prn in 10 minutes
	5–10 mg IV q 15 minutes	May repeat dose once
	Total maximum dose: 30 mg	Total maximum dose: 20 mg
Pregnant Women	2–3 CANA® auto-injectors	10 mg IM Repeat prn in 10 minutes
	5–10 mg IV q 15 minutes	May repeat dose once
	Total maximum dose: 30 mg	Total maximum dose: 20 mg
Geriatric	2–3 CANA® auto-injectors	10 mg IM Repeat prn in 10 minutes
	5–10 mg IV q 15 minutes	May repeat dose once
	Total maximum dose: 30 mg	Total maximum dose: 20 mg

Adapted from: *U.S. Department of Health and Human Services, ASPR, National Library of Medicine, Chemical Hazards Emergency Medical Management: Nerve Agents — Prehospital Management,* *https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=523&toxid=93*

Patient Safety Considerations

1. Continuous and ongoing patient reassessment is critical
2. Clinical response to treatment is demonstrated by the drying of secretion and the easing of respiratory effort
3. Initiation of and ongoing treatment should **not** be based upon heart rate or

pupillary response

4. Precautions for pralidoxime chloride administration:
    a. Although Duodote® and ATNAA® contains atropine, the primary antidote for an acetylcholinesterase inhibitor agent poisoning, the inclusion of pralidoxime chloride in the auto-injector can present challenges if additional doses of atropine are warranted by the patient condition and other formulations of atropine are unavailable:
        i. **Pediatrics**: an overdose of pralidoxime chloride may cause profound neuromuscular weakness and subsequent respiratory depression
        ii. **Adults**: Especially for the geriatric victim, excessive doses of pralidoxime chloride may cause severe systolic and diastolic hypertension, neuromuscular weakness, headache, tachycardia, and visual impairment
        iii. **Geriatrics**: victim who may have underlying medical conditions, particularly impaired kidney function or hypertension, the EMS clinician should consider administering the lower recommended adult dose of intravenous pralidoxime chloride
5. Considerations during the use of auto-injectors
    a. If an auto-injector is administered, a dose calculation prior to administration is not necessary
    b. For atropine, additional auto-injectors should be administered until secretions diminish.
    c. Mark 1 kits, Duodote® and ATNAA® have not been approved for pediatric use by the Food and Drug Administration (FDA), but they can be considered for the initial treatment for children of any age with severe symptoms of an acetylcholinesterase inhibitor agent poisoning especially if other formulations of atropine are unavailable
    d. Pediatric Atro-Pen® auto-injectors are commercially available in a 0.25 mg auto-injector (**yellow**) and a 0.5 mg auto-injector (**red**). Atro-Pen® auto-injectors are commercially available in a 1 mg auto-injector (**blue**) and a 2 mg auto-injector (**green**)
    e. A pralidoxime chloride 600 mg auto-injector may be administered to an infant that weighs greater than 12 kg

Notes/Educational Pearls

Key Considerations

1. Clinical effects of acetylcholinesterase inhibitor agents
    a. The clinical effects are caused by the inhibition of the enzyme acetylcholinesterase which allows excess acetylcholine to accumulate in the nervous system
    b. The excess accumulated acetylcholine causes hyperactivity in muscles, glands, and nerves
2. Organophosphates Insecticides
    a. Can be legally purchased by the general public
    b. Organophosphate pesticides penetrate tissues and bind to the patient's body fat producing a prolonged period of illness and ongoing toxicity even during aggressive treatment
3. Nerve agents
    a. Traditionally classified as weapons of mass destruction (WMD)
    b. Not readily accessible to the general public
    c. Extremely toxic and rapidly fatal with any route of exposure
    d. GA (tabun), GB (sarin), GD (soman), GF, and VX are types of nerve agents and are WMDs

e. Nerve agents can persist in the environment and remain chemically toxic for a prolonged period of time

Pertinent Assessment Findings

The signs and symptoms exhibited with the toxidrome of **DUMBELS** [See Patient Presentation—Inclusion Criteria]

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914047—Exposure - Nerve Agents

Key Documentation Elements

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

Performance Measures

- Ability of the EMS system to rapidly locate additional and adequate antidote assets
- Ability of the EMS system to rapidly deploy additional and adequate antidote assets
- Survival rates of victims
- Complication rates from the toxin
- Complication rates from the antidotes
- Long-term clinical sequelae of the victims

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Revision Date

March 11, 2022

Radiation Exposure

Aliases
None noted

Patient Care Goals
1. Prioritize identification and treatment of immediately life-threatening medical conditions and traumatic injuries above any radiation-associated injury
2. Identify and appropriately treat acute radiation injury
3. Reduce risk for contamination of personnel while caring for patients potentially or known to be contaminated with radioactive material

Patient Presentation

Inclusion Criteria
1. Patients who have been acutely exposed to ionizing radiation from accidental environmental release of a radioactive source
2. Patients who have been acutely exposed to ionizing radiation from a non-accidental environmental release of a radioactive source
3. Patients who have been contaminated with material emitting ionizing radiation

Exclusion Criteria
1. Patients exposed to normal doses of ionizing radiation from medical imaging studies
2. Patients exposed to normal doses of ionizing radiation from therapeutic medical procedures

Patient Management

Assessment
1. Don standard PPE capable of preventing skin exposure to liquids and solids (gown and gloves), mucous membrane exposure to liquids and particles (face mask and eye protection), and inhalational exposure to particles (N95 face mask or respirator)
2. Identification and treatment of life-threatening injuries and medical problems takes priority over decontamination
3. Do not eat or drink any food or beverages while caring for patients with radiation injuries until screening completed for contamination and appropriate decontamination if needed
4. Use caution to avoid dispersing contaminated materials
5. Provide appropriate condition-specific care for any immediately life-threatening injuries or medical problems

Treatment and Interventions
1. If patient experiences nausea, vomiting, and/or diarrhea:
   a. Provide care, per Nausea-Vomiting Guideline
   b. Document the time gastrointestinal symptoms started
2. If seizure occurs:
   a. Consider a primary medical cause or exposure to possible chemical agents unless indicators for a large whole-body radiation dose (greater than 20 Gy (Gray)), such as rapid onset of vomiting, are present

   b. Treat per Seizures Guideline

Patient Safety Considerations

Treat life-threatening medical problems and traumatic injuries prior to assessing for and treating radiation injuries or performing decontamination

Notes/Educational Pearls

Key Considerations

1. Irradiated patients pose no threat to medical clinicians
2. Contaminated patients pose very little threat to medical clinicians who use appropriate PPE including N95 masks or respirators, gloves, gowns, and face and eye protection
3. Sources of radiation
   a. Legal
      i. Industrial plants
      ii. Healthcare facilities that provide radiologic services
      iii. Nuclear power plants
      iv. Mobile engineering sources (i.e., construction sites that are installing cement)
   b. Illegal
      i. Weapons of mass destruction
      ii. "Dirty bomb" design to contaminate widespread areas
4. Physiology of radiation poisoning
   c. Contamination: Poisoning from direct exposure to a radioactive source, contaminated debris, liquids, or clothing where radiation continues to be emitted from particles on surface
   d. Exposure: Poisoning from radioactivity, in the form of ionizing rays, penetrating through the bodily tissues of the patient
5. Common types of radioactivity that cause poisoning
   e. Gamma rays
      i. Highest frequency of ionizing rays
      ii. Penetrates the skin deeply
      iii. Causes the most severe radiation toxicity
   f. Beta rays: can penetrate up to 1 cm of the skin's thickness
   g. Alpha rays
      i. Lowest frequency of ionizing rays
      ii. Short range of absorption
      iii. Dangerous only if ingested or inhaled
   h. Radioactive daughters
      i. Products of decay of the original radioactive substance
      ii. Can produce gamma and beta rays (i.e., uranium decays into a series of radon daughters)
6. In general, trauma patients who have been exposed to or contaminated by radiation should be triaged and treated based on the severity of their conventional injuries
7. A patient who is contaminated with radioactive material (i.e., flecks of radioactive material embedded in their clothing and skin) generally poses a minimal exposure risk to medical personnel, although should not be placed in a contained space before decontamination
8. EMS clinicians may be asked to assist public health agencies in the distribution and

administration of potassium iodide in a mass casualty incident involving radiation release or exposure

9. Stages of Radiation Sickness
    i. Prodromal: nausea, vomiting, diarrhea, fatigue, fever, agitation, starting hours up to 4 days after initial exposure
    j. Latent: May last up to four weeks (this is the maximum period for immunocompromise due to radiation exposure); however, time span may be less as dose of radiation exposure increases. Symptoms include anorexia, fever, weakness, bleeding, diarrhea, potentially altered mental status after two to three weeks
    k. Recovery: may take weeks to months

Pertinent Assessment Findings

1. Treatment of life-threatening injuries or medical conditions takes priority over assessment for contamination or initiation of decontamination
2. Time to nausea and vomiting is a reliable indicator of the received dose of ionizing radiation. The more rapid the onset of vomiting, the higher the whole-body dose of radiation
3. Tissue burns are a late finding (weeks following exposure) of ionizing radiation injury. If burns are present acutely, they are from a thermal or chemical mechanism
4. Seizures may suggest acute radiation syndrome if accompanied by early vomiting. If other clinical indicators do not suggest a whole-body dose of greater than 20 Gy, consider other causes of seizure
5. Delayed symptoms (days to weeks after exposure or contamination)
    a. Skin burns with direct contact with radioactive source
    b. Skin burns or erythema from ionizing rays
    c. Fever
    d. Bone marrow suppression presenting as:
        i. immunosuppression
        ii. Petechiae
    e. Spontaneous internal and external bleeding

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914049—Exposure - Radiologic Agents

Key Documentation Elements

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

Performance Measures

- Use of appropriate PPE
- Use of dosimetry by EMS clinician
- Scene measurements of radioactivity

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Revision Date
March 11, 2022

Topical Chemical Burn

Aliases

Chemical Burn

Patient Care Goals

1. Rapid recognition of a topical chemical burn
2. Initiation of emergent and appropriate intervention and patient transport

Patient Presentation

Inclusion Criteria

1. Patients of all ages who have sustained exposure to a chemical that can cause a topical chemical burn may develop immediate or in some cases a delayed clinical presentation
2. Agents that are known to cause chemical burns include alkalis, acids, mustard agent, and lewisite

Exclusion criteria

None noted

Patient Management

1. Don the appropriate PPE
2. Remove the patient's clothing, if necessary
3. Contaminated clothing should preferably be placed in double bags
4. If deemed necessary and manpower resources permit, the patient should be transported by EMS clinicians who did not participate in the decontamination process, and in an emergency response vehicle that has not been exposed to the chemical
5. Information regarding the chemical should be gathered while on scene including materials safety data sheet if available
6. Communicate all data regarding the chemical to the receiving facility

Assessment

1. Clinical effects and severity of a topical chemical burn is dependent upon:
    a. Class of agent (alkali injury or acid injury)
    b. Concentration of the chemical the (higher the concentration, the greater the risk of injury)
    c. pH of the chemical
        i. Alkali-increased risk with pH greater than or equal to 11
        ii. Acid-increased risk with pH less than or equal to 3
    d. Onset of burn
        i. Immediate
        ii. Delayed (e.g., hydrofluoric acid)
2. Calculate the estimated total body surface area that is involved
3. Prevent further contamination
4. Special attention to assessment of ocular or oropharyngeal exposure — evaluate for airway compromise secondary to spasm or direct injury associated with oropharyngeal

burns
5. Some acid and alkali agents may manifest systemic effects

Treatment and Interventions

1. If dry chemical contamination, carefully brush off solid chemical prior to flushing the site as the irrigating solution may activate a chemical reaction
2. If wet chemical contamination, flush the patient's skin (and eyes, if involved) with copious amounts of water or normal saline
3. Provide adequate analgesia per the Pain Management Guideline
4. Consider the use of topical anesthetic eye drops (e.g., tetracaine) for chemical burns of the eye
5. For eye exposure, administer continuous flushing of irrigation fluid to eye — Morgan lens may facilitate administration
6. Early airway intervention for airway compromise or bronchospasm associated with oropharyngeal burns
7. Take measures to minimize hypothermia
8. Initiate intravenous fluid resuscitation if necessary to obtain hemodynamic stability

Hydrofluoric Acid

Hydrofluoric acid (HF) is a highly corrosive substance that is primarily used for automotive cleaning products, rust removal, porcelain cleaners, etching glass, cleaning cement or brick, or as a pickling agent to remove impurities from various forms of steel. Hydrofluoric acid readily penetrates intact skin and there may be underlying tissue injury. It is unlikely that low concentration HF will cause an immediate acid-like burn however there may be delayed onset of pain to the exposed area. Higher concentration HF may cause immediate pain as well as more of a burn appearance that can range from mild erythema to an obvious burn. An oral or large dermal exposure can result in significant systemic hypocalcemia with possible QT prolongation and cardiovascular collapse

1. For all patients in whom a hydrofluoric acid exposure is confirmed or suspected:
    a. Vigorously irrigate all affected areas with water or normal saline for a minimum of 15 minutes
    b. Apply a cardiac monitor for oral or large dermal exposures significant HF exposures
    c. Apply calcium preparation:
        i. Calcium prevents tissue damage from hydrofluoric acid
        ii. Topical calcium preparations:
            1. Commercially manufactured calcium gluconate gel
            2. If commercially manufactured calcium gluconate gel is not available, a topical calcium gluconate gel preparation can be made by combining 150 mL (5 ounces) of a sterile water-soluble gel (e.g., Surgilube® or KY® jelly) with one of the following:
                a. 35 mL of calcium gluconate 10% solution
                b. 10 g of calcium gluconate tablets (e.g., Tums®)
                c. 3.5 g calcium gluconate powder or
            3. If calcium gluconate is not available, 10 mL of calcium chloride 10% solution in 150 mL in sterile water-soluble gel (e.g., Surgilube® or KY® jelly)
            4. Apply generous amounts of the calcium gluconate gel to the exposed skin sites to neutralize the pain of the hydrofluoric acid

   a. Leave in place for at least 20 minutes then reassess
   b. This can be repeated as needed
5. Hydrofluoric acid exposure is very painful. Calcium gel is the foundation of pain control. While intravenous pain medications may be less effective, they should be added to calcium gel to assist with pain control. Hydrofluoric acid exposure typically causes pain out of proportion to the visible dermal effects. Minimal skin changes may exist with substantial exposures
6. If fingers are involved, apply the calcium gel to the hand, squirt additional calcium gel into a surgical glove, and then insert the affected hand into the glove
7. For patients who have ingested hydrofluoric acid or who have a large dermal exposure consider intravenous calcium gluconate, 1–2 grams of 10% solution, as symptomatic hypocalcemia can precipitate rapidly as manifest by muscle spasms, seizures, hypotension ventricular arrhythmias, and QT prolongation

Patient Safety Considerations

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

Notes/Educational Pearls

Key Considerations

1. IV fluid resuscitation should be guided by patient age, percentage of body surface area involved in burn, body habitus and calculated by the Parkland Formula [See Appendix VI. Burn and Burn Fluid Charts]
2. Since the severity of topical chemical burns is largely dependent upon the type, concentration, and pH of the chemical involved as well as the body site and surface area involved, it is imperative to obtain as much information as possible while on scene about the chemical substance by which the patient was exposed. The information gathering process will often include:
   a. Transport of the **sealed** container of the chemical to the receiving facility
   b. Transport of the original or a copy of the Material Safety Data Sheet (MSDS) of the substance to the receiving facility
   c. Contacting the reference agency to identify the chemical agent and assist in management (e.g., CHEMTREC®)
3. Inhalation of HF should be considered in any dermal exposure involving the face and neck or if clothing is soaked in the product
4. Decontamination is critical for both acid and alkali agents to reduce injury — removal of chemicals with a low pH (acids) is more easily accomplished than chemicals with a high pH (alkalis) because alkalis tend to penetrate and bind to deeper tissues
5. Some chemicals will also manifest local and systemic signs, symptoms, and bodily damage

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914213—Injury - Topical Chemical Burn

Key Documentation Elements

- Burn site
- Body surface area involved
- Identification of the chemical
- Reported or measured pH of the chemical
- Acquisition and transfer of MSDS, chemical container, or other pertinent substance information to the receiving the facility

Performance Measures

- Accurate (overtriage/undertriage) triage of patients to designated burn centers
- Early recognition of a topical chemical burn with appropriate treatment
- Early recognition of hydrofluoric acid burns followed by expeditious initiation of treatment with calcium gluconate and/or calcium chloride and appropriate analgesia
- Measures taken to prevent further contamination

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Revision Date

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Stimulant Poisoning/Overdose

Aliases

Amphetamines	Bath Salts	Cocaine
Ice	Methamphetamine	Phencyclidine (PCP)
Stimulant		

Patient Care Goals

1. Identify intoxicating agent
2. Protect organs at risk for injury such as heart, brain, liver, kidney
3. Determine if there is an antidote
4. Treat the symptoms, which may include severe tachycardia and hypertension, agitation, hallucinations, chest pain, seizure, and arrhythmia

Patient Presentation

Inclusion Criteria

1. Tachycardia/tachydysrhythmias
2. Hypertension
3. Diaphoresis
4. Delusions/paranoia
5. Seizures
6. Hyperthermia
7. Mydriasis (dilated pupils)
8. Stimulant/hallucinogenic (with stimulant properties) agents:
    a. Cocaine
    b. Amphetamine/methamphetamine
    c. Phencyclidine (PCP) (hallucinogen)
    d. Bupropion
    e. Synthetic stimulant drugs of abuse (some having mixed properties)
    f. Ecstasy
    g. Methamphetamine
    h. Khat or Synthetic cathinones (“bath salts”)
    i. “Spice”
    j. “K2”
    k. Synthetic THC

Exclusion Criteria

None noted

Patient Management

Assessment

1. Begin with the **ABCD**s:
    a. **A**irway is patent
    b. **B**reathing is oxygenating
    c. **C**irculation is perfusing

   d. **D**isability/neuro/mental status
   e. Treat any compromise of these parameters
   f. Ask about chest pain and difficulty breathing
2. Vital signs including temperature for hyperthermia
3. Apply a cardiac monitor and examine rhythm strip for arrhythmias
4. Check blood glucose level
5. Monitor $EtCO_2$ for respiratory decompensation
6. Check a 12-lead EKG when possible
7. Check for trauma, self-inflicted injury
8. Law enforcement should have checked for weapons and drugs, but you may need to repeat the inspection

Treatment and Interventions

1. IV access for any fluids and meds
2. Give fluids for poor perfusion; cool fluids for hyperthermia [See Shock Guideline and Hyperthermia/Heat Exposure Guideline]
3. Treat chest pain as acute coronary syndrome (ACS) and follow ST-Elevation Myocardial Infarction (STEMI) Guideline if there is EKG is consistent with STEMI
4. Consider treating shortness of breath as atypical ACS
   a. Administer oxygen as appropriate with a target of achieving 94–98% saturation
5. Consider soft physical management devices especially if law enforcement has been involved in getting patient to cooperate [See Agitated or Violent Patient/Behavioral Emergency Guideline]
6. Consider medications to reduce agitation and other significant sympathomimetic findings, preferably benzodiazepines, for the safety of the patients and clinicians. The administration of ketamine should be considered for delirium with agitated behavior. This may improve behavior and compliance [See Agitated or Violent Patient/Behavioral Emergency Guideline]
   a. If haloperidol or droperidol is used, maintain cardiac monitoring (or obtain 12-lead EKGs) for QT-interval prolongation if feasible
7. Consider prophylactic use of antiemetic:
   a. **Adult**: administer ondansetron 4–8 mg SLOW IV over 2–5 minutes or 4–8 mg IM or 8 mg orally disintegrating tablet
   b. **Pediatric**: Administer ondansetron 0.15 mg/kg SLOW IV over 2–5 minutes
   c. Do not use promethazine if haloperidol or droperidol are to be or have been given. They all increase QT prolongation, but ondansetron has less seizure risk
8. If hyperthermia suspected, begin external cooling (e.g., cold or ice packs to axilla/groin)

Patient Safety Considerations

1. Apply the least amount of physical management devices that are necessary to protect the patient and the clinicians [See Agitated or Violent Patient/Behavioral Emergency Guideline]
2. Assessment for potential weapons or additional drugs is very important since these items can pose a threat not just to the patient but also to the EMS crew

Notes/Educational Pearls

Key Considerations

1. Recognition and treatment of hyperthermia (including sedatives to decrease heat production from muscular activity) is essential as many deaths are attributable to hyperthermia
2. If law enforcement has placed the patient in handcuffs, this patient needs ongoing physical security for safe transport. Have law enforcement in back of ambulance for the handcuffed patient or make sure proper non-handcuff physical management devices are in place before law enforcement leaves and ambulance departs from scene
3. If patient has signs and symptoms of ACS, consider giving nitroglycerin sublingual (SL) q (quaque, every) 3–5 minutes if SBP greater than 100 mmHg and until pain resolves (if range not desired, use q 3 minutes)
   a. Vasospasm is often the problem in this case as opposed to a fixed coronary artery lesion
   b. Consider administration of benzodiazepines as if to treat anxiety
4. Maintaining IV access, cardiac monitor, and SPO_2/$EtCO_2$ monitors are key to being able to catch and intervene decompensations in a timely manner
   a. If agitated, consider restraining the patient to facilitate patient assessment and lessen likelihood of vascular access or monitor displacements
5. Cocaine has sodium channel blocking effects and can cause significant cardiac conduction abnormalities with a widened QRS. Treatment is with sodium bicarbonate similar to a tricyclic antidepressant. Check a 12-lead EKG to assess for these complications

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914225—Medical - Stimulant Poisoning/Overdose

Key Documentation Elements

- Reason for psychologic and physical management procedures used and neurologic/circulatory exams with device use
- Reason for medications selected

- Documentation of QT interval when antiemetic medications, haloperidol, or droperidol is used and result conveyed to ED staff

Performance Measures

- Recognition and treatment of hyperthermia
- Recognition of need for monitoring cardiovascular and respiratory status of patient with stimulant toxicity
- ACS evaluation and treatment considered for chest pain and shortness of breath
- Respiratory compromise quickly recognized and treated
- Cardiovascular compromise quickly recognized and treated
- Patient and medics did not suffer any harm
- Access and monitoring were not lost during transport

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Revision Date

March 11, 2022

Cyanide Exposure

Aliases

Blood agent
Cyanide
Hydrogen cyanide

Patient Care Goals

1. Remove patient from toxic environment
2. Assure adequate ventilation, oxygenation, and correction of hypoperfusion

Patient Presentation

Cyanide is a colorless gas or white crystal which binds to the ferric ion in cells, blocking the enzyme cytochrome oxidase, thus preventing the use of oxygen by the cell's mitochondria, leading to cellular hypoxia. While it has a characteristic "bitter almond smell", genetically only 40% of the population can smell it

Inclusion Criteria

1. Depending on its form, cyanide can enter the body through inhalation, ingestion, or absorption through the skin. Cyanide should be suspected in occupational or other smoke exposures (e.g., firefighting), industrial accidents, natural catastrophes, suicide and murder attempts, chemical warfare, and terrorism (whenever there are multiple casualties of an unclear etiology). Non-specific and early signs of cyanide exposure (inhalation, ingestion, or absorption) include the following signs and symptoms: anxiety, vertigo, weakness, headache, tachypnea, nausea, dyspnea, vomiting, and tachycardia
2. High concentrations of cyanide will produce:
   a. Markedly altered level of consciousness, including rapid collapse
   b. Seizures
   c. Respiratory depression or respiratory arrest
   d. Cardiac dysrhythmias (other than sinus tachycardia)
3. The rapidity of onset is related to the severity of exposure (inhalation or ingestion) and may be dramatic with immediate effects that include early hypertension with subsequent hypotension, sudden cardiovascular collapse or seizure/coma, and rapid death

Exclusion Criteria

None noted

Patient Management

Assessment

1. Remove patient from toxic environment
2. Assess ABCDs and, if indicated, expose the patient, and then re-cover the patient to assure retention of body heat
3. Assess vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) including temperature and pulse oximetry (which may not correlate with tissue oxygenation in cyanide/smoke exposure)
4. Attach a cardiac monitor and examine rhythm strip for arrhythmias
   a. Perform a 12-lead EKG
5. Check blood glucose level

6. Monitor pulse oximetry and $EtCO_2$
7. Monitor patient for signs of hypoxia (pulse oximetry *less than* 94%) and respiratory decompensation regardless of pulse oximetry reading
8. Identify the specific agent of exposure, time of ingestion/inhalation, and quantity/timing of exposure
9. Obtain patient history including cardiovascular history and prescribed medication
10. Obtain other pertinent patient history
11. Perform physical exam

Treatment and Interventions

There is **no** widely available, rapid, confirmatory cyanide blood test. Many hospitals will not be able to rapidly assess cyanide levels. Therefore, treatment decisions must be made on the basis of clinical history and signs and symptoms of cyanide intoxication. For the patient with an appropriate history and manifesting one or more significant cyanide exposure signs or symptoms, treat with:

1. 100% oxygen via non-rebreather mask, CPAP, or bag valve mask
2. Collect a pre-treatment blood sample in the appropriate tube for lactate and cyanide levels, if feasible
3. Administer one of the following medication regimes
    a. Hydroxocobalamin (the preferred agent)
        i. **Adult**: Administer hydroxocobalamin
            1. Initial dose is 5 g administered over 15 minutes slow IV
            2. Each 5 g vial of hydroxocobalamin for injection is to be reconstituted with 200 mL of LR, NS, or D5W (25 mg/mL) and administered at 10–15 mL/minute
            3. An additional 5 g dose may be administered with medical consultation.
        ii. Pediatric: Administer hydroxocobalamin 70 mg/kg (reconstitute concentration is 25 mg/mL)
            4. Each 5 g vial of hydroxocobalamin for injection is to be reconstituted with 200 mL of LR, NS, or DSW (25 mg/mL) and administered at 10–15 mL/minute
        i. Maximum single dose is 5 g

OR

    b. Sodium thiosulfate
        i. **Adult**: Sodium thiosulfate 12.5 g IVF (50 mL of 25% solution)
        ii. **Pediatric**: Sodium thiosulfate 0.5 g/kg IV (2 mL/kg of 25% solution)

4. If seizure, treat per Seizures Guideline

Patient Safety Considerations

1. In the event of multiple casualties, be sure to wear appropriate PPE during rescue evacuation from the toxic environment
2. If the patient ingests cyanide, it will react with the acids in the stomach generating hydrogen cyanide gas. Be sure to maximize air circulation in closed spaces (ambulance) as the patient's gastric contents may contain hydrogen cyanide gases when released with vomiting or belching
3. Do not use nitrites in conjunction with suspected carbon monoxide poisoning as it worsens the hemoglobin oxygen carrying capacity even more than carbon monoxide (CO)
4. Hydroxocobalamin is only agent safe for treatment of cyanide poisoning in pregnant patients

Notes/Educational Pearls

Key Considerations

1. Pulse oximetry accurately reflects serum levels of oxygen but does not accurately reflect tissue oxygen levels therefore should not be relied upon in possible cyanide and/or carbon monoxide toxicity
2. After hydroxocobalamin has been administered, pulse oximetry levels are no longer accurate and skin, tears, and urine will all turn red. This flushing should not be interpreted as an allergic reaction
3. If the patient ingests cyanide, it will react with the acids in the stomach generating hydrogen cyanide gas. Be sure to maximize air circulation in closed spaces (ambulance) as the patient's gastric contents may contain hydrogen cyanide gases when released with vomiting or belching
4. Amyl nitrite and sodium nitrite are no longer being used and no longer available in commercial kits

Pertinent Assessment Findings

Early and repeated assessment is essential

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914043—Exposure - Cyanide

Key Documentation Elements

- Repeat evaluation and documentation of signs and symptoms as the patient's clinical condition may deteriorate rapidly
- Identification of possible etiology of poisoning
- Time of symptom onset and time of initiation of exposure-specific treatments
- Therapy and response to therapy

Performance Measure

- Early airway management in the rapidly deteriorating patient
- Accurate exposure history
  - Time of ingestion/exposure
  - Route of exposure
  - Quantity of medication or toxin taken (safely collect all possible medications or agents)
  - Alcohol or other intoxicant taken
- Appropriate protocol selection and management
- Multiple frequent documented reassessments

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Revision Date
March 11, 2022

Beta Blocker Poisoning/Overdose

Aliases
Anti-hypertensive

Patient Care Goals
1. Reduce GI absorption of oral agents with some form of binding agent (activated charcoal) especially for extended release
2. Early airway protection is required as patients may have rapid mental status deterioration
3. Assure adequate ventilation, oxygenation, and correction of hypoperfusion

Patient Presentation
Beta blocker or beta-adrenergic antagonist medication to reduce the effects of epinephrine/adrenaline

Inclusion Criteria
1. Patients may present with:
    a. Bradycardia
    b. Hypotension
    c. Altered mental status
    d. Weakness
    e. Shortness of breath
    f. Possible seizures
    g. Hypoglycemia
2. Beta blocker agent examples:
    a. Acebutolol hydrochloride (Sectral®)
    b. Atenolol (Tenormin®)
    c. Betaxolol hydrochloride (Kerlone®)
    d. Bisoprolol fumarate (Zebeta®)
    e. Carteolol hydrochloride (Cartrol®)
    f. Esmolol hydrochloride (Brevibloc®)
    g. Metoprolol (Lopressor®, Toprol XL®)
    h. Nadolol (Corgard®)
    i. Nebivolol (Bystolic®)
    j. Penbutolol sulfate (Levatol®)
    k. Pindolol (Visken®)
    l. Propranolol (Inderal®, Inno Pran®)
    m. Timolol maleate (Blocadren®)
    n. Sotalol hydrochloride (Betapace®)
3. Alpha/beta-adrenergic blocking agents' examples:
    a. Carvedilol (Coreg®)
    b. Labetalol hydrochloride (Trandate®, Normodyne®)

Exclusion Criteria
None noted

Patient Management

Assessment

1. Assess ABCDs and if indicated expose and then cover to assure retention of body heat
2. Vital signs which include temperature
3. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead EKG
4. Check blood glucose level
5. Monitor pulse oximetry and $EtCO_2$ for respiratory decompensation
6. Identify specific medication taken (noting immediate release vs. sustained release formulations), time of ingestion, and quantity
7. Pertinent cardiovascular history or other prescribed medications for underlying disease
8. Patient pertinent history
9. Patient physical

Treatment and Interventions

1. Consider activated charcoal without sorbitol (1 g/kg) PO only if within the first hour of ingestion, if indicated per the time of ingestion. If risk of rapid decreasing mental status, do not administer oral agent without adequately protecting the airway
   a. If risk of rapid decreasing mental status, do not administer oral agent without adequately protecting the airway
2. Check blood glucose level on all patients but especially on pediatric patients as beta-blockers can cause hypoglycemia in pediatric population
3. Consider atropine sulfate for symptomatic bradycardia
   a. **Adult**: Atropine 1 mg IV q 5 minutes to maximum of 3 mg
   b. **Pediatric**: Atropine 0.02 mg/kg (0.5 mg maximum) q 5 minutes, maximum total dose 1 mg
4. Consider fluid challenge (20 mL/kg) for hypotension with associated bradycardia
5. For symptomatic patients with cardiac effects (e.g., hypotension, bradycardia) consider:
   a. **Adult**: Glucagon initial dose 5 mg IVP — this can be repeated in 5–10 minutes for a total of 10 mg
   b. **Pediatric**:
      i. Glucagon 1 mg IVP (25–40 kg) every 5 minutes as necessary
      ii. Glucagon 0.5 mg IVP (less than 25 kg) q 5 minutes as necessary
6. Consider vasopressors after adequate fluid resuscitation (1–2 liters of crystalloid) for the hypotensive patient [See Shock Guideline for pediatric vs. adult dosing]
7. Consider transcutaneous pacing if refractory to initial pharmacologic interventions
8. If seizure, treat per Seizures Guideline
9. If widened QRS (100 msec or greater), consider sodium bicarbonate 1–2 mEq/kg IV. This can be repeated as needed to narrow QRS

Patient Safety Considerations

1. Transcutaneous pacing may not always capture nor correct hypotension when capture is successful
2. Aspiration of activated charcoal can cause airway management to be nearly impossible. Do not administer activated charcoal to any patients that may have a worsening mental status

Notes/Educational Pearls

Key Considerations

1. **Pediatric Considerations**
    a. Pediatric patient may develop hypoglycemia from beta blocker overdose therefore it is important to perform glucose evaluation
    b. A single pill can kill a toddler. It is very important that a careful assessment of medications the toddler could have access to is done by EMS and all suspect medications should be brought into the ED
2. Glucagon has a side effect of increased vomiting at these doses and ondansetron prophylaxis may be considered
3. Atropine may have little or no effect (likely to be more helpful in mild overdoses) — the hypotension and bradycardia may be mutually exclusive, and the blood pressure may not respond to correction of bradycardia
4. Propranolol crosses the blood brain barrier and can cause altered mental status, seizure, and widened QRS similar to TCA toxicity

Pertinent Assessment Findings

1. Certain beta-blockers, such as acebutolol and propranolol, may increase QRS duration
2. Certain beta-blockers, such as acebutolol and pindolol, may produce tachycardia and hypertension
3. Sotalol can produce increase in QTc interval and ventricular dysrhythmias
4. Frequent reassessment is essential as patient deterioration can be rapid and catastrophic

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914215—Medical - Beta Blocker Poisoning/Overdose

Key Documentation Elements

- Repeat evaluation and documentation of signs and symptoms and vital signs as patient clinical conditions may deteriorate rapidly
- Identification of possible etiology of poisoning
- Time of symptoms onset and time of initiation of exposure-specific treatment
- Therapy and response to therapy

Performance Measures

- Early airway management in the rapidly deteriorating patient
- Accurate exposure history
    - Time of ingestion/exposure
    - Route of exposure
    - Quantity of medication or toxin taken (safely collect all possible mediations or agents)
    - Alcohol or other intoxicant taken
- Appropriate protocol selection and management
- Multiple frequent documented re-assessments
- Blood glucose checks (serial if long transport, especially in children)
- Good evaluation of the EKG and the segment intervals

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Revision Date

March 11, 2022

Bites and Envenomation

Aliases
Stings

Patient Care Goals
Bites, stings, and envenomations can come from a variety of insects, marine, and terrestrial animals. Assure adequate ventilation, oxygenation, and correction of hypoperfusion. Provide pain control which also may include external interventions to reduce pain

Patient Presentation

Inclusion Criteria
1. Bites, stings, and envenomations can come from a variety of marine and terrestrial animals and insects causing local or systemic effects
2. Patients may present with toxin specific reactions which may include:
   a. Site pain
   b. Swelling
   c. Muscle pain (hallmark of black widow spider bites)
   d. Erythema
   e. Discoloration
   f. Bleeding
   g. Nausea
   h. Abdominal pain
   i. Hypotension
   j. Tachycardia
   k. Tachypnea
   l. Muscle incoordination
   m. Confusion
   n. Anaphylaxis/allergic reactions
3. There is a spectrum of toxins or envenomations and limited EMS interventions that will have any mitigating effect on the patient in the field
   a. The critical intervention is to get the patient to a hospital that has access to the antivenin if applicable

Exclusion Criteria
None noted

Patient Management

Assessment
1. Assess ABCDs and if indicated expose and then cover to assure retention of body heat
2. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) which include temperature
3. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead EKG
4. Check blood glucose Level
5. Monitor pulse oximetry and $EtCO_2$ for respiratory decompensation

6. Patient pertinent history
7. Patient physical with special consideration to area of envenomation especially crotalid bite

Treatment and Interventions

1. Consider an IV fluid bolus (normal saline or lactated Ringer's) 20 mL/kg up to 2 liters
2. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient [for adult vs. pediatric dosing, see Shock Guideline]
3. If seizure, treat per Seizures Guideline
4. Specific therapy for select bites, stings, or envenomation
    a. Envenomations that are known to antivenom readily available in the USA include black widow spider, bark scorpions, crotalid snakes (rattlesnake, copperhead) and coral snakes
        i. For these envenomations, consider transport to a hospital that has access to antivenom, if feasible
    b. Jellyfish
        i. As there is a significant variety and diversity of jellyfish, it is important to be familiar with the species and the appropriate treatment for your local aquatic creatures
        ii. Generally, scrape off any remaining tentacles or nematocysts, then immerse affected body part in hot water (113°F/45°C). Vinegar may be used to reduce pain due to deactivation of the nematocysts remaining in the skin except for stings from certain species of jellyfish (i.e., Physalia, a species found in Australian waters) which may have nematocysts activated by vinegar (acetic acid). Vinegar may also activate the nematocysts of sea nettles and is not recommended after this type of jellyfish exposure
    c. Lionfish, scorpionfish, stingray:
        i. Immerse affected body part in hot water to reduce the pain associated with the toxin
5. Provide adequate analgesia per the Pain Management Guideline

Patient Safety Considerations

1. Do ***NOT:***
    a. Apply tourniquets, tight Ace®/crepe bandage, or constricting bands above or below the site of the envenomation
    b. Incise and/or suction wound to remove toxin
    c. Apply cold packs or immerse the effect extremity in ice water (cryotherapy)
2. EMS clinicians should not try to capture the marine or terrestrial animal or insect
3. If the organism has been killed, beware that many dead insect, marine, or fanged animals can continue to bite or sting with venom and should be safely placed in a hard sided and closed container for future identification
4. Patient may still have an imbedded stinger, tooth, nematocyst, or barb which may continue to deliver toxin if left imbedded. Consider safe removal without squeezing the toxin delivery apparatus

Notes/Educational Pearls

Key Considerations

Vinegar has potential to increase pain associated with jellyfish sting as it can increase nematocyst discharge in certain species. Clinicians must be familiar with endemic species and how to best address exposure

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914079—Injury - Bites and Envenomations-Land
- 9914081—Injury - Bites and Envenomations-Marine

Key Documentation Elements

- It is helpful to accurately describe the suspect bite or sting source without risking patient or EMS clinician
- Only transport source animal or insect if can be done safely in a hard-sided container
- Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
- Time of symptoms onset and time of initiation of exposure-specific treatments
- Therapy and response to therapy

Performance Measures

- Offending organism was managed appropriately without secondary exposure
- Appropriate and timely definitive treatment was provided
- Appropriate pain management

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Revision Date

March 11, 2022

Calcium Channel Blocker Poisoning/Overdose

Aliases

Anti-hypertensive

Patient Care Goals

1. Reduce GI absorption of oral agents with some form of binding agent (activated charcoal) especially for extended release
2. Early airway protection is required as patients may have rapid mental status deterioration
3. Assure adequate ventilation, oxygenation, and correction of hypoperfusion

Patient Presentation

Calcium channel blockers interrupt the movement of calcium across cell membranes. Calcium channel blockers are used to manage hypertension, certain rate-related arrhythmias, prevent cerebral vasospasm, and angina pectoris. Patients may present with:

1. Bradycardia
2. Hypotension
3. Decreased AV nodal conduction
4. Cardiogenic shock
5. Hyperglycemia

Inclusion Criteria

1. Patients who have may have taken/been administered calcium channel blockers
    a. Calcium channel blocker examples:
        i. Amlodipine (Norvasc®)
        ii. Diltiazem (Cardizem®, Tiazac®)
        iii. Felodipine
        iv. Isradipine
        v. Nicardipine
        vi. Nifedipine (Adalat CC®, Afeditab CR®, Procardia®)
        vii. Nisoldipine (Sular®)
        viii. Verapamil (Calan®, Verelan®)

Exclusion Criteria

None noted

Patient Management

Assessment

1. Assess ABCDs and, if indicated, expose, and then cover to assure retention of body heat
2. Vital signs including temperature
3. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and consider obtaining a 12-lead EKG
4. Check blood glucose level
5. Monitor pulse oximetry and $EtCO_2$ for respiratory decompensation
6. Identify specific medication taken (noting immediate release vs. sustained release formulations), time of ingestion, and quantity

Go To TOC

7. Pertinent cardiovascular history or other prescribed medications for underlying disease
8. Patient pertinent history
9. Physical exam

Treatment and Interventions

1. Consider activated charcoal without sorbitol (1 g/kg) PO only if within the first hour of ingestion, if indicated per the time of ingestion. If risk of rapid decreasing mental status, do not administer oral agent without adequately protecting the airway
2. Consider atropine sulfate for symptomatic bradycardia
    a. **Adult**: atropine 1 mg IV q 5 minutes to maximum of 3 mg
    b. **Pediatric**: atropine 0.02 mg/kg (0.5 mg maximum) q 5 minutes, maximum total dose 1 mg
3. Consider calcium gluconate or calcium chloride
    a. Calcium gluconate
        i. **Adult**: Calcium gluconate 2–6 g slow IVP over 10 minutes
        ii. **Pediatric**: Calcium gluconate 60 mg/kg IVP over 10 minutes
    b. Calcium chloride
        i. **Adult**: Calcium chloride 0.5–1 g slow IVP (50 mg/minute)
        ii. **Pediatric**: Calcium chloride 20 mg/kg (0.2 mL/kg) slow IVP over 10 minutes (50 mg/mL) Maximum dose 1 g or 10 mL (Calcium gluconate is preferred as Calcium chloride has increased risk of tissue damage in pediatrics)
4. Consider IV fluid bolus (normal saline or lactated Ringer's) 20 mL/kg up to 2 liters
5. Consider vasopressors after adequate fluid resuscitation for the hypotensive patient [See Shock Guideline for adult vs. pediatric dosing]
6. If atropine, calcium, and vasopressors have failed in the symptomatic bradycardia patient, consider:
    a. **Adult:** Glucagon 5 mg IVP, then 1 mg q 5 minutes IVP (may require 5–15 mg to see effect)
    b. **Pediatric**:
        i. Glucagon 1 mg IVP (25–40 kg); q 5 minutes as necessary
        ii. Glucagon 0.5 mg IVP (less than 25 kg); q 5 minutes as necessary
7. Consider transcutaneous pacing if refractory to initial pharmacologic interventions
8. If seizure, consider midazolam (benzodiazepine of choice). [See Seizures Guideline for adult vs. pediatric dosing]

Patient Safety Considerations

Transcutaneous pacing may not always capture nor correct hypotension when capture is successful.

Notes/Educational Pearls

Key Considerations

1. While most calcium channel blockers cause bradycardia, dihydropyridine class calcium channel blockers (e.g., nifedipine, amlodipine) can cause a reflex tachycardia (torsade de pointes) early in the ingestion. The patient can become bradycardic as the intoxication worsens

2. The avoidance of administering calcium chloride or calcium gluconate to a patient on cardiac glycosides (e.g., digoxin) as this may precipitate toxicity and associate fatal arrhythmias is felt to be a historical belief and not supported
3. Glucagon has a side effect of increased vomiting at these doses and ondansetron prophylaxis should be considered
4. A single pill can kill a toddler. It is very important that a careful assessment of medications the toddler could have access to is done by EMS and suspect medications brought into the ED
5. Calcium channel blockers can cause many types of rhythms that can range from sinus bradycardia to complete heart block
6. Hyperglycemia is the result of the blocking of L-type calcium channels in the pancreas. This can help differentiate these ingestions from beta-blockers. There may also be a relationship between the severity of the ingestion and the extent of the hyperglycemia
7. Atropine may have little or no effect (likely to be more helpful in mild overdoses)
    a. Hypotension and bradycardia may be mutually exclusive, and the blood pressure may not respond to correction of bradycardia

Pertinent Assessment Findings

1. Close monitoring of EKG changes and dysrhythmias
2. Serial frequent assessments are essential as these patients often have rapid deterioration with profound hypotension

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914217—Medical - Calcium Channel Blocker Poisoning/Overdose

Key Documentation Elements

- Repeat evaluation and documentation of signs and symptoms as patient clinical conditions may deteriorate rapidly
- Identification of possible etiology of poisoning
- Time of symptoms onset and time of initiation of exposure-specific treatments
- Therapy and response to therapy

Performance Measures

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

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Carbon Monoxide/Smoke Inhalation

Aliases
CO

Patient Care Goals
1. Remove patient from toxic environment.
2. Assure adequate ventilation, oxygenation, and correction of hypoperfusion.
3. Consider use of environmental carbon monoxide (CO) monitors on "first in" bags to assist in detection of occult CO toxicity.

Patient Presentation
Carbon monoxide is a colorless, odorless gas which has a high affinity for binding to red cell hemoglobin, thus preventing the binding of oxygen to the hemoglobin, leading to tissue hypoxia (although pulse oximetry may appear to be normal). A significant reduction in oxygen delivery to tissues and organs occurs with carbon monoxide poisoning. Carbon monoxide is also a cellular toxin which can result in delayed or persistent neurologic sequelae in significant exposures. With any form of combustion (fire/smoke [e.g., propane, kerosene, or charcoal stoves or heaters], combustion engines [e.g., generators, lawn mowers, motor vehicles, home heating systems]), carbon monoxide will be generated. People in a fire may also be exposed to cyanide from the combustion of some synthetic materials. Cyanide toxicity may need to be considered in the hemodynamically unstable patient removed from a fire.

Inclusion Criteria
1. Patients exposed to carbon monoxide may present with a spectrum of symptoms:
    a. Mild intoxication:
        i. Nausea
        ii. Fatigue
        iii. Headache
        iv. Vertigo
        v. Lightheadedness
    b. Moderate to severe:
        i. Altered mental status
        ii. Tachypnea
        iii. Tachycardia
        iv. Convulsion
        v. Cardiopulmonary arrest

Exclusion Criteria
None noted

Patient Management

Assessment
1. Remove patient from toxic environment
2. Assess ABCDs and, if indicated, expose patient and re-cover to assure retention of body heat
3. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) temperature, and O_2 saturation, and $EtCO_2$ if available

4. Apply a cardiac monitor, examine rhythm strip for arrhythmias, and obtain a 12-lead EKG if available
5. Check blood glucose level
6. Monitor pulse oximetry and $EtCO_2$ for respiratory decompensation
7. Patient pertinent history
8. Patient physical examination

Treatment and Interventions

1. 100% oxygen via non-rebreather mask or high flow oxygen by nasal cannula (HFNC) or CPAP or bag valve mask or advanced airway as indicated
2. If seizure, treat per Seizures Guideline
3. Consider transporting patients with severe carbon monoxide poisoning directly to a facility with hyperbaric oxygen capabilities if feasible and patient does not meet criteria for other specialty care (e.g., trauma or burn)

Patient Safety Considerations

1. Consider affixing a carbon monoxide detector to an equipment bag that is routinely taken into scene (if it signals alarm, don appropriate respiratory protection and exit scene) to assist with detection of occult CO toxicity
2. Remove patient and response personnel from potentially hazardous environment as soon as possible
3. Provide instruction to the patient, the patient's family, and other appropriate bystanders to not enter the environment (e.g., building, car) where the carbon monoxide exposure occurred until the source of the poisoning has been eliminated
4. Do not look for cherry red skin coloration as an indication of carbon monoxide poisoning, as this is an unusual finding
5. CO oximeter devices may yield inaccurate low/normal results for patients with CO poisoning. All patients with probable or suspected CO poisoning should be transported to the nearest appropriate hospital based on their presenting signs and symptoms

Notes/Educational Pearls

Key Considerations

1. Pulse oximetry is inaccurate due to the carbon monoxide binding with hemoglobin
2. As maternal carboxyhemoglobin levels do not accurately reflect fetal carboxyhemoglobin levels, pregnant patients are more likely to be treated with hyperbaric oxygen
3. Consider cyanide toxicity if carbon monoxide poisoning is from a fire

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914167—Exposure - Carbon Monoxide
- 9914173—Exposure - Smoke Inhalation

Key Documentation Elements

- If using an environmental carbon monoxide detector, record the level detected
- Evidence of soot or burns around the face, nares, or pharynx
- Early and repeat assessment of patient's mental status and motor function are extremely useful in determining response to therapy and the need for hyperbaric therapy
- Accurate exposure history
  - Time of ingestion/exposure
  - Route of exposure
  - Quantity of medication or toxin taken (safely collect all possible mediations or agents)
  - Alcohol or other intoxicant taken
- Signs and symptoms of other patients encountered at same location if present

Performance Measures

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

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Revision Date

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Opioid Poisoning/Overdose

Aliases

Carfentanil	Dilaudid®	Drug abuse
Fentanyl	Heroin	Hydrocodone
Hydromorphone	Methadone	Morphine
Opiate	Opioid	Overdose
Oxycodone	Oxycontin®	Percocet®
Percodan®	U-47700	Vicodin®

Patient Care Goals

1. Rapid recognition and intervention of a clinically significant opioid poisoning or overdose
2. Prevention of respiratory and/or cardiac arrest

Patient Presentation

Inclusion Criteria

Patients exhibiting decreased mental status, and respiratory depression of all age groups with known or suspected opioid use or abuse. Lack of miosis (pinpoint pupils) is not a reliable sign for ruling out opioid exposure, although its presence is consistent with such exposure

Exclusion Criteria

Patients with altered mental status exclusively from other causes (e.g., head injury, or hypoglycemia)

Patient Management

1. Don the appropriate PPE. Note that opioids have minimal vapor pressure and do not pose an exposure risk to rescuers unless aerosolized or ingested
2. Therapeutic interventions to support the patient's airway, breathing, and circulation should be initiated prior to the administration of naloxone
3. If possible, identify specific medication taken (including immediate release versus sustained release) time of ingestion, and quantity
4. Obtain and document pertinent cardiovascular history or other prescribed medications for underlying disease
5. Be aware that unsecured hypodermic needles may be on scene if the intravenous route may have been used by the patient, and that there is a higher risk of needle sticks during the management of this patient population which may also have an increased incidence of blood-borne pathogens
6. Naloxone, an opioid antagonist, should be considered for administration to patients with respiratory depression in a confirmed or suspected opioid overdose
7. Naloxone administration via the intravenous route provides more predictable bioavailability and flexibility in dosing and titration
8. Naloxone administration via the intranasal or intramuscular routes or as a nebulized solution provide additional options of medication delivery
9. If naloxone was administered to the patient prior to the arrival of EMS, obtain the dose and route through which it was administered and, if possible, bring the devices containing the dispensed naloxone with the patient along with all other medications on scene

Assessment

1. Assess the patient's airway, breathing, circulation, and mental status
2. Support the patient's airway by positioning, oxygen administration, and ventilator assistance with a bag valve mask if necessary
3. Assess the patient for other etiologies of altered mental status including hypoxia (pulse oximetry less than 94%), hypoglycemia, hypotension, and traumatic head injury
4. Legally prescribed opioids are also manufactured as an adhesive patch for transdermal absorption, and if found, should be removed from the skin

Treatments and Interventions

1. Critical resuscitation (opening and/or maintaining the airway, provision of oxygen, ensuring adequate circulation) should be performed prior to naloxone administration
2. If the patient has respiratory depression from a confirmed or suspected opioid overdose, consider naloxone administration
   a. The administration of the initial dose or subsequent doses can be incrementally titrated until respiratory depression is reversed
3. Naloxone can be administered via the IV, IM, IN, or ETT routes. As the ETT route is not very effective, its use should be reserved for dire circumstances with a patient in extremis with no other choice
   a. **Adults**: The typical initial adult dose ranges between 0.4–2 mg IV, IM, up to a dose of 4 mg IN or 5 mg ETT
   b. **Pediatrics**: The pediatric dose of naloxone is 0.1 mg/kg IV, IM, IN, or ETT
      i. Maximum dose of 2 mg IV, IM, or ETT
      ii. Maximum dose of 4 mg IN
4. Naloxone can be administered via the IV, IM, IN, or ETT routes. As the ETT route is not very effective, its use should be reserved for dire circumstances with a patient in extremis with no other choice
   a. **Adults:** The typical initial adult dose ranges between 0.4–2 mg IV, IM, up to a dose of 4 mg IN or 5 mg ETT
   b. **Pediatrics**: The pediatric dose of naloxone is 0.1 mg/kg IV, IM, IN, or ETT
      i. Maximum dose of 2 mg IV, IM, or ETT
      ii. Maximum dose of 4 mg IN
   c. Naloxone provided to laypersons and non-medical first responders via public access programs or prescriptions may be provided as a pre-measured dose in an auto-injector or nasal spray or as a pre-measured, but variable, dose and/or concentration in a needleless syringe with a mucosal atomization device (MAD) on the hub
   d. Naloxone auto-injectors contain 0.4 mg/0.4 mL or 2 mg/0.4 mL
      i. The cartons of naloxone auto-injectors prescribed to laypersons contain two naloxone auto-injectors and one trainer
   e. Naloxone nasal spray is manufactured in a single-use bottle that contains 4 mg/0.1 mL
   f. For the intranasal route when naloxone is administered via a needleless syringe (preferably with MAD on the hub), divide administration of the dose equally between the nostrils to a maximum of 1 mL per nostril
   g. The administration of naloxone can be titrated until adequate respiratory effort is achieved if administered with a syringe IV, IM, IN, or ETT
   h. Naloxone has no benefit in the treatment of cardiac arrest. Do not delay other

interventions such as chest compressions and ventilations

5. High-potency opioids [See Key Considerations] may require higher and/or more frequently administered doses of naloxone to reverse respiratory depression and/or to maintain adequate respirations
6. Regardless of the doses of naloxone administered, airway management with provision of adequate oxygenation and ventilation is the primary goal in patients with confirmed or suspected opioid overdose

Patient Safety Considerations

1. Clinical duration of naloxone
   a. The clinical opioid reversal effect of naloxone is limited and may end within an hour whereas opioids often have a duration of 4 hours or longer
   b. Monitor the patient for recurrent respiratory depression and decreased mental status
2. Opioid withdrawal
   a. Patients with altered mental status secondary to an opioid overdose may become agitated or violent following naloxone administration due to opioid withdrawal therefore the goal is to use the lowest dose as possible to avoid precipitating withdrawal
   b. Be prepared for this potential scenario and take the appropriate measures in advance to ensure and maintain scene safety
3. EMS clinicians should be prepared to initiate airway management before, during, and after naloxone administration and to provide appropriate airway support until the patient has adequate respiratory effort

Notes/Educational Pearls

Key Considerations

1. The essential feature of opioid overdose requiring EMS intervention is respiratory depression or apnea, managed by ventilation followed by naloxone
2. Some opioids have additional toxic effects (i.e., methadone can produce QT prolongation and tramadol can produce seizures)
3. Overuse and abuse of prescribed and illegal opioids has led to an increase in accidental and intentional opioid overdoses
4. Opioid combinations:
   a. Some opioids are manufactured as a combination of analgesics with acetaminophen, acetylsalicylic acid (aspirin), or other substances
   b. In the scenario of an overdose, there is a potential for multiple drug toxicities
   c. Examples of opioid combination analgesics:
      i. Vicodin® is a combination of acetaminophen and hydrocodone
      ii. Percocet® is a combination of acetaminophen and oxycodone
      iii. Percodan® is a combination of aspirin and oxycodone
      iv. Suboxone® is a combination of buprenorphine and naloxone
5. High-potency opioids:
   a. Fentanyl is 50–100 times more potent than morphine. It is legally manufactured in an injectable and oral liquid, tablet, and transdermal (worn as a patch) forms however much of the fentanyl adulterating the heroin supply are illegal fentanyl analogs such as acetyl fentanyl
   b. Carfentanil is 10,000 times more potent than morphine
      i. It is legally manufactured in a liquid form; however, a powder or tablet is the

most common form of this drug that is illegally produced
    ii. In the concentration in which it is legally manufactured (3 mg/mL), an intramuscular dose of 2 mL of carfentanil will sedate an elephant
  c. Synthetic opioids (i.e., W-18 are 10,000 times more potent than morphine) many synthetic opioids are not detectable by routine toxicology screening assays
6. The IN route has the benefit of no risk of needle stick to the clinician
7. Patients with opioid overdose from fentanyl or fentanyl analogs may rapidly exhibit chest wall rigidity and require positive end expiratory pressure (PEEP), in addition to multiple and/or larger doses of naloxone, to achieve adequate ventilation

Pertinent Assessment Findings

1. The primary clinical indication for the use of opioid medications is analgesia
2. In the opioid overdose scenario, signs and symptoms include:
    a. Miosis (pinpoint pupils)
    b. Respiratory depression
    c. Decreased mental status
3. Additional assessment precautions:
    a. The risk of respiratory arrest with subsequent cardiac arrest from an opioid overdose as well as hypoxia (pulse oximetry less than 94%), hypercarbia, and aspiration may be increased when other substances such as alcohol, benzodiazepines, or other medications have also been taken by the patient
    b. **Pediatric Considerations**: The signs and symptoms of an opioid overdose may also be seen in newborns who have been delivered from a mother with recent or chronic opioid use. Neonates who have been administered naloxone for respiratory depression due to presumed intrauterine opioid exposure may be narcotic dependent and should be monitored closely for seizures

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914219—Medical - Opioid Poisoning/Overdose

Key Documentation Elements

- Rapid and accurate identification of signs and symptoms of opioid poisoning
- Airway management
- Pulse oximetry (oxygen saturation) and, if available, capnometry or capnography
- Blood glucose assessment
- Naloxone dose and route of administration
- Clinical response to medication administration
- Number of doses of naloxone to achieve a clinical response

Performance Measures

- Clinical improvement after prehospital administration of naloxone
- The performance and ongoing assessment of airway management
- Frequency of patients who develop adverse effects or complications (recurrent respiratory depression or decreased mental status, aspiration pneumonia or pulmonary edema)
- Number of patients who refuse transport following naloxone administration

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Airway Respiratory Irritants

Aliases

Airway injury	Chemical respiratory	Injury
Respiratory injury	Respiratory irritant	Toxic inhalation

Patient Care Goals

Rapid recognition of the signs and symptoms of confirmed or suspected airway respiratory irritants

Patient Presentation

Inclusion Criteria

1. Inhalation of a variety of gases, mists, fumes, aerosols, or dusts may cause irritation or injury to the airways, pharynx, lung, asphyxiation, or other systemic effects
2. Inhaled airway/respiratory irritant agents will interact with the mucous membranes, upper and lower airways based on solubility, concentration, particle size, and duration of exposure
3. The less soluble and smaller the particle size of the agent the deeper it will travel into the airway and respiratory systems the inhaled toxic agent will go before reacting with adjoining tissues thus causing a greater delay in symptom onset

Signs and Symptoms

1. As the type, severity and rapidity of signs and symptom onset depends on agent, water solubility, concentration, particle size, and duration of exposure, the below signs and symptoms are often overlapping and escalating in severity
2. Many airways and respiratory irritant agents have "warning properties" such as identifiable or unpleasant smells or irritation to eyes or airways
3. Some agents do not have clear warning properties and will often have delayed onset of any sign or symptom:
   a. Unusual odor/smell
   b. Tearing or itchy eyes
   c. Burning sensation and burns to the nose, pharynx, and respiratory tract
   d. Sneezing
   e. General excitation
   f. Cough
   g. Chest tightness
   h. Nausea
   i. Shortness of breath/dyspnea
   j. Wheezing
   k. Stridor
   l. Dyspnea on exertion
   m. Dizziness Upper
   n. Change in voice
   o. Airway obstructions include laryngospasm and laryngeal edema
   p. Pulmonary edema (non-cardiogenic)
   q. Seizures
   r. Cardiopulmonary arrest
4. High water solubility/highly irritating (oral/nasal and pharynx, particle size greater than

10 micrometers)
   a. Acrolein
   b. Ammonia
   c. Chloramine
   d. Ethylene oxide
   e. Formaldehyde
   f. Hydrogen chloride
   g. Methyl bromide
   h. Sodium azide
   i. Sulfur dioxide
5. Intermediate water solubility (bronchus and bronchiole, particle size 5–10 micrometers)
   a. Chlorine
6. Low water solubility/less irritating (alveolar, particle size less than 5 micrometers)
   a. Cadmium fume
   b. Fluorine
   c. Hydrogen sulfide (rotten egg odor; olfactory fatigue)
   d. Mercury fume
   e. Mustard gas (also delayed blistering skin manifestations)
   f. Nickel carbonyl
   g. Ozone
   h. Phosgene
7. Asphyxia agents (two categories)
   a. Oxygen deprivation below 19.5% oxygen atmosphere ("simple asphyxiants")
      Any gas that reduces oxygen fraction or displaces oxygen from the inspired air
      i. Argon
      ii. Carbon dioxide
      iii. Ethane
      iv. Helium
      v. Methane
      vi. Natural gas (e.g., heptane, propane)
      vii. Nitrogen
      viii. Nitrogen dioxide (delayed symptom onset)
   b. Chemical interfering with oxygen delivery of utilization ("chemical asphyxiants")
      i. Carbon monoxide [See Carbon Monoxide/Smoke Exposure Guideline]
      ii. Cyanide [See Cyanide Exposure Guideline]
      iii. Hydrogen sulfide
8. Inhalants of abuse
   a. These agents or substances are a diverse class of substances that include volatile solvents, aerosols, and gases
   b. These chemicals are intentionally inhaled to produce a state that resembles alcohol intoxication with initial excitation, drowsiness, lightheadedness, and agitation
   c. Users of these inhaled agents are often called huffers, sniffers, baggers, or snorters
      i. These individuals often present after inhaling an aerosol or gas with a loss of consciousness and the presence of the aerosol can or residue/paint around or in the mouth, nose, and oral pharynx

d. Common household products that are used as inhalants of abuse
   i. Volatile solvents
      1. Paint remover
      2. Degreasers
      3. Dry-cleaning fluids
      4. Gasoline
      5. Lighter fluid
      6. Correction fluid
      7. Felt tip markers
      8. Glue
   ii. Cosmetic/paint spray
      1. Deodorant spray
      2. Vegetable oil spray
      3. Fabric protector spray
      4. Spray paint
   iii. Propellants/asphyxiants/nitrous oxide
      1. Propane gas
      2. Balloon tanks (helium)
      3. Computer keyboard cleaner
      4. Ether
      5. Halothane
      6. Chloroform
      7. Butane
      8. Propane
      9. Whipped cream dispensers

9. Riot Control Agents [See Riot Control Agent Guideline]
10. A prototype agent is identified with each region of the effected airway respiratory track for ***mild to moderate exposures,*** as severe concentrated exposures of many of these agents overlap in signs and symptoms — the deeper the symptoms are in the respiratory track and the slower the rate of symptom onset the less water soluble the airway respiratory irritant
    a. Nasal and oral pharynx irritation: highly water-soluble agents (ammonia)
    b. Bronchial irritation (chlorine)
    c. Acute pulmonary edema/deep alveolar injury: poorly water soluble (phosgene)
    d. Direct neurotoxin (hydrogen sulfide)
    e. Asphyxia agent with additional symptoms (nitrogen dioxide — Silo Filler's disease)
    f. Inhalants of abuse (volatile solvents, cosmetics/paints, propellants/asphyxiants/nitrous oxide)
    g. Riot control agents [See Riot Control Agent Guideline]
    h. Anticholinesterase inhibitors [See Acetylcholinesterase Inhibitors Guideline]
11. Ammonia
    a. Immediate detection of unique sharp smell
    b. Nasal pharyngeal burning/irritation sensation
    c. Ocular tearing and irritation
    d. Sneezing
    e. Altered mental status — sleepy to agitated
    f. Cough

- g. Shortness of breath
- h. Chest tightness
- i. Bronchospasm wheezing
- j. Change in voice
- k. Upper airway obstruction includes laryngospasm and laryngeal edema
- l. Corneal burns or ulcers
- m. Skin burns
- n. Pharyngeal, tracheal, bronchial burns
- o. Dyspnea/tachypnea
- p. High concentrations and or protracted exposure may develop non-cardiac pulmonary edema
- q. Esophageal burns

12. Chlorine
    - a. All the above (ammonia)
    - b. Increased likelihood of the following
        - i. Bronchiole burns
        - ii. Bronchospasm wheezing
        - iii. Non-cardiac pulmonary edema develops within 6–24 hours of higher exposures
13. Phosgene
    - a. Often have none of the above symptoms for first half hour to several hours then are much milder until more severe lower respiratory tract symptoms develop
        - i. Only warning is report of "fresh mowed hay" odor
        - ii. Mild airway irritation or drying
        - iii. Mild eye irritation
        - iv. Fatigue
        - v. Chest tightness
        - vi. Dyspnea/tachypnea
        - vii. Significant delay up to 24 hours for
            1. Exertional dyspnea
            2. Bronchospasm wheezing
            3. Hypoxia
            4. Severe non-cardiac pulmonary edema
            5. Cardiopulmonary arrest
14. Hydrogen sulfide — A direct neurotoxin and is rapidly absorbed through lung generating systemic effects
    - a. Distinctive rotten egg smell which rapidly causes olfactory fatigue/loss of sense of smell
    - b. Cough
    - c. Shortness of breath
    - d. Rapid alternations in cognition or consciousness
    - e. Bronchiole and lung hemorrhage/hemoptysis
    - f. Non-cardiac pulmonary edema
    - g. Hydrogen sulfide is known as the "knock down" gas because of near immediate and sudden loss of consciousness with high concentrations
    - h. Asphyxia
    - i. Death
15. Nitrogen dioxide (also called Silo Filler's disease)

a. Heavier than air displacing oxygen from low lying areas and closed spaces causing direct asphyxia
b. Low concentrations may cause
    i. Ocular irritation
    ii. Cough
    iii. Dyspnea/tachypnea
    iv. Fatigue
c. High concentrations:
    i. Altered mental status including agitation
    ii. Cyanosis
    iii. Vomiting
    iv. Dizziness
    v. Loss of consciousness
    vi. Cardiopulmonary arrest

16. Inhalants of abuse (i.e., felt tip markers, spray paint)
    a. Physical presences of paint or residue on individual from the inhaled agent
    b. Slurred speech
    c. Altered mental status (excitation, drowsiness to unconsciousness)
    d. Loss of consciousness
    e. Cardiac dysrhythmias
    f. Cardiopulmonary arrest

Patient Management

1. Don appropriate PPE — respiratory protection critical
2. Remove patient from the toxic environment
    a. Remove the patient's clothing that may retain gases or decontaminate if liquid or solid contamination
    b. Flush irrigated effected/burned areas
3. Rapidly assess the patient's respiratory status, mental status, and oxygenation
4. Administer (humidified if available) oxygen
5. Establish intravenous access (if possible)
6. Apply a cardiac monitor (if available)
7. Continuous and ongoing patient reassessment is critical

Assessment

1. Make sure the scene is safe as many gases are heavier than air and will build up in low lying areas. This is especially true of hydrogen sulfide and it's "knock down" effect of the initial unprotected responder and subsequence casualties associated with unprotected rescuers attempting to safe the first downed responder
2. Consider BSI or appropriate PPE
3. Remove patient from toxic environment
4. Decontaminate
5. Assess ABCD and if indicated, expose the patient, and then cover the patient to assure retention of body heat
6. Vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) which include temperature

7. Place cardiac monitor and examine rhythm strip for arrhythmia potentials (consider 12-lead EKG)
8. Check blood glucose Level
9. Monitor pulse oximetry and $EtCO_2$ for respiratory decompensation
10. Perform carboxyhemoglobin and cyanide device assessment, if available
11. Identify specific suspected agent if possible
12. Pertinent cardiovascular history or other prescribed medications for underlying disease
13. Patient pertinent history
14. Patient physical examination

Treatment and Interventions

1. Assure a patent airway
2. Administer (humidified if available) oxygen and if hypoventilation, toxic inhalation, or desaturation noted, support breathing
    a. Maintain the airway and assess for airway burns, stridor, or airway edema and if indicated, perform intubation early (recommendation to avoid supraglottic airways — cricothyrotomy may be required in rare severe cases
    b. Non-invasive ventilation techniques
        i. Use continuous CPAP, BiPAP, intermittent positive pressure breathing (IPPB), HFNC, and/or bilevel nasal CPAP for severe respiratory distress or impending respiratory failure
        ii. Use bag-valve-mask (BVM) ventilation in the setting of hypoventilation, respiratory failure, or arrest
3. 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 either by basic life support BLS or ALS clinicians. This medication should be repeated at this dose with unlimited frequency for ongoing distress
4. Ipratropium 0.5 mg nebulized should be given up to 3 doses, in conjunction with albuterol
5. Initiate IV access for infusion of lactated Ringer's or normal saline and obtain blood samples in effort to record pre-treatment levels, e.g., via point-of-care testing, associated with EMS management (e.g., glucose, lactate, cyanide)
6. Fluid bolus (20 mL/kg) if evidence of hypoperfusion
7. If the patient is experiencing significant pain, administer IV/IO analgesics
    a. Morphine sulfate 0.1 mg/kg IV or IO
    b. Fentanyl 1 mcg/kg IV or IO
8. Eye irrigation early
9. Treat topical chemical burns [See appropriate Toxins and Environmental Section guideline(s)]
10. In severe respiratory irritation, in particular hydrogen sulfide, with altered mental status and no improvement with removal from the toxic environment, administer oxygen (humidified if available) as appropriate with a target of achieving 94–98% saturation. Consider consultation for transfer to a tertiary care hospital. If carbon monoxide is a confirmed or suspected element of the inhalant, a facility with hyperbaric oxygen capabilities is preferred

Medication Administration

1. If wheezing is present, consider administering inhaled albuterol (2.5–5 mg) as nebulized, or four to eight puffs metered dose inhaler
2. Ipratropium 0.5 mg nebulized should be given in conjunction with albuterol, up to three doses

Patient Safety Considerations

1. Generally, speaking to patients with exposure to highly soluble airway/respiratory irritants you will find that they have self-extricated due to the warning properties such as the smell, rapidity of onset of irritation, and other symptoms
2. The less soluble agents may generate only an odor (e.g., mowed hay smell for Phosgene) and will have delayed serious symptoms such as acute pulmonary edema, hypoxia, and shortness of breath with minimal exertion

Notes/Educational Pearls

Key Considerations

1. Airway respiratory irritants can exacerbate underlying reactive airway diseases (e.g., asthma, chronic obstructive pulmonary disease (COPD)) and precipitate or exacerbate bronchospasm, respiratory distress, and hypoxia
2. As patients may be off gassing (particularly hydrogen sulfide and hydrogen cyanide) in the back of the transport vehicle, it is important to have adequate ventilation of the patient compartment
3. Removal from the toxic environment, oxygen (humidified if available), general supportive therapy, bronchodilators, respiratory support, and rapid transport are core elements of care as there are no specific antidotes for any of these inhaled agents except for heavy metals that may be chelated in-hospital after agent identification
4. Hydrogen sulfide causes the cells responsible for the sense of smell to be stunned into inaction and therefore with a very short exposure will shut down and the exposed victim will not perceive the smell, yet the victim continues to absorb the gas as it is still present
5. Inhaled agents have become popular as a means of committing suicide. If there is some form of suicide signage, hoses, or buckets of substances visible as you arrive at the vehicle or residence, immediately retreat to well ventilated area and don self-contained breathing apparatus (SCBA) before opening the vehicle or making entry as these gases may be highly concentrated and potentially lethal to EMS responders
6. Household bathroom, kitchen, and oven cleaners when mixed can generate various airway respiratory irritants (ammonia, chloramine, and chlorine gas releases are particularly common). A very common exposure is to chloramine, a gas liberated when bleach (hypochlorite) and ammonia are combined. Chloramine then hydrolyzes in the distal airways and alveoli to ammonia and hypochlorous acid
7. Sudden sniffing death can result from a single use of inhalant of abuse
   a. Some inhalants can cause cardiac arrest due to dysrhythmias from irritated myocardium
   b. This syndrome most often is associated with abuse of butane, propane, and effects of the chemicals in the aerosols

Pertinent Assessment Findings

1. Patient may describe a specific odor (chlorine swimming pool smell, ammonia smell,

fresh mowed hay smell [phosgene]) which may be helpful but should not be relied upon as the human nose is a poor discriminator of scent
2. Respiratory distress (retractions, wheezing, stridor)
3. Decreased oxygen saturation
4. Skin color
5. Neurologic status assessment
6. Reduction in work of breathing after treatment
7. Improved oxygenation after breathing

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*
- 9914033—Exposure - Airway/Inhalation Irritants
- 9914139—Medical - Respiratory Distress/Asthma/COPD/Reactive Airway

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/stridor
  - Mental status
  - Color
  - Reduction of burning sensation in airway/pharynx

Performance Measures
- Clinical improvement in patient and response to therapy
- Survival rates of victims
- Long term sequelae of the victims
- No EMS clinicians injured while managing these incidents

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Revision Date

March 11, 2022

Riot Control Agents

Aliases

Chemical crowd control agents
Harassing agents
Lacrimators
Oleoresin capsicum (OC, pepper spray)
2-Chloroacetophenone (CN, Mace®)
Incapacitating agents
o-chlorobenzylidene malononitrile (CS)
Tear gas

Patient Care Goals

1. Address side effects of exposed individuals
2. Decontamination of affected individuals
3. Minimize effect to clinician

Patient Presentation

Inclusion Criteria

Exposure to identifiable agents that are not intended to cause significant injury or fatality

Exclusion Criteria

1. Exposure to chlorine, phosgene, ammonia, or other agents that are intended to cause significant injury or fatality
2. Exposure to an unknown agent

Patient Management

Assessment

1. Assess scene safety: evaluate for hazards to EMS personnel, patient, bystanders
    a. Determine riot control agent being used
    b. Don appropriate PPE
    c. Determine number of patients
2. Note symptoms exhibited by the exposed individual
3. Examine as appropriate to complaints

Treatment and Interventions

1. Move affected individuals from contaminated environment into fresh air if possible
2. Remove contaminated clothing as able
3. Have patient remove contact lenses if appropriate
4. Irrigation with water or saline may facilitate resolution of symptoms and is recommended for decontamination of dermal and ocular exposure
5. If patient is in respiratory distress, go to Respiratory Section
6. If patient is wheezing, go to Bronchospasm Guideline
7. For persistent pain of the eye or skin, go to Topical Chemical Burn Guideline
8. Exposed individuals who are persistently symptomatic warrant further evaluation and treatment per local standards

Patient Safety Considerations

1. Toxicity is related to duration of exposure and concentration of agent used (exposure in non-ventilated space)
2. Patients with pre-existing pulmonary conditions (e.g., asthma, COPD) may be prone to more severe respiratory effects
3. Traumatic injury may result when exposed individuals are in proximity to the device used to disperse the riot control agent (e.g., hose/stream under pressure, riot control agent projectile, grenade)

Notes/Educational Pearls

Key Considerations

1. CN, CS, and OC are the most encountered riot control agents
2. CN, CS, and OC have a high safety ratio. All three have a high median lethal concentration (LCt50) and a low median effective concentration (ECt50)
3. Toxicity is related to time of exposure and concentration of agent used (exposure in non-ventilated space)
4. Symptoms that may be experienced after exposure:
   a. **Eyes**: tearing, pain, conjunctivitis, blurred vision
   b. **Nose/mouth/throat**: rhinorrhea, burning/pain, trouble swallowing, drooling
   c. **Lungs**: chest tightness, coughing, choking sensation, wheezing, dyspnea
   d. **Skin**: burning, redness, dermatitis
   e. **GI**: nausea and vomiting are rare and may be posttussive
5. Symptoms begin within seconds of exposure, are self-limited and are best treated by removing patient from ongoing exposure. Symptoms frequently decrease over time (15–45 minutes) after exposure ends

Pertinent Assessment Findings

1. Riot control agent used
2. Symptoms of exposed
3. Lung sounds
4. Evidence of other traumatic injuries

Quality Improvement

Key Documentation Elements

- Type of riot control agent if known
- Symptoms being treated
- Treatment provided
- Response to treatment

Performance Measures

- Riot control agent identified before making patient contact and providing treatment
- PPE used by responders
- Affected individuals removed from ongoing exposure
- Contaminated clothing and contact lenses removed as able

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Revision Date

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Hyperthermia/Heat Exposure

Aliases

Heat cramps	Heat edema	Heat exhaustion
Heat stroke	Heat syncope	Hyperthermia

Definitions

1. **Heat Cramps**: are muscle cramps usually in the legs and abdominal wall. Patient temperature is normal
2. **Heat Exhaustion**: has both salt and water depletion usually of a gradual onset. As it progresses tachycardia, hypotension, elevated temperature, and very painful cramps occur. Symptoms of headache, nausea, and vomiting occur. Heat exhaustion can progress to heat stroke
3. **Heat Stroke**: occurs when the cooling mechanism of the body ceases due to temperature overload and/or electrolyte imbalances. Patient core temperature is usually greater than 104°F. When no thermometer is available, it is distinguished from heat exhaustion by altered level of consciousness, seizures, or coma
4. **Heat Syncope**: transient loss of consciousness with spontaneous return to normal mentation, attributable to heat exposure

Patient Care Goals

1. Cooling and rehydration
2. Mitigate high-risk for decompensation
3. Mitigate high-risk for agitation and uncooperative behavior

Patient Presentation

Inclusion Criteria

1. Heat cramps
2. Heat exhaustion
3. Heat stroke
4. Heat syncope
5. Heat edema
6. Stimulant drug abuse
7. Delirium with agitated behavior [See Agitated or Violent Patient/Behavioral Emergency Guideline]

Exclusion Criteria

1. Fever from infectious or inflammatory conditions
2. Malignant hyperthermia
3. Serotonin syndrome
4. Neuroleptic malignant syndrome

Patient Management

Assessment

1. Patient Assessment:
    a. Age

   b. Oral intake
   c. Medications
   d. Alcohol
   e. Illicit drugs
   f. Overdose
   g. Withdrawal risk
2. Environmental Assessment:
   a. Ambient temperature and humidity
   b. Exertion level
   c. Length of time at risk
   d. Attire (clothing worn)
   e. Confined space
      i. **Pediatric Considerations:** Children left in cars who show signs of altered mental status and elevated body temperature should be presumed to have hyperthermia
3. Associated Symptoms:
   a. Cramps
   b. Headache
   c. Orthostatic symptoms
   d. Nausea
   e. Weakness
   f. Mental status changes, including
      i. Confusion
      ii. Coma
      iii. Seizures
      iv. Psychosis
4. Vital signs:
   a. Core temperature: usually 104°F or greater (if thermometer available)
   b. Skin:
      i. Flushed and hot
      ii. Dry or sweaty
      iii. Signs of first or second degree burns from sun exposure
   c. Other signs of poor perfusion/shock

Treatment and Interventions

1. Move victim to a cool area and shield from the sun or any external heat source
2. Remove as much clothing as is practical and loosen any restrictive garments
3. If alert and oriented, give small sips of cool liquids
4. If altered mental status, check blood glucose level
5. Manage airway as indicated
6. Place on cardiac monitor and record ongoing vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment)
7. If core temperature is greater than 104°F (40°C) or if altered mental status is present, begin active cooling by:
   a. Ice bath immersion provides the most rapid cooling mechanism
   b. If ice bath immersion is not available, consider the following:
      i. Tarp-assisted cooling with oscillation
      ii. Rotating ice water-soaked towels or sheets

iii. Continually misting the exposed skin with tepid water while fanning the victim
iv. Truncal ice packs may be used, but are less effective than evaporation
v. DO NOT apply wet cloths or wet clothing, as they may trap heat and prevent evaporative cooling

c. If shivering occurs during cooling and prevents effective cooling, benzodiazepines may be considered:
   i. **Adult**:
      1. Midazolam
         a. 2.5 mg IV/IN, may repeat once in 5 minutes
            OR
         b. 5 mg IM may repeat once in 10 minutes
      2. Lorazepam
         a. 1 mg IV, may repeat once in 5 minutes
            OR
         b. 2 mg IM, may repeat once in 10 minutes
         c. Diazepam – 2 mg IV, may repeat once in 5 minutes
   ii. **Pediatric**:
      1. Midazolam (single maximum dose 1 mg)
         a. 0.5 mg/kg IV, maximum single dose 2 mg, may repeat once in 10 minutes
            OR
         b. 0.2 mg/kg IN/IM, maximum single dose 10 mg
         c. ***NOTE:*** a 5 mg/mL concentration is recommended for IN/IM administration
      2. Lorazepam (single maximum dose 1 mg)
         a. 0.1 mg/kg IV/IM
      3. Diazepam
         a. 0.1 mg/kg IV (maximum single dose 2.5 mg)
         b. May repeat once, for maximum total IV/IM dose 5 mg
            OR
         c. 0.5 mg/kg PR (maximum single dose 10 mg)
         d. May repeat once for maximum total PR dose 20 mg

8. Cooling efforts should continue until the patient's temperature is less than 102.2°F (39°C) or, if continuous temperature monitoring is not available, until the patient demonstrates improvement in mental status
9. Establish IV access for patients suffering from heat stroke — give cool fluids at 20 mL/kg boluses and reduce to 10 mL/kg/hr boluses when vitals are stable
10. Monitor for arrhythmia and cardiovascular collapse [See Cardiovascular Section]
11. Treat seizures, per the Seizures Guideline
12. All patients suffering from life threatening heat illness (including heat stroke) should be transported to the hospital

Patient Safety Considerations

Consider use of physical securing devices [See Agitated or Violent Patient/Behavioral Emergency Guideline] to protect vascular access sites.

Notes/Educational Pearls

Key Considerations

1. Patients at risk for heat emergencies include neonates, infants, geriatric patients, and patients with mental illness
2. Contributory risk factors may come from:
   a. Prescription and over-the-counter herbal supplements
   b. Cold medications
   c. Heart medications
   d. Diuretics
   e. Psychiatric medications
   f. Drug abuse
   g. Accidental or intentional drug overdose
3. Heat exposure can occur either due to increased environmental temperatures or prolonged exercise or a combination of both
   a. Environments with temperature *greater than* 90°F and humidity *greater than* 60% present the most risk
4. Heat stroke is associated with cardiac arrhythmias independent of drug ingestion/overdose Heat stroke has also been associated with cerebral edema
5. For patients with signs and symptoms of heat stroke, rapid cooling takes priority over other interventions (e.g., cardiac monitoring, IV access)
6. Do not forget to look for other causes of altered mental status such as low blood glucose level, or, in the proper circumstances (i.e., endurance exercise events), consider exercise associated hyponatremia (EAH), especially in the patient with altered mental status, normal blood glucose, and normal temperature
7. *Controversy:* shivering may occur while treating heat stroke
   a. It is uncertain how harmful shivering is to heat stroke patients
   b. Cooling should be continued until the above temperature and mental status goals are met
   c. Treat shivering as above
   d. Research does not demonstrate the value of one benzodiazepine over another in shivering patients or any value of other medications
8. Hyperthermia not from environmental factors has a differential that includes the following:
   a. Fever and delirium
   b. Hyperthyroid storm
   c. Delirium tremens (DTs)
   d. CNS lesion or tumor
   e. Adverse drug event: neuroleptic malignant syndrome, malignant hyperthermia
   f. Mental status changes without hyperthermia in the correct circumstances could be exercise associated hyponatremia
9. There is no evidence supporting EMS obtaining orthostatic vital signs as a clinical indicator

Pertinent Assessment Findings

1. Warning signs: fever, altered mental status
2. Blood glucose level for AMS

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914027—Environmental - Heat Exposure/Heat Exhaustion
- 9914029—Environmental - Heat Stroke/Heat Exposure

Key Documentation Elements

- Patient assessment includes all types of medication/drug use and detailed past medical history
- Environmental assessment performed
- Cooling interventions considered and implemented
- Decision-making regarding securing devices
- Decision-making regarding monitoring ABCs (Airway, Breathing, Circulation)

Performance Measures

- Blood glucose level obtained
- Fluids given for hypotension
- Attempts to reduce core temperature
- Time from arrival at scene to when active cooling by immersion is started
- All decompensations during EMS care reviewed
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Hypoglycemia—01: Treatment Administered for Hypoglycemia.*
        - *Measure of patients who received treatment to correct their hypoglycemia*
    - *Pediatrics—03: Documentation of Estimated Weight in Kilograms*

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March 11, 2022

Hypothermia/Cold Exposure

Aliases

Cold induced injuries | Frost bite | Hypothermia

Patient Care Goals

1. Maintain hemodynamic stability
2. Prevent further heat loss
3. Rewarm the patient in a safe manner
4. Appropriate management of hypothermia induced cardiac arrest
5. Prevent loss of limbs

Patient Presentation

1. Patients may suffer from hypothermia due to exposure to a cold environment (increased heat loss) or may suffer from a primary illness or injury that, in combination with cold exposure (heat loss in combination with decreased heat production), leads to hypothermia
2. Patients may suffer systemic effects from cold (hypothermia) or localized effects (i.e., frostbite)
3. Patients with mild hypothermia will have normal mental status, shivering, and may have normal vital signs while patients with moderate to severe hypothermia will manifest mental status changes, eventual loss of shivering and progressive bradycardia, hypotension, and decreased respiratory status
4. Patients with frostbite will develop numbness involving the affected body part along with a "clumsy" feeling along with areas of blanched skin — later findings include a "woody" sensation, decreased or loss of sensation, bruising or blister formation, or a white and waxy appearance to affected tissue

Inclusion Criteria

Patients suffering systemic or localized cold injuries.

Exclusion Criteria

1. Patients without cold exposure
   OR
2. Patients with cold exposure but no symptoms referable to hypothermia or frostbite

Patient Management

Assessment

1. Patient assessment should begin with attention to the primary survey, looking for evidence of circulatory collapse and ensuring effective respirations
   a. The patient suffering from moderate or severe hypothermia may have severe alterations in vital signs including weak and extremely slow pulses, profound hypotension, and decreased respirations
   b. The rescuer may need to evaluate the hypothermic patient for a pulse for longer than the normothermic patient (up to 60 seconds)
2. History: along with standard SAMPLE — type history, additional patient history should include:

   a. Attention to any associated injury or illness
   b. Duration of cold exposure
   c. Ambient temperature
   d. Treatments initiated before EMS arrival
3. There are several means to categorize the severity of hypothermia based on either core body temperature readings or clinical evaluation. If possible and reliable, EMS clinicians should perform core body temperature measurements and categorize patients into one of the three follow levels of hypothermia:
   a. **Mild**: 32.1°–35°C/89.8°–95°F
   b. **Moderate**: 28.1°–32°C/82.5°–89.7°F
   c. **Severe**: 24°–28°C/75.2°–82.4°F
   d. **Profound**: less than 24°C (75.2°F)
4. Equally important is the patient's clinical presentation and the signs or symptoms the patient is experiencing — the above temperature-based categorization should be balanced against these clinical findings
   a. **Mild**: vital signs not depressed; normal mental status; shivering is preserved; body maintains the ability to attempt to control temperature
   b. **Moderate/Severe**: progressive bradycardia, hypotension, and decreased respirations, alterations in mental status with eventual coma, shivering will be lost in moderate hypothermia (generally between 30°–31°C (86°-87.8°F), and general slowing of bodily functions; the body loses the ability to thermo-regulate

Treatment and Interventions

1. Maintain patient and rescuer safety
2. Manage airway per the Airway Management Guideline
3. Mild hypothermia:
   a. Remove the patient from the environment and prevent further heat loss by removing wet clothes and drying skin, insulate from the ground, shelter the patient from wind and wet conditions, and insulate the patient with dry clothing or a hypothermia wrap/blanket. Cover the patient with a vapor barrier and, if available, move the patient to a warm environment
   b. Hypothermic patients have decreased oxygen needs and may not require supplemental oxygen
      i. If oxygen is deemed necessary, it should be warmed to a maximum temperature between 40°–42°C (104°–108°F) and humidified if possible
   c. Provide beverages or foods containing glucose if feasible and patient is awake and able to manage airway independently
   d. Vigorous shivering can substantially increase heat production — shivering should be fueled by caloric replacement
   e. Consider field-rewarming methods such as placement of large heat packs or heat blankets (chemical or electric if feasible) to the anterior chest or wrapped around the patient's thorax if large enough — forced air warming blankets (e.g., Bair Hugger®) can be an effective field rewarming method if available
   f. Monitor frequently — if temperature or level of consciousness decreases, refer to severe hypothermia
   g. Consider IV access
      i. Indications for IV access and IV fluids in the mildly hypothermic patient are

similar to those of the non-hypothermic patient
   ii. IV fluids, if administered, should be warmed, ideally to 42°C (107.6°F)
   iii. Bolus therapy is preferable to continuous drip
h. If alterations in mental status, consider measuring blood glucose and treat as indicated (treat per Hypoglycemia Guideline or Hyperglycemia Guideline) and assess for other causes of alterations of mentation
i. Transport to a hospital capable of rewarming the patient

4. Moderate or severe hypothermia:
   a. Perform ABCs (Airway, Breathing, Circulation), pulse checks for patients suffering hypothermia should be performed for 60 seconds, and obtain core temperature, if possible, for patients exhibiting signs or symptoms of moderate/severe hypothermia
      i. Core temperatures can be measured by esophageal probe, if one is available, the patient's airway is secured, and the clinician has been trained in its insertion and use.
      ii. Rectal temperatures may also be used, with caution to avoid worsening the hypothermia by undressing the patient (e.g., done in a warm environment such as a heated ambulance)
      iii. If neither esophageal nor rectal thermometers are available, an epitympanic field thermometer with an isolating ear cap may be used, but is generally less accurate
   b. Manage airway as needed
      i. Care must be taken not to hyperventilate the patient as hypocarbia may reduce the threshold for ventricular fibrillation in the cold patient
      ii. Indications and contraindications for advanced airway devices are similar in the hypothermic patient as in the normothermic patient
   c. Prevent further heat loss by removing the patient from the environment and removing wet clothes and drying skin, insulate from the ground, shelter the patient from wind and wet conditions, and insulate the patient with dry clothing or a hypothermia wrap/blanket. Cover the patient with a vapor barrier and, if available, move the patient to a warm environment
   d. Initiate field-rewarming methods such as placement of large heat packs or heat blankets (chemical or electric if feasible) to the anterior chest or wrapped around the patient's thorax if large enough
      i. Chemical or electrical heat sources should never be applied directly to the skin
      ii. Use a barrier between the skin and heat source to prevent burns
      iii. Forced air warming blankets (e.g., Bair Hugger®) can be an effective field rewarming method if available
   e. Handle the patient gently
      i. Attempt to keep the patient in the horizontal position, especially limiting motion of the extremities to avoid increasing return of cold blood to the heart
      ii. Once in a warm environment, clothing should be cut off (rather than removed by manipulating the extremities)
      iii. Move the patient only when necessary, such as to remove the patient from the elements
   f. Apply cardiac monitor or AED if available
   g. Establish IV and provide warmed isotonic crystalloid bolus. Repeat as necessary
   h. If alterations in mental status, consider measuring blood glucose and treat as indicated (treat per Hypoglycemia Guideline or Hyperglycemia Guideline) and assess

for other causes of alterations of mentation

i. Transport as soon as possible to a hospital capable of resuscitation. If cardiac arrest develops consider transport to a center capable of extracorporeal circulation (ECMO) or cardiopulmonary bypass (if feasible)

j. Warm the patient compartment of the ambulance to at least 24°C (75.2°F) during transport

5. Frost bite:
    a. If the patient has evidence of frostbite, and ambulation/travel is necessary for evacuation or safety, avoid rewarming of extremities until definitive treatment is possible. Additive injury occurs when the area of frostbite is rewarmed then inadvertently refrozen. Only initiate rewarming if refreezing is absolutely preventable
        i. If rewarming is feasible and refreezing can be prevented use circulating warm water (37°–39°C/98.6°–102°F) to affected body part, thaw injury completely. If warm water is not available, rewarm frostbitten parts by contact with non-affected body surfaces. **Do not rub** or cause physical trauma.
        ii. After rewarming, cover injured parts with loose sterile dressing. If blisters are causing significant pain, and the clinician is so trained, these may be aspirated, however, should not be de-roofed. Do not allow injury to refreeze. Treat per the Pain Management Guideline.

Patient Safety Considerations

1. Given the additive effects of additional cold stress, the patient should be removed from the cold environment as soon as operationally feasible
2. In patients suffering from moderate to severe hypothermia, it is critical to not allow these patients to stand or exercise as this may cause circulatory collapse
3. Devices that self-generate heat (e.g., heat packs) that are being utilized during the rewarming process should be wrapped in a barrier to avoid direct contact with the skin and to prevent burns. Available evidence suggests that heat packs with peak temperatures above 45°C (113°F) are most likely to cause burns. In patients who are unresponsive, or unable to recognize a developing injury, please check the area in which the heating pad is placed regularly to ensure no tissue damage occurs.

Notes/Educational Pearls

Key Considerations

Considerations in cardiac arrest

1. The following are contraindications for initiation of resuscitation in the hypothermic patient:
    a. Obvious fatal injuries (such as decapitation)
    b. The patient exhibits signs of being frozen (such as ice formation in the airway)
    c. Chest wall rigidity such that compressions are impossible
    d. Danger to rescuers or rescuer exhaustion
    e. Avalanche victims buried for 35 minutes or longer with airway obstruction by ice or snow
2. Fixed and dilated pupils, apparent rigor mortis, and dependent lividity may not be contraindication for resuscitation in the severely hypothermic patient
3. The mainstay of therapy in severe hypothermia and cardiac arrest should be effective chest compressions and attempts at rewarming. Chest compressions

should be provided at the same rate as in normothermic patients

4. The temperature at which defibrillation should first be attempted in the severely hypothermic cardiac arrest victim and the number of defibrillation attempts is unclear. There are different approaches regarding resuscitation of the hypothermic arrest patient
   a. Per the American Heart Association (AHA), if the patient has a shockable rhythm (VF/VT), defibrillation should be attempted. It is reasonable to continue defibrillation attempts per AHA protocols concurrently with rewarming strategies
   b. The state of Alaska's 2014 guidance on management of hypothermic patients in cardiac arrest advises that defibrillation should be attempted once, followed by 2 minutes of chest compressions, then rhythm and pulse checks
      i. If defibrillation is unsuccessful and the patient's core temperature is less than 30°C (86°F), do not make further attempts at defibrillation until the core temperature has increased to greater than 30°C (86°F)
      ii. Continue CPR and attempt to rewarm the patient
   c. An alternate strategy, per the Wilderness Medical Society's accidental hypothermia guideline, suggests that if the patient's core temperature is below 30°C (86°F), attempt defibrillation once, then wait until the patient has been rewarmed at least 1°–2°C or to 30°C (86°F) before attempting additional shocks. It is noted that the likelihood of successful defibrillation increases with every one-degree increase in temperature
   d. If defibrillation is unsuccessful and the patient's core temperature is greater than 30°C (86°F), follow guidelines for normothermic patients
   e. If available monitors reveal asystole, CPR alone is the mainstay of therapy
   f. If monitoring reveals an organized rhythm (other than VF or VT) and no pulses are detected, do not start CPR, but continue to monitor
      i. While this may represent pulseless electrical activity (PEA), this may also represent situations in which the patient's pulses are not detectable but remain effective due to decreased metabolic needs
      ii. In the case of PEA, the rhythm will deteriorate rapidly to asystole, in which case, CPR should be initiated
      iii. Given the potential to cause VF with chest compressions, the Alaska guidance offers that it is better to maintain effective cardiac activity than to start CPR and cause VF
5. Manage the airway per standard care in cardiac arrest victims [See Cardiac Arrest Guideline]
   a. In the absence of advanced airways, ventilate the patient at the same rate as a normothermic patient
   b. If the patient has an advanced airway, ventilate at half the rate recommended for a normothermic patient to prevent hyperventilation. If $EtCO_2$ is available, ventilate to maintain normal $EtCO_2$ levels
6. There is little evidence to guide use of medications in severe hypothermia with cardiac arrest, however 2010 AHA updates to advanced cardiac life support recommend use of vasopressors according to standard ACLS protocols while the 2014 Alaska guidelines and the Wilderness Medical Society's accidental hypothermia guideline for the management of hypothermic patients advises medications should be withheld until the patient's core temperature is greater than 30°C (86°F)
   a. Above 30°C (86°F), intervals between medication provision should be doubled until the

patient reaches 35°C (95°F), at which time, normal medication intervals may be adopted

7. Upon ROSC, treat per Adult Post-ROSC Care Guideline
8. Patients with severe hypothermia and arrest may benefit from resuscitation even after prolonged downtime, and survival with intact neurologic function has been observed even after prolonged resuscitation
   a. Patients should not be considered deceased until rewarming has been attempted
9. If a hypothermic patient clearly suffered cardiac arrest and subsequently became hypothermic afterward with prolonged down time between arrest and rescue, there is no rationale for initiating resuscitation and warming the patient

Pertinent Assessment Findings

1. Identification of associated traumatic injuries (when present)
2. Identification of localized freezing injuries
3. Patient core temperature (when available)

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914023 – Environmental - Cold Exposure
- 9914025 – Environmental - Frostbite/Cold Injury
- 9914031 – Environmental - Hypothermia

Key Documentation Elements

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

Performance Measures

- Patient core temperature and means of measurement (when available)
- Presence of cardiac dysrhythmias
- Documentation of associated trauma (when present)
- Blood glucose level obtained
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
  - *Hypoglycemia—01: Treatment Administered for Hypoglycemia*
  - *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

March 11, 2022

Drowning

Aliases

Fatal drowning
Non-fatal drowning
Immersion
Submersion
Near-drowning

Patient Care Goals

1. Rapid assessment and management of life-threatening injuries
2. Rescue from the water-based environment
3. Transport patients suffering from drowning for hospital evaluation unless field arrest resuscitation termination guidelines apply.

Patient Presentation

Inclusion Criteria

Patients suffering from drowning or drowning events independent of presence or absence of symptoms

Exclusion Criteria

When protocol is inapplicable.

Patient Management

Assessment

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

Treatment and Interventions

1. Ensure scene safety for patient and rescuers. Remove patient from water as soon as possible
   a. Practice the safest water rescue technique possible, given circumstances on scene
   b. Evacuate to land or a watercraft as soon as possible
   c. If there is a delay to accessing shore or a rescue boat, initiate in-water basic life support consisting of ventilation only
2. Manage airway per the Airway Management Guideline
3. Follow Cardiac Arrest Guideline as indicated with consideration of **ABC**s (**A**irway, **B**reathing, **C**irculation) strategy for drowning victims in cardiac arrest
   a. Initiate 5 rescue breaths followed by 30 chest compressions
   b. After the initial 5 breaths, use ratio of 30 compressions to 2 breaths
4. If mechanism or history suggest cervical spine injury, manage c-spine, per the Spinal

Care Guideline

5. Monitor vital signs (pulse, blood pressure, respiratory rate, neurologic status assessment) including oxygen saturations
6. If O_2 saturations are less than 92%, administer oxygen as appropriate with a target of achieving 94–98% saturation. Consider positive pressure ventilation in patients with signs or symptoms of respiratory difficulty
7. Consider hypothermia, treat per Hypothermia/Cold Exposure Guideline
8. If the victim was involved in underwater diving and uncertainty exists regarding the most appropriate therapy, consider contacting medical direction and discussing need for hyperbaric treatment. Include discussion regarding:
   a. Submersion time
   b. Greatest depth achieved
   c. Ascent rate
   d. Gas mix
9. Establish IV access
10. Fluid bolus as indicated
11. Advanced airway management as indicated. Consider CPAP in awake patients with respiratory distress
12. Cardiac monitor

Patient Safety Considerations

1. Avoidance of hyperoxygenation of the drowning victim
2. Rescuer safety considerations

Notes/Educational Pearls

Key Considerations

1. The World Health Organization definition of drowning is " the process of experiencing respiratory impairment from submersion/immersion in liquid"
2. Drowning is further defined in the following categories:
   a. Non-fatal drowning: patients rescued from drowning
   b. Fatal drowning: any death, acutely or subacutely, resulting from drowning
3. Submersion refers to situations in which the patient's airway is underwater. Immersion refers to situations in which the patient's body is in water, but the patient's airway remains out of the water
4. **Pediatric Considerations:**
   a. Drowning is a common cause of death in children
   b. Risk factors for drowning include male gender, age less than 14 years old, alcohol use, lack of supervision, and risky behavior
5. Rescue efforts should be coordinated between all responding agencies to ensure patient is rapidly accessed and removed from the water
6. Initiation of in-water ventilations may increase survival. In-water chest compressions are futile
7. The European Resuscitation Council recommends five initial breaths be provided to the drowning victim
   a. The initial ventilations may be more difficult to achieve as water in the airways may impede alveolar expansion
   b. If cardiac arrest after 5 rescue breaths, refer to Cardiac Arrest Guideline.

8. Active efforts to expel water from the airway (by abdominal thrusts or other means) should be avoided as they delay resuscitative efforts and increase the potential for vomiting and aspiration
9. Long-standing teaching has suggested that rescuers should always assume c-spine injury in victims of drowning
    a. The 2010 American Heart Association update on special circumstances in cardiac arrest notes that routine c-spine precautions in all victims of drowning is likely unnecessary unless the mechanism or injury, history, or physical exam suggests a cervical spine injury
    b. Mechanisms of injury highly suggestive of cervical spine injury include diving, water skiing, surfing, or watercraft accidents
10. Uncertainty exists regarding survival in cold water drowning; however, recent literature suggests the following:
    a. If water temperature is less than 43°F (6°C) and the patient is submerged with evidence of cardiac arrest:
        i. Survival is possible for submersion time less than 90 minutes and resuscitative efforts should be initiated
        ii. Survival is not likely for submersion time greater than 90 minutes and clinicians may consider not initiating resuscitation or termination of resuscitation on scene
    b. If water temperature is greater than 43°F (6°C) and the patient is submerged with evidence of cardiac arrest:
        i. Survival is possible for submersion time less than 30 minutes and resuscitative efforts should be initiated
        ii. Survival is not likely for submersion time greater than 30 minutes and clinicians may consider not initiating resuscitation or termination of resuscitation on scene
11. Patients may develop subacute respiratory difficulty after drowning and therefore all victims of drowning should be transported for observation
12. Decompression illness may have a variety of presentations depending on system affected (e.g., skin, joint(s), pulmonary, neurologic), and can occur even when a diver does not exceed dive table limits

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914091 – Injury - Diving Emergencies
- 9914093 – Injury - Drowning/Near Drowning

Key Documentation Elements

- Mechanism of injury or history suggesting cervical spine injury
- Submersion time
- Water temperature
- Activities leading to drowning
- Consider a standardized data collection metrics such as the Utstein drowning data reporting elements

Performance Measures

- Recognition and appropriate care of pulmonary/respiratory complaints

- Cervical spine management when appropriate
- Adherence to Cardiac Arrest (VF/VT/Asystole/PEA) Guideline

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Revision Date

March 11, 2022

Dive (SCUBA) Injury/Accidents

Aliases

Barotrauma Bends Squeeze

Patient Care Goals

1. Rapid assessment and management of life-threatening injuries
2. Rescue from the water-based environment
3. Transport patients suffering from self-contained underwater breathing apparatus (SCUBA) diving injury/illness for hospital evaluation and consideration of repressurization/hyperbaric oxygen therapy (HBOT)

Patient Presentation

Inclusion Criteria

Patients with history of recent (within 48 hours) SCUBA diving activity who are exhibiting potential signs and/or symptoms of dive related illness/injury, regardless of dive table compliance. NOTE: SCUBA-related complications may occur anywhere, particularly when divers travel by air within 24-hours of diving

Exclusion Criteria

Patients without history of recent (within 48 hours) SCUBA diving exposure

Patient Management

Assessment

1. History should include circumstances leading to the complaint, details of mechanism of injury, time under water, depth of dive, compliance with dive tables/decompression stops, gas mixture used, and water temperature (if available)
2. Be alert for signs of barotrauma (pulmonary barotrauma, arterial gas embolism, pneumothorax, pneumomediastinum, ear/sinus/dental barotrauma, dysrhythmias, skin mottling or erythema, neurologic signs and symptoms etc.) and/or decompression sickness (joint pain, mental status change, other neurologic symptoms including paralysis) or nitrogen narcosis (confusion, intoxication).
3. Assess for other associated injury such as injury to the head or spine (if mechanism and symptoms suggest), marine envenomation, hypothermia, or other injury

Treatment and Interventions

1. If a SCUBA accident includes associated drowning/near-drowning [See Drowning Guideline]
2. Manage airway as indicated and provide 100% oxygen
3. If air embolism suspected, place in left lateral recumbent position (patient lying with the left side down, knees drawn upward, and flat)
    a. Trendelenburg position is sometimes recommended to help trap the air in the dependent right ventricle, and may be useful if a central venous catheter is being used to withdraw the air, but this position may increase cerebral edema
4. Monitor vital signs including oxygen saturations and cardiac rhythm (if possible)
5. Administer oxygen as appropriate with a target of achieving 94–98% saturation

   a. Use positive pressure ventilation (e.g., CPAP) carefully in patients for whom pulmonary barotrauma is a consideration [See Airway Management Guideline] and if signs or symptoms of tension pneumothorax are present perform needle decompression
6. Patients with symptoms suspicious for decompression illness, should be placed on supplemental oxygen regardless of saturations to enhance washout of inert gasses
7. Assess for hypothermia, treat per Hypothermia/Cold Exposure Guideline
8. Consider contacting medical direction and discussing need for hyperbaric treatment and primary transport to facility with hyperbaric oxygen therapy (HBOT) capability — include discussion regarding factors such as submersion time, greatest depth achieved, ascent rate, and gas mix
9. Establish IV access
10. Fluid bolus as indicated

Patient Safety Considerations

1. If the patient is still in the water, seek safest and most rapid means of removal safe (within your scope of training) while minimizing risk of further injury
2. Seek assistance early for special rescue/extrication and transportation needs
3. Check for multiple patients (e.g., group dive table calculation error(s) or contaminated dive gases)

Notes/Educational Pearls

Key Considerations

1. Rescue efforts should be coordinated between all responding agencies to ensure that the patient is rapidly accessed and safely removed from the water if diver unable to do so themselves
2. If air medical transport is necessary, the patient should be transported with the cabin pressurized to lowest possible altitude. If an unpressurized aircraft is used (i.e., most helicopter emergency medical services (HEMS)), patient should be flown at the lowest safe altitude possible
3. Decompression illness may have a variety of presentations depending on system affected (e.g., skin, joint(s), pulmonary, neurologic)
4. SCUBA accidents/incidents can result in a variety of issues, including barotrauma, air embolism and decompression illness
5. Decompression illness may have a variety of presentations depending on system affected (e.g., skin, joint(s), pulmonary, neurologic), and can occur even when a diver does not exceed dive table limits
6. Do not attempt to disassemble, turn off, or modify any of the dive equipment. The dive computer may provide a clue about the patient’s exposure to depth

Pertinent Assessment Findings

1. Vital signs findings
2. Neurologic status assessment findings
3. Respiratory assessment findings (i.e., oxygen saturation, respiratory rate)
4. Subcutaneous emphysema

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914091 – Injury - Diving Emergencies
- 9914211 – Injury - SCUBA Injury/Accidents

Key Documentation Elements

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

Performance Measures

- Recognition and appropriate care of pulmonary/respiratory complaints
- Patient transported to nearest appropriate facility (HBOT if available and indicated)
- Need for HBOT recognized and communicated to receiving facility if indicated

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Revision Date

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Altitude Illness

Aliases

Acute mountain sickness (AMS)
High altitude cerebral edema (HACE)
Altitude sickness
High altitude pulmonary edema (HAPE)

Definitions

1. Acute mountain sickness: Headache plus one or more of the following: anorexia, nausea or vomiting, fatigue or weakness, dizziness or lightheadedness or difficulty sleeping. (In infants and young children, symptoms include pallor, fussiness, vomiting, decreased appetite, poor sleep, decreased playfulness.) These symptoms must occur in the setting of recent arrival to high altitude (generally considered greater than 5000 – 7000 feet)
2. High altitude pulmonary edema (HAPE): Progressive dyspnea, cough, hypoxia, and weakness in high altitude environments (considered greater than 8000 feet). (In infants and young children, symptoms again include pallor, fussiness, vomiting, decreased appetite, poor sleep, decreased playfulness.) Patients may or may not exhibit new symptoms if acute mountain sickness precedes symptoms of HAPE
3. High altitude cerebral edema (HACE): Heralded by mental status changes in patients with symptoms of acute mountain sickness including altered mentation, ataxia, or stupor and progressing to coma. Typically seen in high altitude environments (greater than 8000 feet)
4. Feet to meters conversion reference:

Feet	Meters	
8000 ft	Approximately	2400 m
7000 ft	Approximately	2100 m
5000 ft	Approximately	1500 m
1000 ft	Approximately	300 m
500 ft	Approximately	150 m

Patient Care Goals

1. Improve oxygenation through a combination of descent and supplemental O_2
2. Safe but rapid transport from the high-altitude environment to a lower altitude environment

Patient Presentation

Inclusion Criteria

1. Patients suffering from altitude illness, including
   a. Acute mountain sickness
   b. High altitude pulmonary edema
   c. High altitude cerebral edema

Exclusion Criteria

When protocol is inapplicable.

Patient Management

Assessment

Assessment should target the signs and symptoms of altitude illness but should also consider alternate causes of these symptoms

Treatment and Interventions

1. Ensure scene safety for rescuers
2. Stop ascent
    a. Patients with acute mountain sickness only may remain at their current altitude and initiate symptomatic therapy
    b. Patients with HACE or HAPE should initiate descent
3. Perform **ABC**s (**A**irway, **B**reathing, **C**irculation) and manage airway as necessary
4. Administer supplemental oxygen, if available, with goal to keep oxygen saturations 90%
5. Descend to lower altitude. Descent is the mainstay of therapy and is the definitive therapy for all altitude related illnesses. Descent should be initiated as soon as scene conditions permit
    a. If severe respiratory distress is present and pulmonary edema is found on exam, clinician should start positive pressure ventilation
    b. Establish IV and perform fluid bolus with goal to maintain systolic BP greater than 90 mmHg
    c. Monitor cardiac rhythm
6. Descent should always be the primary treatment strategy for patients suffering from altitude illness, especially patients suffering from HACE and HAPE. If decent is not possible, or if medical direction permits, the EMS clinician may consider the following possible therapies — portable hyperbaric chambers are effective for the management of severe altitude illness. However, they should not be used in lieu of decent, only as an alternative should descent be unfeasible.
    a. Acute mountain sickness
        i. Ibuprofen or acetaminophen for pain [See Pain Management Guideline]
        ii. Ondansetron 4 mg IV, PO, or sublingual every 6 hours for vomiting [See Nausea-Vomiting Guideline]
        iii. Acetazolamide: up to 250 mg PO twice a day
            1. **Pediatric** dosing is 2.5 mg/kg to a maximum of 125 mg, given twice a day
            2. Acetazolamide speeds acclimatization and therefore helps in treating acute mountain sickness
        iv. Dexamethasone 4 mg IM, IV, or PO q 6 hours until symptoms resolve
            1. **Pediatric** dosing is 0.15 mg/kg IM, IV, or PO q 6 hours; maximum single dose is 4 mg.
            2. Dexamethasone helps treat the symptoms of acute mountain sickness and may be used as an adjunctive therapy in severe acute mountain sickness when the above measures alone do not ameliorate the symptoms. In these circumstances, patients should also initiate descent, as dexamethasone does not facilitate acclimatization
    b. HACE: All therapies listed below should be considered as adjunctive to descent. Descent should always be the primary treatment modality
        i. Dexamethasone: 8 mg IM, IV, or PO once followed by 4 mg q 6 hours
            1. **Pediatric** dosing: 0.15 mg/kg/dose every 6 hours

2. Dexamethasone helps treat the symptoms of HACE and should be initiated in HACE. In these circumstances, patients should also initiate descent

ii. Consider use of acetazolamide at the above dosing

c. HAPE: All therapies listed below should be considered as adjunctive to descent. Descent should always be the primary treatment modality

i. Nifedipine: **Adult** 30 mg ER (extended-release) PO twice a day. **Pediatric:** 0.5 mg/kg (max single dose 20 mg), extended-release PO every 8 hours

ii. If nifedipine is not available:

iii. Tadalafil: 10 mg PO twice daily may be used

OR

i. Sildenafil: 50 mg PO three times a day may be used

ii. Multiple pulmonary vasodilators should not be used concurrently

Patient Safety Considerations

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

Notes/Educational Pearls

Key Considerations

1. Patients suffering from altitude illness have exposed themselves to a dangerous environment. By entering the same environment, clinicians are exposing themselves to the same altitude exposure. Be vigilant in looking for symptoms of altitude illness amongst rescuers
2. Descent of 500–1000 feet is often enough to see improvements in patient conditions
3. Patients with HAPE are suffering from non-cardiogenic pulmonary edema and may benefit from positive pressure ventilation via either bag assisted ventilation, CPAP, or other means of positive pressure ventilation
4. Patients suffering from altitude illness are commonly dehydrated and require IV fluids — once resuscitation is complete and the patient requires no further fluid boluses, maintain IV fluids at 125 mL/hr
5. HAPE is the most lethal of all altitude illnesses
6. Consider alternate causes of symptoms of AMS — the symptoms of AMS may be caused by alternate etiologies such as carbon monoxide poisoning (in patients cooking within enclosed areas), dehydration, exhaustion, hypoglycemia, hyponatremia
7. Children with the following are at greater risk for altitude illness:
   a. Those with a concurrent upper or lower respiratory tract infection or otitis media.
   b. Full term infants less than 6 weeks of age, or preterm infants less than 46 weeks post conceptual age
   c. Congenital heart disease
   d. Down syndrome, especially those with obstructive sleep apnea
   e. Those with bronchopulmonary dysplasia (BPD), cystic fibrosis, sickle cell anemia, severe scoliosis, and neuromuscular diseases
   f. Premature infants beyond 46-weeks with a history of oxygen requirement, PBD or pulmonary hypertension

Go To TOC

g. Children who live at high altitude when they descend to lower altitude, then return home are at risk for HAPE

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914021 – Environmental - Altitude Sickness

Key Documentation Elements

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

Performance Measures

- Mechanism of treatment for acute mountain sickness, HACE, or HAPE
- Medical decision-making regarding treatment choice (i.e., weather, inability to descend)

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Revision Date

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Conducted Electrical Weapon Injury (i.e., TASER®)

Aliases

Tased

Patient Care Goals

1. Manage the condition that triggered the application of the conducted electrical weapon with special attention to patients meeting criterion for delirium with agitated behavior [See Agitated or Violent Patient/Behavioral Emergency Guideline]
2. Ensure patient is appropriately secured or restrained with assistance of law enforcement to protect the patient and clinicians [See Agitated or Violent Patient/Behavioral Emergency Guideline]
3. Perform comprehensive trauma and medical assessment for injuries (e.g., from falls or altercations or concomitant medical issues)
4. If discharged from a distance, up to two single barbed darts (13 mm length) should be located
    a. Do not remove barbed dart from sensitive areas (head, neck, hands, feet, or genitals)

Patient Presentation

Inclusion Criteria

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

Exclusion Criteria

None noted

Patient Management

Assessment

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

Treatment and Interventions

1. Make sure patient is appropriately secured with assistance of law enforcement to protect the patient and staff. Consider psychologic management medications if patient struggling against physical devices and may harm themselves or others
2. Some EMS agencies treat all barbed darts as a foreign body and leave them for physician removal while others allow EMS or law enforcement to remove barbed darts except for

sensitive areas (head, neck, hands, feet, or genitals). Follow local protocols, including those of law enforcement for evidence collection and retention.
3. Treat medical and traumatic injury

Patient Safety Considerations

1. Before removal of the barbed dart, make sure the cartridge has been removed from the conducted electrical weapon
2. Patient should not be restrained in the prone, face down, or hog-tied position as respiratory compromise is a significant risk
3. The patient may have underlying pathology before being tased (refer to appropriate guidelines for managing the underlying medical/traumatic pathology)
4. Perform a comprehensive assessment with special attention looking for signs and symptoms of active medical decompensation
5. Transport the patient to the hospital
6. EMS clinicians who respond for a conducted electrical weapon patient should not perform a "medical clearance" for law enforcement to then take the patient to a nonmedical facility

Notes/Educational Pearls

Key Considerations

1. Conducted electrical weapon can be discharged in three fashions:
    a. Direct contact without the use of the darts
    b. A single dart with addition contact by direct contact of weapon
    c. From a distance up to 35 feet with two darts
2. The device delivers 19 pulses per second with an average current per pulse of 2.1 milliamps which, in combination with toxins/drugs, patient's underlying diseases, excessive physical exertion, and trauma, may precipitate arrhythmias. Thus, consider cardiac monitoring and 12-lead EKG assessment
3. Drive Stun is a direct weapon two-point contact which is designed to generate pain and not incapacitate the subject. Only local muscle groups are stimulated with the Drive Stun technique

Pertinent Assessment Findings

1. Thoroughly assess the patient for trauma as the patient may have fallen from standing or higher
2. Ascertain if more than one TASER® cartridge was used (by one or more officers, in effort to identify total number of possible darts and contacts)

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914203 – Injury - Conducted Electrical Weapon (e.g., Taser)

Key Documentation Elements

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

Performance Measures

- Comprehensive patient documentation as this is a complex patient
- Abnormal findings or vital signs were addressed
- Patient received cardiac monitoring and/or 12-lead EKG evaluation
- If indicated, review for appropriate securing technique

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Revision Date

March 11, 2022

Electrical Injuries

Aliases

Electrical burns
Electrocution

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

Exposure to electrical current (AC or DC).

Exclusion Criteria

None noted

Patient Management

Assessment

1. Verify scene is secure. The electrical source must be disabled prior to assessment
2. Perform primary survey with specific focus on dysrhythmias or cardiac arrest—apply a continuous cardiac monitor and obtain 12-lead EKG as soon as feasible
3. Identify all sites of burn injury. If the patient became part of the circuit, there will be an additional site near the contact with ground. Electrical burns are often full thickness and involve significant deep tissue damage, and there may be multiple burn sites
4. Assess for potential associated trauma and note if the patient was thrown from contact point. If patient has altered mental status, assume trauma was involved and treat accordingly
5. Assess for potential compartment syndrome from significant extremity tissue damage
6. Determine characteristics of source if possible (AC or DC, voltage, amperage, time of injury)

Treatment and Interventions

1. Identify dysrhythmias or cardiac arrest — even patients who appear dead (particularly dilated pupils) may have good outcomes with prompt intervention [see appropriate guideline for additional information and patient assessment/treatment]
2. Apply spinal motion restriction if associated trauma suspected [See Trauma Section]
3. Apply dry dressing to any wounds
4. Remove constricting clothing and jewelry since additional swelling is possible
5. Administer IV fluid resuscitation. Remember that external appearance will underestimate the degree of tissue injury but that electrical injuries do not generally require as much fluid as thermal burn injuries

6. Electrical injuries may be associated with significant pain, treat per Pain Management Guideline
7. Electrical injury patients should be taken to a burn center whenever possible since these injuries can involve considerable tissue damage
8. When there is significant associated trauma, this takes priority, if local trauma resources and burn resources are not in the same facility

Patient Safety Considerations

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

Notes/Educational Pearls

Key Considerations

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

Current level (Milliamperes)	Probable Effect on Human Body of 120 V, 60 Hz AC for 1 second
1mA	Perception level. Slight tingling sensation. Still dangerous if wet conditions.
5mA	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range may lead to injuries.
6mA–16mA	Painful shock, begin to lose muscular control. Commonly referred to as the freezing current or "let-go" range.
17mA–99mA	Extreme pain, respiratory arrest, severe muscular contractions. Individual cannot let go. Death is possible.
100mA–2000mA	Ventricular fibrillation (uneven, uncoordinated pumping of the heart). Muscular contraction and nerve damage begins to occur. Death is likely.
> **2,000mA**	Cardiac arrest, internal organ damage, and severe burns. Death is probable.
Source: *https://www.osha.gov/SLTC/etools/construction/electrical_incidents/eleccurrent.html*	

Pertinent Assessment Findings

1. Identification of potential trauma concomitant with electrical injury
2. Presence of cardiac dysrhythmias

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914095 – Injury - Electrical Injuries

Key Documentation Elements

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

Performance Measures

- Confirmation of scene safety
- Documentation of electrical source and voltage if known
- Documentation of cardiac monitoring
- Documentation of appropriate care of associated traumatic injuries
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - o *Trauma—01: Pain Assessment of Injured Patients*

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Revision Date

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Lightning/Lightning Strike Injury

Aliases
Lightning burn

Patient Care Goals

1. Identify patient(s) as lightning strike victim(s)
2. Move to safe area
3. Initiate immediate resuscitation of cardiac arrest victim(s), within limits of mass casualty care, also known as "reverse triage"
4. Cardiac monitoring during transport
5. Treat associated traumatic injuries

Patient Presentation

1. Lightning strikes may happen in a variety of environmental conditions
   a. Most commonly they occur in outdoor or wilderness circumstances
   b. Golf courses, exposed mountains or ledges and farms/fields all present conditions that increase risk of lightning strike, when hazardous meteorological conditions exist
2. Lacking bystander observations or history, it is not always immediately apparent that patient has been the victim of a lightning strike
   Subtle findings such as injury patterns might suggest lightning injury

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

Exclusion Criteria
No recommendations

Patient Management

Assessment

1. Respiratory
   a. Apnea
   b. Agonal respirations
   c. Respiratory paralysis
2. Cardiovascular
   a. Dysrhythmias
   b. Transient hypertension
3. Neurologic
   a. Seizures
   b. Confusion
   c. Paralysis
   d. Paraplegia
   e. Vertigo/dizziness
   f. Paresthesias
   g. Amnesia
   h. Memory deficits

   i. Anxiety
   j. Fixed/dilated pupils possible (autonomic dysfunction)
4. Skin
   a. Ferning or fern-like superficial skin burn ("Lichtenberg figures")
   b. Vascular instability may result in cool, mottled extremities
   c. Frequent first and/or second-degree burns
   d. Third degree burns less common
5. Patient may be in full cardiopulmonary arrest or have only respiratory arrest, as injury is a result of DC current
6. May have stroke-like findings as a result of neurologic insult
7. May have secondary traumatic injury as a result of overpressurization, blast or missile injury
8. Fixed/dilated pupils may be a sign of neurologic insult, rather than a sign of death/impending death. Should not be used as a solitary, independent sign of death for the purpose of discontinuing resuscitation in this patient population

Treatment and Interventions
1. Assure patent airway — if in respiratory arrest only, manage airway as appropriate
2. If in cardiopulmonary arrest, treat per Cardiac Arrest Guideline
3. Consider IV initiation — avoid initiation through burned skin
4. Monitor EKG. Be alert for potential arrhythmias. Consider 12-lead EKG, when available
5. Consider early pain management for burns or associated traumatic injury [See Pain Management Guideline]

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

Notes/Educational Pearls

Key Considerations
1. Lightning strike cardiopulmonary arrest patients have a high rate of successful resuscitation, if initiated early, in contrast to general cardiac arrest statistics
2. There may be multiple victims
3. If multiple victims, cardiac arrest patients whose injury was witnessed or thought to be recent should be treated first and aggressively (reverse from traditional triage practices)
   a. Patients suffering cardiac arrest from lightning strike initially suffer a combined cardiac and respiratory arrest
   b. Return of spontaneous circulation may precede resolution of respiratory arrest
   c. Patients may be successfully resuscitated if provided proper cardiac and respiratory support, highlighting the value of "reverse triage"
4. It may not be immediately apparent that the patient is a lightning strike victim
5. Injury pattern and secondary physical exam findings may be key in identifying patient as a victim of lightning strike
6. Lightning strike is a result of very high voltage, very short duration DC current exposure

Pertinent Assessment Findings

1. Presence of thermal or non-thermal burns
2. Evidence of trauma
3. Evidence of focal neurologic deficits

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01) *(for additional information, go to www.nemsis.org)*

- 9914209 – Injury - Lightning/Lightning Strike

Key Documentation Elements

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

Performance Measures

- Cardiopulmonary issues addressed early and documented appropriately
- Patient transported to closest appropriate facility
- Pain scale documented and treated per guidelines (when appropriate)
- ***National EMS Quality Alliance (NEMSQA) Performance Measures*** *(for additional information, see www.nemsqa.org)*
    - *Trauma—01: Pain Assessment of Injured Patients*

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II. Universal Documentation Guideline

Aliases

NEMSIS, Documentation

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 guideline defines minimum standards and inclusions used and referenced throughout this document under the "Quality Improvement" section of each guideline
3. The National EMS Information System (NEMSIS) submission requirements, state and local EMS systems, and EMS billing reimbursement services will have more extensive minimum requirements that exceed this guideline *(For additional information, go to www.nemsis.org)*
4. This guideline 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 guideline 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 *(NEMSIS 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

<u>Patient Demographics and Medical History</u>

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

<u>Patient Complaints and Symptoms</u>

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 guidelines 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
   a. **M**edications
      i. eHistory.12—Current Medications
   b. **P**ast medical and surgical history
      i. eHistory.08—Medical/Surgical History
   c. **L**ast Oral Intake
      i. eHistory.19—Last Oral Intake *(if software configured to collect)*
         and/or
      ii. eNarrative.01—Patient Care Report Narrative
   d. **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 Guideline for Field Triage of Injured Patients)*
   d. eInjury.04—Vehicular, Pedestrian, or Other Injury Risk Factor *(per the ACS-COT 2022 National Guideline 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

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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 Impressions [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

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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)*

<u>Procedures Performed</u>

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 guidelines 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 of thecal 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 EMS software systems. *(For additional information, go to www.nemsis.org.)* 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 guidelines 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.

   d. State and local systems may have Mandatory or Required fields that are not Mandatory or Required by NEMSIS. The manager for these systems should be contacted for a list of these fields.
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 Guideline 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 guideline 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 Guidelines 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.

References

1. National Association of EMS Officials, Data Mangers Council. Extended data definitions, NEMSIS Version 3.4.0. https://www.nasemso.org/Councils/DataManagers/documents/Extended-Data-Definitions_v3_Final.pdf. Published May 2016.
2. National EMS Information System Technical Assistance Center. NEMSIS data dictionary, NHTSA v3.4.0, Build 160713 Critical Patch 2, EMS Data Standard.

https://nemsis.org/media/nemsis_v3/release-3.4.0/DataDictionary/PDFHTML/DEMEMS/NEMSISDataDictionary.pdf. Updated July 13, 2016.

3. Wang HE, Domeier RM, Kupas DF, Greenwood MJ, O'Connor RE. Recommended guidelines for uniform reporting of data from out-of-hospital airway management: position statement of the national association of EMS physicians. *Prehosp Emerg Care* 2004;8(1):58-72.

Revision Date

March 11, 2022

III. Medications

The project team considered the use of Institute for Safe Medication Practices (ISMP) Tall Man Letters methodology to avoid the miscommunication of lookalike drug names. Upon review of the list and the limited number of medications carried by EMS, as well as the expected use of this document, it was elected not to institute this measure into our medication list. We recommend EMS agencies consider incorporating these measures into practice where appropriate.
Additional information regarding Tall Man Letters can be found on the ISMP website: http://www.ismp.org/tools/tallmanletters.pdf and the US Food and Drug Administration website: http://www.fda.gov/Drugs/DrugSafety/MedicationErrors/ucm164587.htm.

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 Guidelines 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 listed on the http://www.medscape.com website 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.

Medication List

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

Acetaminophen
Name — There are multiple over-the-counter medications, as well as scheduled drugs, that include 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 acetaminophen
Indications — Antidote for 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 non-ACLS/nerve agent/organophosphate scenarios

Go To TOC

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

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

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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

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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 infarction*: 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

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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

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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 – WILL NEED TO REVIEW EVERY PLACE PREDNISONE IS MENTIONED IN THE 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 – WILL NEED TO REVIEW EVERY PLACE PREDNISONE IS MENTIONED IN THE 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

IV. Approved Abbreviations

The following is the Project's list of approved medical abbreviations used in this document. The Drug.com article "Medical Abbreviations on Pharmacy Prescriptions" at https://www.drugs.com/article/prescription-abbreviations.html is considered the reference of authority.

Table X: List of Abbreviations

Abbreviation	Description
ACS	acute coronary syndrome
AED	automatic external defibrillator
A-FIB	atrial fibrillation
ALS	advanced life support
AMS	altered mental status
ASA	aspirin
AV	atrioventricular
AVPU	alert, verbal, pain, unresponsive (neurological status measure)
BiPAP	bi-level positive airway pressure
BLS	basic life support
BP	blood pressure
BPM	beats per minute
BSA	body surface area
BSI	body substance isolation
BVM	bag-valve-mask
CABG	coronary artery bypass graft
CAD	coronary artery disease
CARES	Cardiac Arrest Registry to Enhance Survival
CC	chief complaint
CDC	Centers for Disease Control and Prevention
CHF	congestive heart failure
CNS	central nervous system
CO	carbon monoxide
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease
CP	chest pain
CPAP	continuous positive airway pressure
CPI	continuous performance improvement
CPR	cardiopulmonary resuscitation
C-SECTION	caesarean section
C-SPINE	cervical spine

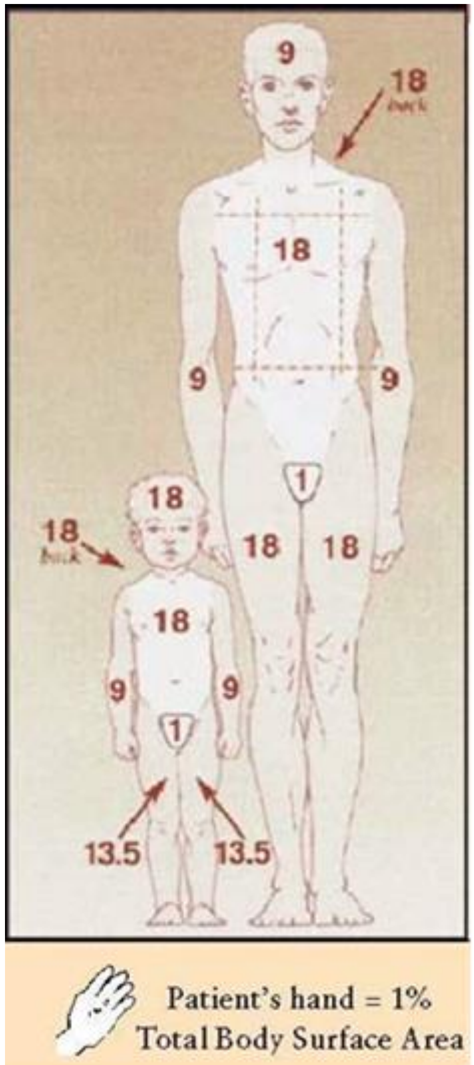
CT	cat scan, Cardiac Technician
CVA	cerebrovascular accident (stroke)
D5W	5% dextrose in water
DKA	diabetic ketoacidosis
DNI	do not intubate
DNR	do not resuscitate
DT	delirium tremens
Dx	diagnosis
ECPR	extracorporeal cardiopulmonary resuscitation
EEG	electroencephalogram
EENT	eye, ear, nose, and throat
EGD	extraglottic device
EKG	electrocardiogram
EMS	emergency medical services
EMT	emergency medical technician
ePCR	electronic patient call/care record/report
ET	endotracheal
ETA	estimated time of arrival
$EtCO_2$	end-tidal carbon dioxide; end-tidal capnography
ETOH	ethanol (alcohol)
ETT	endotracheal tube
FBAO	foreign body airway obstruction
FiO_2	fraction of inspired oxygen
g	gram(s)
GI	gastrointestinal
gtt	drops
GU	genitourinary
GYN	gynecology (gynecological)
HFNC	high flow nasal cannula
HR	heart rate (hour)
ICU	intensive care unit
IM	intramuscular
IO	intraosseous
IPPB	intermittent positive pressure breathing
IV	intravenous
IVP	intravenous push
J	joules
JVD	jugular vein distension

kg	kilogram
KVO	keep vein open
L	liter
LMA	laryngeal mask airway
LPM	liters per minute
LR	lactated Ringer's
MAT	multifocal atrial tachycardia
mcg	microgram(s)
MED	medicine
mg	milligram(s)
mg/dL	milligrams per deciliter
MI	myocardial infarction (heart attack)
mL	milliliter
mmHg	millimeters of mercury
mmol	millimole
MOLST	medical orders for life-sustaining treatment
MS	mental status
msec	millisecond
MVC	motor vehicle crash
N/V	nausea/vomiting
NC	nasal cannula
NRB	non-rebreather
NS	normal saline
NSR	normal sinus rhythm
OB/GYN	obstetrics/gynecology
O_2	oxygen
P	pulse
PAC	premature atrial contraction
PCR	Patient call/care record/report
PE	pulmonary embolus
PEA	pulseless electrical activity
PO	orally
POLST	physician orders for life-sustaining treatment
PPE	personal protection equipment
prn	as needed
PVC	premature ventricular contraction
q	every (e.g., q 3-5 minutes)
RR	respiratory rate

RSI	rapid sequence intubation
Rx	medicine
sat	saturation
SBP	systolic blood pressure
SC	subcutaneous
SCBA	self-contained breathing apparatus
SCUBA	self-contained underwater breathing apparatus
SGD	supraglottic device
SL	sublingual
SOB	shortness of breath
ST	sinus tachycardia
SVT	supraventricular tachycardia
T	temperature
TBSA	total body surface area
TCA	tricyclic antidepressants
TIA	transient ischemic attack
TID	three times a day
TKO	to keep open
VF	ventricular fibrillation
VS	vital signs
VT	ventricular tachycardia
y/o	years old (years old)

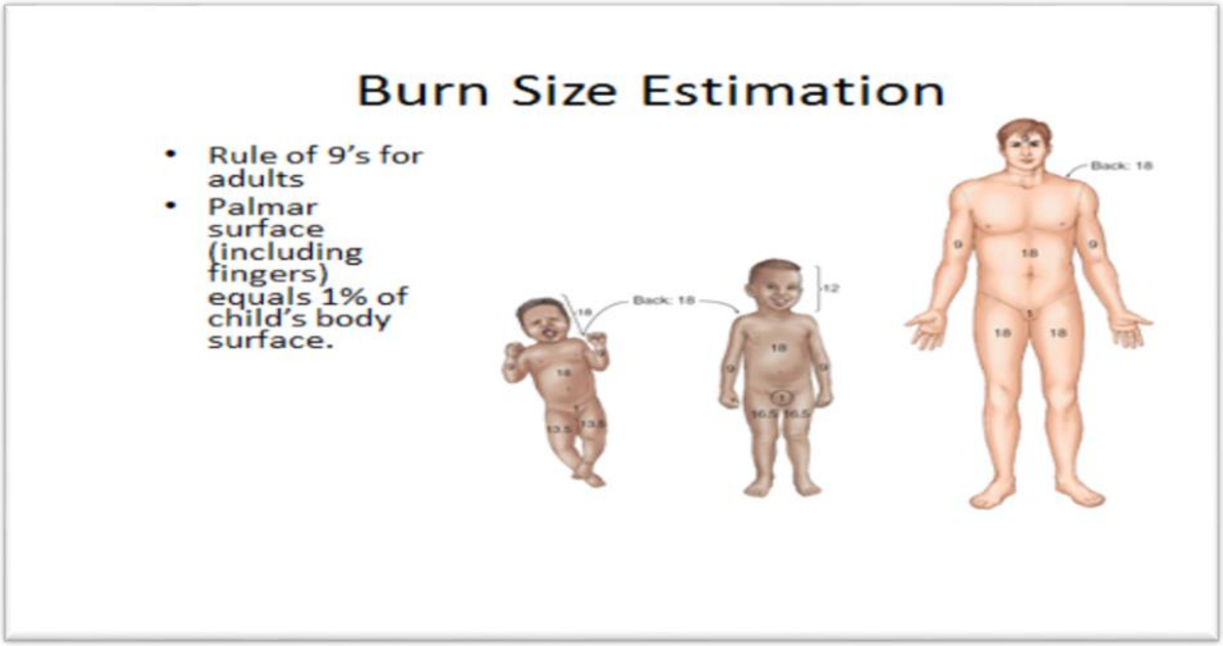
V. Burn and Burn Fluid Charts

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 guidelines 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

Patients with traumatic injuries may require additional fluids.

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).

VI. 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	

Table X: 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

VII. 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

VIII. Evidence-Based Guidelines: 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 guideline (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 Guideline Model Process for the development, implementation, and evaluation of evidence-based guidelines. This Model Process recommends the use of the GRADE methodology for the guideline 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 guidelines 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.

References:

Brown KM. The development of evidence-based prehospital guidelines using a GRADE-based methodology, *Prehospital Emergency Care,* 2014, Suppl 1:3-14, 2014

IX. 2022 National Guideline 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)

Note: "Low-level" refers to less than 10 feet including ground level falls

Source: The American College of Surgeons Committee on Trauma (*ACS COT*), *2022*

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