National Model EMS Clinical Guidelines

June 2018

VERSION 2.1

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

NASEMSO Medical Directors Council
www.nasemso.org

Contents

Introduction

The inaugural edition of the National Association of State EMS Officials (NASEMSO) National Model EMS Clinical Guidelines was released in September 2014 and has been warmly welcomed by EMS practitioners, agencies, medical directors, and healthcare organizations in our nation as well as abroad. The creation of this document was a pinnacle event in the profession and medical practice of EMS 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 Highway Traffic Safety Administration's Office of EMS (NHTSA OEMS) has embraced this recommendation with the development of the Evidence-Based Guideline Project and continued support of the NASEMSO National EMS Model Clinical Guidelines.

The National Association of State EMS Officials recognizes the need for national EMS clinical guidelines to help state EMS systems ensure a more standardized approach to the current practice of patient care and, as experience dictates, adoption of future practices. Model EMS clinical guidelines promote uniformity in prehospital care which, in turn, promotes more consistent practice as EMS providers 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 OEMS and the Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau's EMS for Children Program, NASEMSO authorized its Medical Directors Council to partner with national stakeholder organizations with expertise in EMS direct medical oversight and subject-matter experts to create a unified set of patient care guidelines. For the aspects of clinical care where evidence-based guidelines derived in accordance with the national evidence-based guideline model process were not available, consensus-based clinical guidelines were developed utilizing currently available research.

The NASEMSO National Model EMS Clinical Guidelines are not mandatory nor are they meant to be all-inclusive or to determine local scope of practice. The focus of these guidelines is solely patient-centric. As such, they are designed to provide a resource to clinical practice and to maximize patient care, safety, and outcomes regardless of the existing resources and capabilities within an EMS system. They are a set of clinical guidelines that can be used as is or adapted for use on a state, regional or local level to enhance patient care and benchmark performance of EMS practice. NASEMSO's ongoing support of this project underlines the critical evolution of the practice of EMS medicine as new EMS research and evidence-based patient care measures emerge in the future. We are grateful to be able to continue the work on this initiative considering the group of talented, committed individuals we have been fortunate to call our partners in the endeavor.

Carol Cunningham, M.D.
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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 as they are developed.

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

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

These guidelines will be maintained by the Medical 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 is 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 IV – 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 indispensable elements of direct medical oversight as they facilitate the identification of gaps and potential avenues of their resolution within an EMS system. Since the release of the inaugural document, the EMS Compass® project, which was led by NASEMSO, was tasked with the mission of improving systems of care through meaningful measures. This edition of the NASEMSO National Model EMS Clinical Guidelines has incorporated the existing EMS Compass® 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 practitioners.

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

New in the 2017 Edition

All of the 2014 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 content has been added to the 2017 edition for the following clinical conditions or scenarios (as stand-alone guidelines or content in related guidelines):

Abdominal Pain
Active Shooter Incidents
Airway/Respiratory Irritants
Amputation
Back Pain
Cardiac Devices
Crush Syndrome
End-of-Life Palliative Care
Human Trafficking
Hypertension
Impaled Objects
Riot Control Agents
Sickle Cell Pain Crisis
Termination of Resuscitative Efforts
Tracheostomy/Laryngectomy

Acknowledgements

The authors of this document are NASEMSO Medical Directors 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 Osteopathic Emergency Physicians (ACOEP), 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. Determine number of patients
   c. Determine mechanism of injury
   d. Request additional resources if needed and weigh the benefits of waiting for additional resources against rapid transport to definitive care
   e. Consider declaration of mass casualty incident if needed
2. Use appropriate personal protective equipment (PPE)
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 trauma
5. Primary survey
   (**A**irway**,** **B**reathing, **C**irculation is cited below; although there are specific circumstances where **C**irculation, **A**irway, **B**reathing may be indicated such as cardiac arrest or major arterial bleeding)
   a. Airway (assess for patency and open the airway as indicated)
      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, blind insertion, or supraglottic airway device, laryngeal mask airway, 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

ii. Obstructed airway, laryngectomy, or tracheostomy – go to Airway Management guideline

b. Breathing
    i. Evaluate rate, breath sounds, accessory muscle use, retractions, patient positioning
    ii. Administer oxygen as appropriate with a target of achieving 94-98% saturation for most acutely ill patients
    iii. Apnea (not breathing) – go to Airway Management guideline
c. Circulation
    i. Control any major external bleeding [see Extremity Trauma/External Hemorrhage Management guideline]
    ii. Assess pulse
        1. If none – go to Cardiac Arrest guideline
        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 scale (Alert, Verbal, Pain, Unresponsive)
    ii. Evaluate gross motor and sensory function in all extremities
    iii. Check blood glucose in patients with altered mental status
    iv. If acute stroke suspected – go to Suspected Stroke/Transient Ischemic Attack guideline
e. Expose patient as appropriate to complaint
    i. Be considerate of patient modesty
    ii. Keep patient warm

6. 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. Naso-oropharynx
       iii. 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 deformity
   d. Abdomen/Back
       i. Flank/abdominal tenderness or bruising
       ii. Abdominal distension
   e. Extremities
       i. Edema
       ii. Pulses

            iii. Deformity
    e. Neurologic
        i. Mental status/orientation
        ii. Motor/sensory
7. Obtain Baseline Vital Signs (An initial full set of vital signs is required: pulse, blood pressure, respiratory rate, neurologic status assessment)
    a. Neurologic status assessment [see Appendix VII] involves establishing a baseline and then trending any change in patient neurologic status
        i. Glasgow Coma Score (GCS) is frequently used, but there are often errors in applying and calculating this score. With this in consideration, a simpler field approach may be as valid as GCS. Either AVPU (**A**lert, **V**erbal, **P**ainful, **U**nresponsive) or only the motor component of the GCS may more effectively serve in this capacity
    b. Patients with cardiac or respiratory complaints
        i. Pulse oximetry
        ii. 12-lead EKG should be obtained early in patients with cardiac or suspected cardiac complaints
        iii. Continuous cardiac monitoring, if available
        iv. Consider waveform capnography (essential for patients who require invasive airway management) or digital capnometry
    c. Patient with altered mental status
        i. Check blood glucose
        ii. Consider waveform capnography (essential for 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
8. 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
9. 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)
    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

Treatment and Interventions

1. Administer oxygen as appropriate with a target of achieving 94-98% saturation
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 .5 mg/kg of lidocaine 0.1mg/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. Reassess patient

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. Direct medical oversight 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 45 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
    b. Normal vital signs (see chart below)
        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
        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: may not be completed if patient has critical primary survey problems
6. Critical Patients: proactive patient management should occur simultaneously with assessment
    a. Ideally, one provider should be assigned to exclusively monitor and facilitate patient-focused care
    b. Treatment and Interventions should be initiated as soon as practical, but should not impede extrication or delay transport to definitive care
7. Air Medical Transport: air transport of trauma patients should be reserved for higher acuity trauma patients where there is a significant times savings over ground transport, where the appropriate destination is not accessible by ground due to systemic or logistical issues, and for patients who meet the Centers for Disease Control and Prevention's (CDC) anatomic, physiologic, and situational high-acuity triage criteria

Pertinent Assessment Findings

This guideline is too broad to list all possible findings

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914075 – General-Universal Patient Care/Initial Patient Contact

Key Documentation Elements

- At least two full sets of vital signs should be documented for every patient
- All patient interventions should be documented

Performance Measures

- Abnormal vital signs should be addressed and reassessed
- Response to therapy provided should be documented including pain scale 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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
  - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
  - *PEDS-01: Respiratory assessment.* Documented evidence that a respiratory assessment was performed on pediatric patients
  - *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia
  - *Stroke-01: Suspected stroke receiving prehospital stroke assessment.* To measure the percentage of suspected stroke patients who had a stroke assessment performed by EMS
  - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain

Normal Vital Signs

Age	Pulse	Respiratory Rate	Systolic BP
Preterm less than 1 kg	120-160	30-60	36-58
Preterm 1 kg	120-160	30-60	42-66
Preterm 2 kg	120-160	30-60	50-72
Newborn	120-160	30-60	60-70
Up to 1 year	100-140	30-60	70-80
1-3 years	100-140	20-40	76-90
4-6 years	80-120	20-30	80-100
7-9 years	80-120	16-24	84-110
10-12 years	60-100	16-20	90-120
13-14 years	60-90	16-20	90-120
15 years or older	60-90	14-20	90-130

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**	

References

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2. Bledsoe BE, Porter RS, Cherry RA. *Paramedic Care: Principles & Practice, Volume 3, 4th Ed.* Brady, 2012.
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4. National Association of State Emergency Medical Services Officials. *State model rules for the regulation of air medical services*. Published September 2016.
5. O'Driscoll BR, Howard LS, Davison AG. BTS guideline for emergency oxygen use in adult patients. *Thorax* 2008;63:vi1-vi68.
6. Thomas SH, Brown KM, Oliver ZJ, Spaite DW, Sahni R, Weik TS, et al. An evidence-based guideline for the air medical transportation of trauma patients. *Prehosp Emerg Care* 2014;18 Suppl 1:35-44.
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Revision Date

September 8, 2017

Functional Needs

Aliases

Developmental delay, disabled, handicapped, impaired, mental Illness, mental retardation, 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

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 manner in which 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 manner in which 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. <u>Physical Barriers:</u>
        i. Ambulatory impairment (e.g. limb amputation, bariatric)
        ii. Neuromuscular impairment
3. <u>Cognitive Barriers:</u>
        i. Mental illness
        ii. Developmental challenge or delay

Pertinent Assessment Findings

1. <u>Assistance Adjuncts.</u> 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. <u>Service Animals</u>
   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 providers may only ask the patient if the service animal is required because of a disability and the form of assistance the animal has been trained to perform.
c. EMS providers 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 or not 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)

- 9914165 – Other *(no specific NEMSIS protocol matching this guideline)*
- 9914063 – General-Individualized Patient Protocol

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.
2. U.S. Department of Health and Human Services, Office of the Assistant Secretary of Preparedness and Response. *FEMA's Functional Needs Support Services Guidance*. http://www.phe.gov/Preparedness/planning/abc/Documents/fema-fnss.pdf. Accessed August 18, 2017.
3. US Department of Labor. Americans with Disabilities Act; 28 Code of Federal Regulations Part 35. July 23, 2010.
4. US Department of Labor. Americans with Disabilities Act; 42 U.S. Code, Chapter 126. 1990.
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Revision Date

September 8, 2017

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

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 provider has doubts about whether the individual has the mental capacity to refuse or if the patient lacks capacity, the EMS provider should contact direct medical oversight
3. If patient has capacity, clearly explain to the individual and all responsible parties the possible risks and overall concerns with regards to refusing care
4. Perform appropriate medical care with the consent of the individual
5. Complete the patient care report clearly documenting the initial assessment findings and the discussions with all involved individuals regarding the possible consequences of refusing additional prehospital care and/or transportation

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. These individuals must be advised of the risks and consequences resulting from refusal of medical care

2. An individual determined to lack decision-making capacity by EMS providers should not be allowed to refuse care against medical advice or to be released at the scene. Mental illness, drugs, alcohol intoxication, or physical/mental impairment may significantly impair an individual's decision-making capacity. Individuals who have attempted suicide, verbalized suicidal intent, or have other factors that lead EMS providers to suspect suicidal intent, should not be regarded as having demonstrated sufficient decision-making capacity
3. The determination of decision-making capacity may be challenged by communication barriers or cultural differences
4. EMS providers should not put themselves in danger by attempting to treat and/or transport an individual who refuses care
5. Always act in the best interest of the patient – EMS providers, with the support of direct medical oversight, must strike a balance between abandoning the patient and forcing care
6. ***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 providers to provide emergency treatment when a parent is not available to provide consent. This is known as the emergency exception rule or the doctrine of implied consent. For minors, this doctrine means that the prehospital professional can presume consent and proceed with appropriate treatment and transport if the following four conditions are met:
      i. The child is suffering from an emergent condition that places his or her 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 prehospital professional administers only treatment for emergency conditions that pose an immediate threat to the child
      v. As a general rule, when the prehospital professional's authority to act is in doubt, EMS providers should always do what they believe to be in the best interest of the minor
      vi. If a minor is injured or ill and no parent contact is possible, the provider may contact direct medical oversight for additional instructions

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914189 – General-Refusal of Care

Key Documentation Elements

- Document patient capacity with:
  - Any and 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
- Direct medical oversight contact
- Any assessments and treatments performed

Performance Measures

- Patient decision-making capacity was determined and documented
- Direct medical oversight 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

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Revision Date

September 8, 2017

Cardiovascular

Adult and Pediatric Syncope and Presyncope

Aliases

Loss of consciousness, passed out, fainted

Patient Care Goals

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

Patient Presentation

Syncope is heralded by both the loss of consciousness and the loss of postural tone and resolves spontaneously without medical interventions. Syncope typically is abrupt in onset and resolves equally quickly. EMS providers may find the patient awake and alert on initial evaluation. Presyncope is defined as the prodromal symptoms of syncope. It usually lasts for seconds to minutes and may be described by the patient as "nearly blacking out" or "nearly fainting."

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 patients:

1. Patients with alternate and obvious cause of loss of consciousness (e.g. trauma – go to Head Injury guideline)
2. Patients with ongoing mental status changes or coma should be treated per the Altered Mental Status 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)
        ii. Seizure
        iii. Recent trauma
        iv. Anticoagulation
        v. Dysrhythmia
        vi. Congestive heart failure (CHF)
        vii. Syncope
    b. History of Present Illness, including:
        i. Conditions leading to the event
        ii. Patient complaints before or after the event including prodromal symptoms
        iii. Syncope that occurs during exercise often indicates an ominous cardiac cause. Patients should be evaluated in the emergency department

        iv. History from others on scene, including seizures or shaking, presence of pulse/breathing (if noted), duration of the event, events that lead to the resolution of the event
   c. Review of Systems:
      i. Occult blood loss (GI/GU)
      ii. Fluid losses (nausea/vomiting/diarrhea) and fluid intake
      iii. Current Medications
2. Pertinent Physical Exam Including:
   a. Attention to vital signs as well as evaluation for trauma
   b. Detailed neurologic exam (including stroke screening and mental status)
   c. Heart, lung, abdominal and extremity exam
   d. Additional Evaluation:
      i. Cardiac monitoring
      ii. Ongoing vital signs
      iii. 12-lead EKG

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, and the like
   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 syncope due to arrhythmia may suffer recurrent arrhythmia 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 – go to General Trauma Management guideline

Notes/Educational Pearls

Key Considerations

1. By being most proximate to the scene and to the patient's presentation, EMS providers are commonly in a unique position to identify the cause of syncope. Consideration of potential causes, ongoing monitoring of vitals and cardiac rhythm as well as detailed exam and history are essential pieces of information to pass onto hospital providers.
2. All patients suffering from syncope deserve hospital level evaluation, even if they appear normal with few complaints on scene
3. High risk causes of syncope include the following:
   a. Cardiovascular
      i. Myocardial infarction
      ii. Aortic stenosis

        iii. Hypertrophic cardiomyopathy
        iv. Pulmonary embolus
        v. Thoracic aortic dissection
        vi. Lethal dysrhythmia
    b. Neurovascular
        i. Intracranial hemorrhage
        ii. Transient ischemic attack or stroke
4. Consider high risk 12-lead EKG features including, but not limited to:
    a. Evidence of QT prolongation (generally over 500ms)
    b. Delta waves
    c. Brugada syndrome (incomplete RBBB pattern in V1/V2 with ST segment elevation)
    d. Hypertrophic obstructive cardiomyopathy

<u>Pertinent Assessment Findings</u>

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914149 – Medical-Syncope

Key Documentation Elements

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

Performance Measures

- Acquisition of 12-lead EKG
- Application of cardiac monitor
- ***EMS Compass® Measure*** *(for additional information, see www.emscompass.org)*
    - *Stroke-01: Suspected stroke receiving prehospital stroke assessment.* To measure the percentage of suspected stroke patients who had a stroke assessment performed by EMS

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Revision Date

September 8, 2017

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

Aliases

Heart attack, myocardial infarction (MI)

Patient Care Goals

1. Identify 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, sweating, nausea, vomiting, and 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. 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 and nitrates per the Pain Management guideline.

Exclusion Criteria

None recommended

Patient Management

Assessment, Treatment, and Interventions

1. Signs and symptoms include chest pain, congestive heart failure, syncope, shock, symptoms similar to a patient's previous MI
2. Assess the patient's cardiac rhythm - treat pulseless rhythms, tachycardia, or symptomatic bradycardia [see Cardiovascular and Resuscitation guidelines]
3. If the patient is dyspneic, hypoxemic, or has obvious signs of heart failure, EMS providers should administer oxygen as appropriate with a target of achieving 94-98% saturation [see Universal Care guideline]
4. The 12-lead EKG is the primary diagnostic tool that identifies a STEMI; It is imperative that EMS providers 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 providers with or without the assistance of computer-interpretation
    b. Advance notification should be provided to the receiving hospital for patients identified as having STEMI
    c. Performance of serial EKGs is suggested

   d. All EKGs should be made available to treating personnel at the receiving hospital, whether brought in or transmitted from the field
5. Administer aspirin; chewable, non-enteric-coated aspirin preferred (162 to 325 mg)
6. Establish IV access
7. Nitroglycerin 0.4 mg SL, can repeat q 3-5 minutes as long as SBP greater than 100 mmHg (if range not desired use q 3 minutes)
   a. The use of nitrates should be avoided in any patient who has used a phosphodiesterase inhibitor within the past 48 hours
   b. Examples are: 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. Administer nitrates with extreme caution, if at all, to patients with inferior-wall STEMI or suspected right ventricular (RV) involvement because these patients require adequate RV preload
8. Analgesia is indicated in STEMI when chest discomfort is unresponsive to nitrates; Morphine should be used with caution in unstable angina (UA)/non-STEMI due to an association with increased mortality
9. Transport and destination decisions should be based on local resources and system of care

Patient Safety Considerations

1. Observe for signs of clinical deterioration: dysrhythmias, CP, SOB, decreased LOC/syncope, or other signs of shock/hypotension
2. Perform serial 12-lead EKGs (especially any time clinical changes noted)

Notes/Educational Pearls

Key Considerations

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

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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 ASA administered, or reason why not given
- The time of STEMI notification

Performance Measures

- The time of patient contact by 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 Aspirin (taken Prior To EMS Arrival, 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 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 cardiac catheterization (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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Revision Date

September 8, 2017

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 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 with either symptoms (AMS, CP, 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 —Wenckenbach/Mobitz I
        ii. Type II —Mobitz II
    c. Third-degree AV block complete block
    d. Ventricular escape rhythms
3. See additional inclusion criteria, below, for pediatric patients

Exclusion Criteria

No recommendations

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 and Hyperglycemia guidelines
    f. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue:
        i. Atropine 0.5 mg IV q 3-5 minute (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)
            a. Prepare 10 mcg/mL by adding 1 mL 0.1mg/mL Epinephrine to 9 mL normal saline, then administer 10-20 mcg boluses (1-2mL) every 2 minutes titrated MAP greater than 65mmHg

           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. <u>Pediatric Management</u>
   Treatment is only indicated for patients who are symptomatic (pale/cyanotic, diaphoretic, altered mental status, hypoxic)
    a. Initiate chest compressions for heart less than 60 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 provider 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). Prepare 10 mcg/mL by adding 1 mL 0.1mg/mL Epinephrine to 9 mL Normal Saline, then administer 0.01mg/kg (0.1ml/kg) maximum single dose 10mcg (1ml) every 3-5 minutes titrated to MAP greater than 65mmHg
        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 0.5mg (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: MI, hypoxia, pacemaker failure, hypothermia, sinus bradycardia, athletes, head injury with increased 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
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

No recommendations

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
  - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
  - *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia

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Revision Date

September 8, 2017

Implantable Ventricular Assist Devices

Aliases

Ventricular assist device (VAD), left ventricular assist device (LVAD), right ventricular assist device (RVAD), biventricular assist device (BiVAD)

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 hypoperfusing:
    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 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 in order 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 accompany them at all times 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 are 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/TIA
    c. Bleeding
    d. Arrhythmias
    e. Cardiac tamponade
    f. CHF
    g. Aortic insufficiency

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

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

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

September 8, 2017

Tachycardia with a Pulse

Aliases

Supraventricular tachycardia (SVT), ventricular tachycardia (VT), multifocal atrial tachycardia (MAT), torsades, atrial fibrillation (A-FIB), atrial flutter

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. CHF

Patient Presentation

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

Inclusion Criteria
Heart rate 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 and symptoms or hemodynamic instability continue:
        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, recommend initial dose of diltiazem 10 mg IV and a second dose of 20mg. For patients 65 and under, recommend a single dose of 20 mg
    4. Metoprolol 5 mg IV given over 1-2 minutes. May repeat as needed every 5 minutes for a total of 3 doses

ii. **Regular Narrow Complex Tachycardia – Unstable**
    1. Deliver a synchronized shock based on manufacturer's recommendations
    2. For responsive patients, consider sedation and analgesia

iii. **Irregular Narrow Complex Tachycardia – Stable** (atrial fibrillation, 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, recommend initial dose of diltiazem 10 mg IV and a second dose of 20mg. For patients 65 and under, recommend a single dose of 20 mg
    2. Metoprolol 5 mg IV given over 1-2 minutes
        May repeat as needed every 5 minutes for a total of 3 doses

iv. **Irregular Narrow Complex Tachycardia – Unstable**
    1. Deliver a synchronized shock 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
    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** (atrial fibrillation with aberrancy, pre-excited atrial fibrillation (i.e. atrial fibrillation using an accessory pathway), 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 if 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. Atrial fibrillation rarely requires cardioversion in the field. As it is difficult to ascertain onset of rhythm, risk of stroke needs to be considered prior to cardioversion
3. A wide-complex irregular rhythm should be considered pre-excited atrial fibrillation; 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 atrial fibrillation (e.g. Wolff-Parkinson-White Syndrome, Lown-Ganong-Levine Syndrome) because these drugs may cause a paradoxical increase in the ventricular response
   c. Blocking the AV node in some of these patients may lead to impulses that are transmitted exclusively down the accessory pathway, which can result in ventricular fibrillation
   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, COPD, asthma, as well as hypotension and bradycardia can occur with use of metoprolol
6. Biphasic waveforms have been proven to convert atrial fibrillation at lower energies and higher rates of success than monophasic waveforms
   a. Strategies include dose escalation (70, 120, 150, 170 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

No recommendations

Patient Safety Considerations

1. Only use one antidysrhythmic at a time
2. Patients who receive metoprolol and diltiazem are at significant risk for hypotension and bradycardia
3. If using cardioversion, consider sedation and pain control
4. With irregular wide complex tachycardia (atrial fibrillation 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)

- 9914199 – Medical-Tachycardia
- 9914151 – Medical-Ventricular Tachycardia (With Pulse)
- 9914147 – Medical-Supraventricular Tachycardia (Including Atrial Fibrillation)

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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - o *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia

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<u>Revision Date</u>

September 8, 2017

Suspected Stroke/Transient Ischemic Attack

Aliases

Cerebrovascular accident (CVA), TIA

Patient Care Goals

1. Detect neurological deficits
2. Determine eligibility for transport to a stroke center

Patient Presentation

1. Neurologic deficit such as facial droop, localized weakness, gait disturbance, slurred speech, altered mentation
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

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

Exclusion Criteria

1. If glucose less than 60 mg/dL, treat per the Hypoglycemia guideline
2. If trauma and GCS less than or equal to 13, treat per the Head Injury and General Trauma Management guidelines

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 – "You can't teach an old dog new tricks"
2. Pertinent historical data includes:
   a. History – "last known well" and source of that information
   b. Neurologic status assessment [see Appendix VII]
   c. Patient is taking warfarin or any anticoagulant medication
3. 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
    a. Treat only if glucose less than 60 mg/dL
5. Acquire 12-lead EKG, if possible
6. Hospital notification per local stroke plan

Patient Safety Considerations

1. Prevent aspiration – elevate head of stretcher 15-30 degrees if systolic BP greater than 100 mm Hg
    a. Maintain head and neck in neutral alignment, without flexing the neck
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. Destinations hospitals may include:
        i. Stroke Ready
        ii. Primary Stroke Center
        iii. Comprehensive Stroke Center
2. Do not treat hypertension
3. Place on cardiac monitor
4. 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)

- 9914145 – Medical-Stroke/TIA

Key Documentation Elements

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

Performance Measures

- Documentation of time "last seen normal"
- Use of validated stroke scare
- Blood glucose level obtained
- EMS scene time minimized (goal: less than 20 minutes)
- Hospital stroke team pre-arrival alert or activation occurred as early as possible after positive stroke assessment finding

- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *Stroke-01: Suspected stroke receiving prehospital stroke assessment.* To measure the percentage of suspected stroke patients who had a stroke assessment performed by EMS
    - *Stroke-08: Emergency Department Diagnosed Stroke Identified by Prehospital Stroke Assessment.* Measures the percentage of emergency department diagnosed stroke patients who had a positive stroke assessment by EMS
      NOTE: This measure can only be evaluated if EMS documentation can be combined with information provided by the receiving hospital

References

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Revision Date

September 8, 2017

General Medical

Abdominal Pain

Aliases

None

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 guidelines]

Patient Management

Assessment

1. Perform airway assessment and management per the Airway Management guideline
2. Obtain vital signs including pulse, respiratory rate, pulse oximetry, and blood pressure
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 abdominal pain, which may include:
    a. Ischemic, necrotic, or perforated bowel
        i. Severe tenderness
        ii. Abdominal pain with motion or "jiggling" of the abdomen
        iii. Fever
        iv. Bloody stool
        v. Nausea and vomiting
        vi. Possible absence of passage of stool or gas
        vii. Abdominal distention, with possible tympany to percussion
    b. 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. Ruptured ectopic pregnancy
        i. Vaginal bleeding
        ii. Recently diagnosed pregnancy
    d. Recent missed period/menstrual cycle in women of childbearing age

e. 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 or "jiggling" of the abdomen/pelvis
    iv. Fever
    v. Nausea, vomiting
    vi. Lack of appetite
f. Acute Cholecystitis
    i. Right upper quadrant or epigastric tenderness
    ii. Fever
    iii. Nausea and vomiting
    iv. Possible history of gallstones
g. Pyelonephritis
    i. Fever
    ii. Nausea, vomiting
    iii. Urinary frequency/urgency
    iv. Dysuria
    v. Hematuria
    vi. Back/flank pain
    vii. Costovertebral angle tenderness to percussion

6. Assess for signs of shock
    a. If shock is present, provide treatment per appropriate Shock guideline
7. Assess for other non-life-threatening causes of abdominal pain
    a. Kidney stone
        i. Unilateral flank pain
        ii. Nausea, vomiting
        iii. Possible 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
    d. Reassess vital signs and response to therapeutic interventions throughout transport

Patient Safety Considerations

None recommended

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 trauma center if aortic aneurysm 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 (character), vaginal bleeding

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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

September 8, 2017

Abuse and Maltreatment

Aliases

Maltreatment of vulnerable populations

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
2. Child Maltreatment/Abuse: Child maltreatment includes any act or series of acts of commission or omission by a parent or other caregiver that results in harm, potential for harm, or threat of harm to a child. An act of commission (child abuse) is the physical, sexual or emotional maltreatment or neglect of a child or children. An act of omission (child neglect) includes, but is not limited to, failure to provide for the child's needs (e.g. physical, emotional, medical/dental, and educational neglect) and failure to supervise (e.g. inadequate supervision or safety precautions, lack of appropriate car seat use, and exposure to violent or dangerous environments)
3. Human Trafficking: when people are abducted or coerced into service and often transported across international borders. Signs may include, but are not limited to: patient with branding/tattoos and environmental clues such as padlocks and/or doorknobs removed on interior doors, and intact windows that are boarded up

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. Get the patient out of 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

Patient Presentation

1. Clues to abuse or maltreatment can vary with age group of the patient and type of abuse
2. Not all abuse or maltreatment is physical
3. EMS role is to:
   a. Document concerns
   b. Assess potentially serious injuries
   c. Disclose concerns to appropriate authorities
   d. Initiate help to get the patient into a safe situation
   e. Not 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 BRUE guideline]

Patient Management

Assessment

1. Start with a primary survey and identify any potentially life-threatening issues
2. Document thorough secondary survey to identify clues of for potential abuse/maltreatment:
   a. Inability to communicate due to developmental age, language and/or cultural barrier
   b. Multiple bruises in various stages of healing
   c. Age- inappropriate behavior (e.g. adults who are submissive or fearful, children who act in a sexually inappropriate way)
   d. Pattern burns, bruises, or scars suggestive of specific weaponry used
   e. Evidence of medical neglect for injuries or infections
   f. Unexplained trauma to genitourinary systems or frequent infections to this system
   g. Evidence of malnourishment and/or serious dental problems
3. Assess physical issues and avoid extensive investigation of the specifics of abuse or maltreatment, but document any statements made 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, about:
   a. Caregivers impeding your ability to assess/transport patient
   b. Caregivers refusing care for the patient
4. For patients transported, report concerns to hospital and/or law enforcement personnel per mandatory reporting laws

Patient Safety Considerations

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

Notes/Educational Pearls

Key Considerations

1. 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. 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. It is very important to have a high index of suspicion for abuse in children presenting with a Brief Resolved Unexplained Event (BRUE). Of the very serious causes of BRUE, child abuse has been found in as many as 11% of cases. One retrospective review noted that a call to 911 for BRUE was associated with an almost 5 times greater odds of abusive head trauma being diagnosed as the cause of the BRUE, clearly emphasizing the high index of suspicion EMS providers must have when responding to these calls.
4. Abuse and maltreatment can happen to patients of all ages
5. Patients may be unwilling or unable to disclose abuse or maltreatment so the responsibility falls on EMS personnel to assess the situation, document appropriately, and take appropriate action to secure a safe place for the patient.
6. 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”).
7. Providers should be knowledgeable about mandatory reporting statutes in their area, especially regarding adults (domestic violence, elder abuse).

Pertinent Assessment Findings

As noted above

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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

No recommendations

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Revision Date

September 8, 2017

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, violent, or uncooperative behavior or who are a danger to self or others

Exclusion Criteria

1. Patients exhibiting agitated or violent behavior due to medical conditions including, but not limited to:
    a. Head trauma
    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 oversight
        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. <u>Adults</u>:
                a. 5 mg IV; 2-5 minute onset of action
                OR
                b. 10 mg IM; 15-30 minute onset of action
            2. <u>Pediatrics</u>:
                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. <u>Adults</u>:
                a. 2 mg IV; 2-5 minute onset of action
                OR
                b. 4 mg IM; 15-30 minute onset of action
            2. <u>Pediatrics</u>:
                a. 0.05 mg/kg IV (maximum dose is 2 mg)
                OR
                b. 0.05 mg/kg IM (maximum dose is 4 mg)
        iii. Midazolam
            1. <u>Adults</u>:
                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. <u>Pediatrics</u>:
                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. <u>Adults</u>:
                a. 2.5 mg IV; 10 minute onset of action
                OR
                b. 5 mg IM; 20 minute onset of action

2. Pediatrics: Not routinely recommended

ii. Haloperidol (Limited data available, optimal dose not established)

1. Adults:
   a. 5 mg IV; 5-10 minute onset of action
   OR
   b. 10 mg IM; 10-20 minute onset of action
2. Pediatrics: Age 6-12 yo: 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: 10 mg IM; 15-30 minute onset of action
2. Pediatrics:
   a. Age 6-11 yo: 5 mg IM *(limited data available for pediatric use)*
   b. Age 12-18 yo: 10 mg IM

iv. Ziprasidone

1. Adults: 10 mg IM; 10 minute onset of action
2. Pediatrics:
   a. Age 6-11 yo: 5 mg IM *(limited data available for pediatric use)*
   b. Age 12-18 yo: 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. 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 in order to provide the safest care for all involved. These are complex and high-risk encounters. There is no one size fits all solution for addressing these patients.

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

- 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 direct medical oversight
- 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 direct medical oversight
- Initiation and duration of engagement with law enforcement
- ***EMS Compass® Measure*** *(for additional information, see www.emscompass.org)*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms

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Revision Date

September 8, 2017

Anaphylaxis and Allergic Reaction

(Adapted from an evidence-based guideline created using the National Prehospital Evidence-Based 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
No recommendations

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 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, wheeze, stridor, hypoxemia)
            3. Persistent gastrointestinal symptoms (vomiting, abdominal pain, diarrhea)
            4. Hypotension or associated symptoms (syncope, hypotonia, 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 4**
2. If signs of anaphylaxis, administer epinephrine 1mg/mL at the following dose and route:
   a. Adult (25kg or more) 0.3 mg IM in the anterolateral thigh
   b. Pediatric (less than 25kg) 0.15 mg in the anterolateral thigh
   c. Epinephrine 1mg/mL may be administered from a vial or via auto-injector, if available
3. 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 shock
   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
4. If respiratory distress with wheezing is present, consider administering
   a. Albuterol 2.5-5 mg nebulized
      AND/OR
   b. Epinephrine 1mg/mL, 5mL nebulized
5. If stridor is present, consider administering epinephrine 1mg/mL, 5mL nebulized
6. If signs of anaphylaxis and hypoperfusion persist following the first dose of epinephrine, additional IM epinephrine can be repeated every 5-15 minutes at above noted doses
7. 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
8. 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
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. 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. When anaphylaxis is suspected, EMS personnel should always consider epinephrine as first-line treatment. Cardiovascular collapse may occur abruptly, without the prior development of skin or respiratory symptoms. Constant monitoring of the patient's airway and breathing is essential.
2. 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.

3. 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
   c. Other Considerations
      i. Angioedema (drug-induced)
      ii. Aspiration/airway obstruction
      iii. Vasovagal event
      iv. Asthma or COPD
      v. Heart failure
4. 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
5. Patients with asthma are at high risk for a severe allergic reaction
6. There is no proven benefit to using steroids in the management of allergic reactions and/or anaphylaxis
7. 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)

- 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)
- ***EMS Compass® Measure*** *(for additional information, see www.emscompass.org)*
  - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms

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Revision Date

September 8, 2017

Altered Mental Status

Aliases

Confusion, altered level of consciousness

Patient Care Goals

1. Identify treatable causes
2. Protect patient from harm

Patient Presentation

Inclusion Criteria

Impaired decision-making capacity

Exclusion Criteria

Traumatic brain injury

Patient Management

Assessment

Look for treatable causes of altered mental status:

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 shock
4. Glasgow Coma Score and/or AVPU
5. Pupils
6. Neck rigidity or pain with range of motion
7. Stroke tool
8. Blood glucose level
9. EKG - Arrhythmia limiting perfusion
10. Breath odor - Possible unusual odors include alcohol, acidosis, ammonia
11. Chest/Abdominal – Intra-thoracic hardware, assist devices, abdominal pain or distention
12. Extremities/skin – Track marks, hydration, edema, dialysis shunt, temperature to touch (or if able, use a thermometer)
13. Environment – Survey for pills, paraphernalia, ambient temperature

Treatment and Interventions

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

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
2. Age of the patient
3. Environment where patient found
4. Recent complaints (e.g. headache, chest pain, difficulty breathing, vomiting, fever)
5. Pill bottles/medications:
   a. Anticoagulants
   b. Anti-depressants
   c. Narcotic pain relievers
   d. Benzodiazepines
6. Medical alert tags and accessory medical devices
7. Evaluate for reduced PO intake and/or vomiting and/or diarrhea or dehydration as a cause of AMS in the pediatric and geriatric populations
8. Medications a child may have access to including but not limited to:
   a. Antihypertensives
   b. Oral hypoglycemic
   c. Opioids
   d. Benzodiazepines
   e. Antiepileptics

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914113 – Medical-Altered Mental Status

Key Documentation Elements

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

Performance Measure

- Hypoglycemia considered and treated appropriately
  - Blood glucose level obtained.
  - ***EMS Compass® Measure*** *(for additional information, see www.emscompass.org)*
    - *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their 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

References

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Revision Date

September 8, 2017

Back Pain

Aliases

None

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 or when pain was due to non-acute trauma (e.g. chronic pain conditions)

Exclusion Criteria

1. Back pain from spinal trauma [see Trauma guidelines]
2. Back pain due to sickle cell pain crisis [see Sickle Cell Pain Crisis guideline]
3. Back pain from suspected labor [see OB/GYN guidelines]

Patient Management

Assessment

1. Perform airway assessment and management, per the Airway Management guideline
2. Obtain vital signs including pulse, respiratory rate, pulse oximetry, and blood pressure
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 abdominal 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

No recommendations

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 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

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)

- 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 recommended

Revision Date

September 8, 2017

End-of-Life Care/Palliative 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

Patient enrolled in hospice or palliative 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. If the patient is able to communicate and has the capacity to make decisions regarding treatment and transport, consult directly with the patient before treatment and/or transport
3. 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. Advanced care directives
   b. MOLST/POLST or similar forms
   c. Guardian, power of attorney, or other accepted healthcare proxy
4. If the patient requires pain relief [see Pain Management guideline]
5. If the adult patient is experiencing severe respiratory distress, consider:
   a. Midazolam 2 to 5 mg IV
      OR
   b. Fentanyl 25 mcg mixed in 2 mL saline nebulized or other analgesics
6. If the patient has nausea [see Nausea and Vomiting guideline]
7. If the patient has excessive secretions, provide suctioning
8. If the adult patient is anxious, consider:
   a. Benzodiazepines
      OR
   b. Haldol 5 mg IV
      OR
   c. Geodon 20 mg IM

9. If the patient appears dehydrated
    a. Encourage PO fluid intake if patient is able to swallow
    b. If available, offer ice chips and swabs soaked in ice water
    c. Consider administration of normal saline at 10 to 20 mL/kg IV
10. In collaboration with hospice or palliative care provider, 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 palliative 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)

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

Key Documentation Elements

- Interaction with hospice or palliative care provider
- Confirmation of advanced directive or other advanced care documentation
- Pain score if applicable

Performance Measures

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

References

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Revision Date

September 8, 2017

Hyperglycemia

Aliases
Diabetic ketoacidosis (DKA), hyperosmolar hyperglycemic state, hyperosmolar non-ketotic coma, diabetes

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 mucus membranes or tongue bite from seizure
   d. Neurologic:
      i. Assess 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 peaked T waves or other findings consistent with hyperkalemia

Treatment and Interventions

1. If altered level of consciousness, stroke, or sepsis/septic shock, treat per Altered Mental Status, Suspected Stroke/Transient Ischemic Attack**,** or Shock guidelines accordingly
2. 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

3. If findings of hyperkalemia, administer sodium bicarbonate 1 mEq /kg (max dose of 50 mEq) IV bolus over 5 minutes and consider albuterol 5.0 mg via small volume nebulizer
4. 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 1 L bolus IV; reassess and rebolus 1L if indicated
      ii. Pediatric: Normal saline 10 mL/kg bolus IV, reassess, and repeat up to 40 mL/kg total
5. Reassess patient
   a. Reassess vital signs, 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
   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 can harm patients

Notes/Educational Pearls

Key Considerations

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

Pertinent Assessment Findings

1. Concomitant trauma
2. Abdominal pain, "fruity breath," and rapid-deep respirations (Kussmaul's respiration) may be associated with diabetic ketoacidosis

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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
- ***EMS Compass® Measure*** *(for additional information, see www.emscompass.org)*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms

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Revision date

September 8, 2017

Hypoglycemia

Aliases

Diabetic coma, insulin shock

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. Adult or pediatric patient with blood glucose less than 60 mg/dL with symptoms of hypoglycemia
2. Adult or pediatric patient with altered level of consciousness [see Altered Mental Status guideline]
3. Adult or pediatric patient with stroke symptoms (e.g. hemiparesis, dysarthria) [see Suspected Stroke/Transient Ischemic Attack guideline]
4. Adult or pediatric patient with seizure [see Seizures guideline]
5. Adult or pediatric patient with history of diabetes and other medical symptoms
6. Pediatric patient with suspected alcohol ingestion
7. Adult patient who appears to be intoxicated

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. 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 mucus 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 or Suspected Stroke/Transient Ischemic Attack guidelines 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
        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
            b. 4 – 8 mL/kg of 12.5% dextrose
            c. 5 – 10 mL/kg of 10% dextrose
    ii. Glucagon IM/IN
        1. Adult dosing: 1 mg IM/IN
        2. Pediatric dosing:
            a. 1 mg IM/IN if ≥ 20 kg (or ≥ 5 yo)
            b. 0.5 mg IM/IN if less than 20 kg (or less than 5 yo)
    iii. Remove or disable insulin pump if above treatments cannot be completed
c. For patients with an insulin pump who are hypoglycemic with associated altered mental status (GCS <15):
    i. Stop the pump, disconnect or remove at insertion site if patient cannot ingest oral glucose or ALS is not available
    ii. Leave the pump connected and running if able to ingest oral glucose or receive ALS interventions

3. Reassess patient
    a. Reassess vital signs 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 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
4. Disposition
    a. If hypoglycemia with continued symptoms, transport to closest appropriate receiving facility
    b. Hypoglycemic patients who have had a seizure should be transported to the hospital regardless of their mental status and response to therapy
    c. If symptoms of hypoglycemia resolve after treatment, release without transport should only be considered if **all** of the following are true:
        i. Repeat glucose is greater than 80 mg/dL
        ii. Patient takes insulin or metformin to control diabetes
        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 providers agree transport not indicated

vi. A reliable adult will be staying with patient
vii. No major co-morbid symptoms exist, like chest pain, shortness of breath, seizures, intoxication
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
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 yo, 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 hours. 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:
[50] [____ % concentration of glucose] = ____ mL/kg

For example:

Desired Dose	Fluid type	mL of fluid
0.5g/kg	25% dextrose	2mL/kg
	12.5% dextrose	4mL/kg
	10% dextrose	5mL/kg
1g/kg	25% dextrose	4mL/kg
	12.5% dextrose	8mL/kg
	10% dextrose	10mL/kg

Key Considerations

1. Consider contribution of oral diabetic medications to hypoglycemia
2. If possible, have family/patient turn off insulin pumps
3. Consider potential for intentional overdose of hypoglycemic agents
4. 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)

- 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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - o *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia

References

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Revision Date

September 8, 2017

Nausea-Vomiting

Aliases

Gastroenteritis, emesis

Patient Care Goals

Decrease discomfort secondary to nausea and vomiting

Patient Presentation

Inclusion Criteria
Currently nauseated and/or vomiting

Exclusion Criteria
No recommendations

Patient Management

Assessment

1. Routine patient care (vital signs)
2. History and physical examination focused on potential causes of nausea and vomiting (e.g. gastrointestinal, cardiovascular, gynecologic, hypoglycemia, hyperglycemia)

Treatment and Interventions

1. Anti-emetic medication administration (optional, if available; any that can be given IV can be given IO):
    a. Ondansetron (contraindicated for suspected or known diagnosis of prolonged QT syndrome)
        1. Adult:
            1. 4mg IV/PO/SL
               OR
            2. 4 mg SL of the ODT formulation
        ii. Pediatric (6 months old –14 yo): 0.15 mg/kg IV/PO (maximum dose of 4 mg)
    b. Metoclopramide
        i. Adult: 10 mg IV/IM
        ii. Pediatric (over 2 yo only and greater than 12kg):
            1. 0.1 mg/kg IM
               OR
            2. IV (maximum 10 mg)
                a. May repeat x 1 in 20 -30 minutes if no relief
    c. Prochlorperazine
        i. Adult: 5 mg IV/IM
        ii. Pediatric (over 2 yo only and greater than 12kg):
            1. 0.1 mg/kg slow IV
               OR
            2. Deep IM (maximum 10 mg)
    d. Diphenhydramine
        i. Adult: 12.5-25mg IV/IM/PO
        ii. Pediatric (over 2 yo only and greater than 12kg): 0.1 mg/kg IV (maximum 25 mg)

e. Isopropyl alcohol – Allow patient to inhale vapor from isopropyl alcohol wipe 3 times every 15 minutes as tolerated
2. If signs of hypovolemia, administer Normal Saline
   a. Adult: 500 mL IV/IO unless contraindicated (e.g. h/o CHF, renal failure)
   b. Pediatric: Consider 10-20 mL/kg IV fluid unless contraindicated (e.g. by potential fluid overload)
   c. May repeat as indicated

Patient Safety Considerations

1. For very young pediatric patients, Ondansetron can be sedating
2. Dystonic and extrapyramidal symptoms are possible side effects of antiemetics – If encountered, consider diphenhydramine:
   a. Adult: 25-50mg IV/IM/PO
   b. Pediatric: 1 mg/kg IV/IM/PO (maximum dose 50mg)

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 children under 2 yo
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, it remains a treatment option for hyperemesis gravidum in pregnant patient

Pertinent Assessment Findings

1. Vital signs
2. Risk factors for heart disease/EKG if applicable
3. Pregnancy status
4. Abdominal exam

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914131 – Medical-Nausea/Vomiting

Key Documentation Elements

- Patient age
- Patient weight and/or length-based weight measure for pediatric patients
- Medications given, including time, provider level, dose, dose units, route, response and complications

- Vital signs before and after medication administration
- History and physical with regard to etiology of nausea/vomiting
- 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 Compass® Measure*** *(for additional information, see www.emscompass.org)*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms

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Revision Date

September 8, 2017

Pain Management

(Incorporates elements of an evidence-based guideline for prehospital analgesia in trauma created using the National Prehospital Evidence-Based Guideline Model Process)

Aliases

Analgesia, pain control, acute pain, acute traumatic pain, acute atraumatic pain

Patient Care Goals

The practice of prehospital emergency medicine requires expertise in a wide variety of pharmacological and non-pharmacological techniques to treat acute pain resulting from myriad injuries and illnesses. Approaches to pain relief must be designed to be safe and effective in the dynamic prehospital environment. The degree of pain and the hemodynamic status of the patient will determine the urgency and extent of analgesic interventions.

Patient Presentation

Inclusion Criteria
Patients who are experiencing pain

Exclusion Criteria
1. Pregnancy with active labor
2. Dental pain
3. Patients with care-plans that prohibit use of parenteral analgesics by EMS
4. Patients with chronic pain who aren't part of a hospice/palliative care plan

Patient Management

Assessment, Treatment, and Interventions
1. Determine patient's pain score assessment using standard pain scale.
    a. Less than 4 yo: Observational scale (e.g. Faces, Legs, Arms, Cry, Consolablity [FLACC] or Children's Hospital of Eastern Ontario Pain Scale (CHEOPS)
    b. 4-12 yo: Self-report scale (e.g. Wong Baker Faces, Faces Pain Scale [FPS], Faces Pain Scale Revised [FPS-R])
    c. Greater than 12 yo: Self-report scale (Numeric Rating Scale [NRS])
2. Place patient on cardiac monitor per patient assessment
3. If available, consider use of non-pharmaceutical pain management techniques
    a. Placement of the patient in a position of comfort
    b. Application of ice packs and/or splints for pain secondary to trauma
    c. Verbal reassurance to control anxiety
4. If not improved and patient is experiencing moderate discomfort consider use of analgesics as available and as permitted by direct medical oversight
    a. Acetaminophen 15 mg/kg PO (maximum dose 1 g)
    b. Ibuprofen 10 mg/kg PO for patients greater than 6 months of age (maximum dose 800 mg)
    c. Fentanyl 1 mcg/kg IN or IM (maximum initial dose of 100 mcg)
    d. Ketorolac (one-time dose only):
        i. Adult: 30 mg IM in adults who are not pregnant

        ii. Pediatric: (2-16 yo) 1mg/kg IM (maximum dose 30 mg)
        iii. Geriatric: 1mg/kg IM (maximum dose 30 mg)
    e. Morphine sulfate: 0.1 mg/kg IM (maximum initial dose 15 mg)
    f. Ketamine: 0.5mg/kg IN (maximum initial dose 25mg; maximum cumulative dose of 100mg)
    g. Nitrous Oxide
5. Establish IV of normal saline per patient assessment
6. If the patient is experiencing severe to excruciating pain, administer analgesics
    a. Ketorolac (one-time dose only):
        i. Adult: 15 mg IV in adults who are not pregnant
        ii. Pediatric: (2-16 yo) 0.5mg/kg (maximum dose 15 mg)
    b. Morphine sulfate: 0.1 mg/kg IV or IO (maximum initial dose 10 mg)
    c. Fentanyl: 1 mcg/kg IV or IO (maximum initial dose 100 mcg)
    d. Hydromorphone: 0.015mg/kg IM, IV, or IO (maximum initial dose 2 mg; maximum cumulative dose of 4 mg)
    e. Ketamine: 0.25mg/kg IM, IV, IO (maximum initial dose 25mg; maximum cumulative dose 100mg)
7. Consider administration of oral, sublingual, or IV antiemetics to prevent nausea in high risk patients [see Nausea/Vomiting guideline]
8. If indicated based on pain assessment, and vital signs allow, repeat pain medication administration (excluding ketorolac) after 5 minutes of the previous dose
9. Transport in position of comfort and reassess as indicated

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% $\downarrow SpO_2$ mild asynchrony with ventilator	RR > 20 above baseline, or 10% $\downarrow SpO_2$ 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.

From: 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. Available at: http://www.aacn.org /AACN/NTIPoster.nsf/vwdoc/2004NTI Posters. Accessed July 18, 2017.

Universal Pain Assessment Tool

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
Wong-Baker FACES®						
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

Faces, Legs, Activity, Cry, Consolability (FLACC) Behavioral Scale

Appropriate age for use (per guideline): less than 4 years

Categories	Scoring		
	0	**1**	**2**
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.			

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.

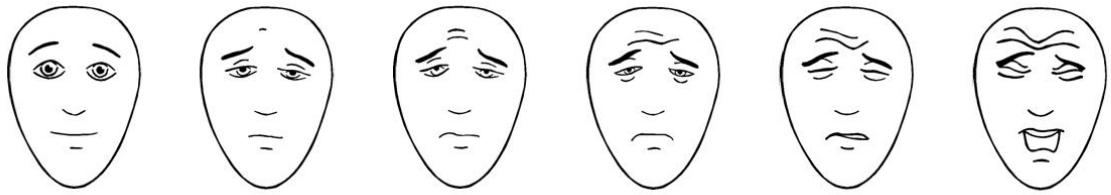
Each category is scored on a 0-2 scale, which results in a total score of 0-10

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.

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.

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 GCS less than 15, hypotension, identified medication allergy, hypoxia (oxygen saturation less than 90%) after maximal supplemental oxygen therapy, or signs of hypoventilation
3. Opioids are contraindicated for patients who have taken monoamine oxidase inhibitors (MAOIs – e.g. Nardil®, Parnate®, Azilect®, Marplan®, Eldepryl®) during the previous 14 days
4. Avoid non-steroidal anti-inflammatory medications such as 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. Pain severity (0 - 10) should be recorded before and after analgesic medication administration and upon arrival at destination
2. Patients with acute abdominal pain should receive analgesic interventions – Use of analgesics for acute abdominal pain does not mask clinical findings or delay diagnosis
3. Opiates may cause a rise in intracranial pressure

Pertinent Assessment Findings

1. Mental status (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)

- 9914071 – General-Pain Control

Key Documentation Elements

- Documentation of patient vital signs 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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - o *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - o *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain

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Revision Date

September 8, 2017

Seizures

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

Aliases

Status epilepticus, febrile seizure, convulsions, eclampsia

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

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. Air entry/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 ventilation if oxygenation/ventilation are compromised
4. Assess perfusion
5. Assess neurologic status
6. Routes for treatment
    a. IN/IM routes are preferred over rectal (PR), IV, or IO routes, if within the provider's scope of practice
        i. If none of these routes (IN/IM/IV/IO) of medication administration are in provider's scope of practice, diazepam 0.2 mg/kg PR (maximum dose 10 mg) is an acceptable route of administration
    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: midazolam 0.2 mg/kg (maximum dose 10 mg), IM preferred, or IN
    b. If vascular access (IV or IO) is present:
        i. Diazepam 0.1mg/kg IV or IO, maximum 4mg
        ii. Lorazepam 0.1mg/kg IV or IO, maximum 4mg
        iii. Midazolam 0.1mg/kg IV or IO, maximum 4mg
7. Glucometry
    a. If still actively seizing, check blood glucose level
    b. If less than 60 mg/dL, treat per the Hypoglycemia guideline
8. Consider magnesium sulfate in the presence of seizure in the third trimester of pregnancy or post-partum [see the Eclampsia/Pre-eclampsia guideline]
9. For febrile seizures, consider the following interventions after stopping the seizure, since the following interventions provide symptomatic relief for fevers but do not stop the seizure:
    a. Acetaminophen 15 mg/kg, maximum dose 650 mg, PR/IV/IO (if unable to swallow) or PO (if able to swallow)
    AND/OR
    b. 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
    c. Removing excessive layers of clothing
    AND/OR
    d. Applying cool compresses to the body
10. 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 direct medical oversight, 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 direct medical oversight if patient has received two doses of benzodiazepines by bystanders and/or prehospital providers

2. Hypoglycemic patients who are treated in the field for seizure should be transported to hospital, regardless of whether or not they return to baseline mental status after treatment

Notes/Educational Pearls

Key Considerations

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

- 9914141 – Medical- Seizure

Key Documentation Elements

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

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

September 8, 2017

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 in order to promptly initiate additional therapy

Patient Presentation

Inclusion Criteria

1. Signs of poor perfusion (due to a medical cause) such as one or more of the following:
    a. Altered mental status
    b. Delayed/flash capillary refill
    c. Hypoxia (pulse oximetry $less\ than$ 94%)
    d. Decreased urine output
    e. Respiratory rate greater than 20 in adults or elevated in children (see normal vital signs table)
    f. Hypotension for age (lowest acceptable systolic blood pressure in mm Hg):
        i. Less than 1 yo: 60
        ii. 1-10 yo: (age in years) (2)+70
        iii. Greater than 10 yo: 90
    g. Tachycardia 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. Hypovolemia (poor fluid intake, excessive fluid loss (e.g. bleeding, SIADH, hyperglycemia excessive diuretics, vomiting, diarrhea)
    b. Sepsis
        i. Temperature instability:
            1. Less than 36°C or 96.8°F
            2. Greater than 38.5°C or 101.3°F
            and/or
            3. Tachycardia, warm skin, tachypnea
    c. Anaphylaxis (urticaria, nausea/vomiting, facial edema, wheezing)
    d. Signs of heart failure (hepatomegaly, rales on pulmonary exam, extremity edema, JVD)

Exclusion Criteria

Shock due to suspected trauma [see Trauma section guidelines]

Patient Management

Assessment

1. History
   a. History of GI bleeding
   b. Cardiac problems
   c. Stroke
   d. Fever
   e. Nausea/vomiting, diarrhea
   f. Frequent or no urination
   g. Syncopal episode
   h. Allergic reaction
   i. Immunocompromise (malignancy, transplant, asplenia)
   j. Adrenal insufficiency
   k. Presence of a central line or port
   l. Other risk of infection (spina bifida or other genitourinary anatomic abnormality)
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 2.0 mmol/L is abnormal)
8. Establish IV access - if unable to obtain within 2 attempts or less than 90 seconds, place an IO needle
9. 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 (preferred for pediatric patients) - may repeat up to 3 times based on patient's condition and clinical impression
10. If there is a history of adrenal insufficiency or long-term steroid dependence, give:
    a. Hydrocortisone succinate, 2 mg/kg (maximum 100 mg) IV/IM (preferred)
    OR
    b. Methylprednisolone 2 mg/kg IV (maximum 125 mg)

11. Vasopressors (shock unresponsive to IV fluids)
    a. Cardiogenic shock, hypovolemic shock, obstructive shock:
        i. Norepinephrine - there is recent evidence that supports the use of norepinephrine as the preferred intervention. Although dopamine is often recommended for the treatment of symptomatic bradycardia, recent research indicates that patients in cardiogenic or septic shock treated with norepinephrine have a lower mortality rate compared to those treated with dopamine (initial norepinephrine dose: 0.05 – 0.5 mcg/minute titrated to effect)
        ii. Give epinephrine, 0.05-0.3 mcg/kg/minute
        iii. Give dopamine, 2-20 mcg/kg/minute
    b. Distributive shock (with the exception of anaphylactic shock):
12. Give norepinephrine, 0.05-0.5 mcg/kg/minute
13. Norepinephrine is the first-line drug of choice for neurogenic shock
14. For anaphylactic shock, treat per the Anaphylaxis and Allergic Reaction guideline
15. Provide advanced notification to the hospital
16. Consider empiric antibiotics for suspected septic shock if transport time is anticipated to be greater than 1 hour, if blood cultures can be obtained in advance, and/or EMS has coordinated with regional receiving hospitals about choice of antibiotic therapy
17. Antipyretics for fever
    a. Acetaminophen (15 mg/kg; maximum dose of 1000 mg)
    b. Ibuprofen (10 mg/kg; maximum dose of 800 mg)

Patient Safety Considerations

1. Recognition of cardiogenic shock - if patient condition deteriorates after fluid administration, rales or hepatomegaly develop, then consider cardiogenic shock and holding further fluid administration

Notes/Educational Pearls

Key Considerations

1. Early, aggressive IV fluid administration is essential in the treatment of suspected shock
2. Patients predisposed to shock:
    a. 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
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 ($less\ than$ 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)

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

Key Documentation Elements

- Medications administered
- Full vital signs with reassessment every 15 minutes or as appropriate
- Lactate level (if available)
- Neurologic status assessment [see Appendix VII]
- Amount of fluids given

Performance Measures

- Percentage of patients who have full vital signs (HR, RR, BP, T, O2) 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

September 8, 2017

Sickle Cell Pain Crisis

Aliases

None

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

1. Patient with known sickle cell disease experiencing a pain crisis

Exclusion Criteria

1. Pain due to acute traumatic injury [see Trauma section guidelines]
2. Abdominal pain due to or related to pregnancy [see OB/GYN section guidelines]
3. Patients with sickle cell trait

Patient Management

Assessment

1. Perform airway assessment and management per the Airway Management guideline
2. Obtain vital signs including pulse, respiratory rate, pulse oximetry, and blood pressure
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
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
   c. Start an IV and provide saline 10ml/kg normal saline bolus (up to 1L)
   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 recommended

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 a number of 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)

- 9914165 – Other (as of 3/1/2017, no specific NEMSIS protocol exists)

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

1. Mitchell BL. Sickle cell trait and sudden death – bringing it home. *J Natl Med Assoc.* 2007;99(3):300-5.

Revision Date

September 8, 2017

Resuscitation

Cardiac Arrest (VF/VT/Asystole/PEA)

Aliases

Heart attack, arrest, full arrest

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 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 providers, immediately proceed with rhythm analysis and defibrillation, if appropriate
   b. It is realistic for EMS providers to tailor the sequence of rescue actions to 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 unmonitored 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 360 J (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
6. Continue the cycle of chest compressions for 2 minutes, followed by rhythm analysis and defibrillation of shockable rhythms; during this period of time, the proper strategy of airway management is currently not defined and many options for airway management exist – Regardless of the airway management 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; 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 (as below).
      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)
    c. **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
    b. There is inadequate evidence to support the routine use of lidocaine and beta blockers <u>after</u> 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 (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 (for **pediatrics** the dose is 100 mg/kg) OR
        ii. Calcium chloride 10% 10ml IV (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 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 provider safety concern
2. In addition, manual chest compressions during patient movement are less effective in regards 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 (6cm) 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 provider 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 CO_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 guidelines
4. Chest compressions are usually the most rapidly applied therapy for the patient in cardiac arrest and should be applied as soon as the patient is noted to be pulseless. If the patient is being monitored with pads in place at the time of arrest, immediate defibrillation should take precedence over all other therapies, however, if there is any delay in defibrillation (for instance, in order to place pads), chest compressions should be initiated while the defibrillator is being applied. There is no guidance on how long these initial compressions should be applied; however, it is reasonable to either complete 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. Effectiveness of chest compressions decreases with any movements
    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 providers, 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 providers 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 (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 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 in order 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 in an effort to displace the gravid uterus and increase venous return by avoiding aorto-caval compression
        iii. If manual displacement is unsuccessful, the patient may be placed in the left lateral tilt position at 30°. This position is less desirable than the manual uterine displacement as chest compressions are more difficult to perform in this position
        iv. Chest compressions should be performed slightly higher on the sternum than in the non-pregnant patient to account for elevation of the diaphragm and abdominal contents in the obviously gravid patient
        v. Defibrillation should be performed as in non-pregnant patients
    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 <u>not</u> indicated for these patients.
14. Application of the "pit crew" model of resuscitation
    a. Ideally, providers in each EMS agency will use a "pit crew" approach when using this protocol to ensure the most effective and efficient cardiac arrest care. Training should include teamwork simulations integrating first responders, BLS, and ALS crewmembers 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 provider assumes code leader position overseeing the entire response
        vii. Use a CPR checklist to ensure that all best practices are followed during CPR
    b. For efficient "pit crew" style care, the EMS agency medical director should establish the options that will be used by providers functioning within the EMS agency. Options include establishing:
        i. The airway/ventilation management, if any, that will be used
        ii. The initial route of vascular access

15. The EMS agency must perform a 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)

- 9914011 – Cardiac Arrest-Asystole
- 99014013 – 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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Revision Date

September 8, 2017

Adult Post-ROSC (Return of Spontaneous Circulation) Care

Aliases

None noted

Patient Care Goals

Out-of-hospital cardiac arrest in the U.S. has a mortality rate greater than 90% and results in excess of 300,000 deaths per year. Many of those who do survive suffer significant neurologic morbidity. Current research has demonstrated that care of patients with return of spontaneous circulation (ROSC) at specialized centers is associated with both decreased mortality and improved neurologic outcomes.

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

Patient Presentation

Inclusion Criteria
Patient returned to spontaneous circulation following cardiac arrest resuscitation

Exclusion Criteria
None recommended

Patient Management

Assessment, Treatment, and Interventions

1. Perform general patient management
2. Support life-threatening problems associated with airway, breathing, and circulation. Monitor closely for reoccurrence of cardiac arrest
3. Administer oxygen as appropriate with a target of achieving 94-98% saturation. Do not hyperoxygenate
4. Do not hyperventilate. Maintain a ventilation rate of 6-8 per minute and $ETCO_2$ of 30-40 mmHg
5. For hypotension (SBP less than 90 mmHg or MAP less than 65) [see Shock guideline]
6. Perform 12-lead EKG
7. Check blood glucose
   a. If hypoglycemic, treat per Hypoglycemia guideline
   b. If hyperglycemic, notify hospital on arrival
8. If patient seizes, treat per Seizures guideline
9. Post-cardiac arrest patients with evidence or interpretation consistent with ST elevation myocardial infarction (STEMI/Acute MI) should may be transported to any hospitals which offer percutaneous coronary intervention in their cardiac catheterization laboratory
10. Consider transport patients to facility which offers specialized post-resuscitative care
11. Do not allow patient to become hyperthermic

Patient Safety Considerations

1. Avoid hyperthermia
2. Prehospital initiation of therapeutic hypothermia 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
2. Most patients immediately post resuscitation will require ventilatory assistance
3. The condition of post-resuscitation patients fluctuates rapidly and continuously, and they require close monitoring. A significant percentage of post-OSC patients will re-arrest
4. A moderate number of post-ROSC patients may have evidence of ST elevation MI on EKG
5. Common causes of post-resuscitation hypotension include hyperventilation, hypovolemia, and pneumothorax

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914019 – Cardiac Arrest-Post Resuscitation Care

Key Documentation Elements

- Immediate post-arrest rhythms, vital signs, oxygen saturation, neurologic status assessment
- 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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Revision Date

September 8, 2017

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 inhuman 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

    a. A valid DNR order (form, card, bracelet) or other actionable medical order (e.g. POLST/ MOLST form) present, when 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 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 may be discontinued and direct medical oversight 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 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 obtain direct medical oversight
    c. If there is documentation of a Do Not Intubate (DNI/MOLST/POLST) advanced directive, the patient should receive full treatment per protocols with the exception of any intervention specifically prohibited in the patient's advanced directive
    d. If for any reason an intervention that is prohibited by an advanced directive is being considered, direct medical oversight should be obtained

Patient Safety Considerations

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

Notes/Educational Pearls

Key Considerations

1. For scene safety and/or family wishes, provider 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

No recommendations

Quality improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

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

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 direct medical oversight

- Time of death determination
- Names/contact information for significant bystanders

Performance Measures

None recommended

References

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Revision Date

September 8, 2017

Do Not Resuscitate Status/Advance Directives/Healthcare Power of Attorney (POA) Status

Aliases

DNR, comfort care

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 provider 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 of 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 of the following criteria:
    a. Conforms to the state specifications for color and construction
    b. Is intact: it has not been cut, broken or shows signs of being repaired
    c. Displays the patient’s name and the physician’s name
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 pain as appropriate
2. If CPR has been initiated and a valid exclusion to resuscitation has been subsequently verified, CPR may be discontinued and direct medical oversight 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 providers 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 direct medical oversight 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, direct medical oversight should be obtained

Patient Safety Considerations

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

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 direct medical oversight procedures will be followed
4. Special Consideration: For scene safety and/or family wishes, provider may decide to implement CPR even if all the criteria for death are met

Pertinent Assessment Findings

No recommendations

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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 recommended

References

1. *'Do Not Attempt Resuscitation' in the Out-of-Hospital Setting*. American College of Emergency Physicians; October 2003. ACEP Policy Statement.
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Revision Date

September 8, 2017

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

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, direct medical oversight 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
      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. Advanced life support 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 no return of spontaneous circulation after 20 minutes in the absence of hypothermia and the $ETCO_2$ is less than 20mmHg
      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 20mmHg, age, co-morbidities, distance from, and resources available at the closest hospital. Termination before this timeframe should be done in consultation with direct medical oversight
   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 personnel involved in the patient's care agree that discontinuation of the resuscitation is appropriate
   g. Consider direct medical oversight 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 with direct medical 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 direct medical oversight before termination of resuscitative efforts

Assessment

1. Pulse
2. Respirations
3. Neurologic status assessment [see Appendix VII; purposeful movement, pupillary response]
4. Cardiac activity (including electrocardiography, cardiac auscultation and/or ultrasonography)
5. Quantitative capnography

Treatment and Interventions

1. Focus on continuous, quality CPR that is initiated as soon as possible
2. Focus attention on the family and/or bystanders. Explain the rationale for termination
3. Consider support for family members such as other family, friends, clergy, faith leaders, or chaplains
4. For patients that are less than 18 yo, consultation with direct medical oversight 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, in order to capture over 99% of potential survivors from medical cardiac arrest (especially VF and pulseless VT arrests), resuscitation should be continued for approximately 40 minutes. This does not imply, however, that all resuscitations should continue this long (e.g. asystolic rhythms)
2. In remote or wilderness situations, EMS providers should make every effort to contact direct medical oversight, but resuscitation may be terminated in the field without direct medical oversight 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 providers 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 end-tidal carbon dioxide measurements of less than 10 mmHg or falling greater than 25% despite resuscitation indicates a poor prognosis and provide additional support for termination

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914201 – Cardiac Arrest-Determination of Death/Withholding Resuscitative Efforts
- 9914169 – Cardiac Arrest-Do Not Resuscitate
- 9914171 – Cardiac Arrest-Special Resuscitation Orders
- 9914055 – General-Cardiac Arrest
- 9914087 – Injury-Cardiac Arrest

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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Revision Date

September 8, 2017

Pediatric-Specific Guidelines

Brief Resolved Unexplained Event (BRUE)

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 yo reported by a bystander as sudden, brief (less than 1 min), completely resolved upon EMS arrival that includes one or more of the following:
   a. Absent, decreased, or irregular breathing
   b. Color change (central cyanosis or pallor)
   c. Marked change in muscle tone (hyper- or hypotonia)
   d. Altered level of responsiveness

Exclusion Criteria

1. Any of the following present upon EMS evaluation:
   a. Abnormal vitals signs for age (including fever)
   b. Vomiting
   c. Signs of trauma
   d. Noisy breathing
2. Identifiable cause for the event, which may include:
   a. Gastric reflux (spitting up)
   b. Swallowing dysfunction
   c. Nasal congestion
   d. Periodic breathing of the newborn
   e. Breath-holding spell
   f. Change in tone associated with choking, gagging, crying, feeding
   g. Seizure (eye deviation, nystagmus, tonic-clonic activity)
3. History or exam concerning for child abuse or neglect
4. Color change that involved only redness (e.g. in the face) or isolated perioral or hand/feet cyanosis

Patient Management

Assessment

1. History
    a. History of circumstances and symptoms before, during, and after the event, including duration, interventions done, and patient color, tone, breathing, feeding, position, location, activity, level of consciousness
    b. Other concurrent symptoms (fever, congestion, cough, rhinorrhea, vomiting, diarrhea, rash, labored breathing, fussy, less active, poor sleep, poor feeding)
    c. Prior history of BRUE
    d. Past medical history (prematurity, prenatal/birth complications, gastric reflux, congenital heart disease, developmental delay, airway abnormalities, breathing problems, prior hospitalizations, surgeries, or injuries)
    e. Family history of sudden unexplained death or cardiac arrhythmia in other children or young adults
    f. Social history: who lives at home, recent household stressors, exposure to toxins/drugs, sick contacts)
    g. Considerations for possible child abuse (multiple/changing versions of the story; reported mechanism of injury does not seem plausible, especially for child's developmental stage)
2. Exam
    a. Full set of vital signs (per Universal Care guideline, includes: T, P, RR, BP, O_2 sat)
    b. General assessment:
        i. Signs of respiratory distress (grunting, nasal flaring, retracting)
        ii. Color (pallor, cyanosis, normal)
        iii. Mental status (alert, tired, lethargic, unresponsive, irritability)
    a. Head to toe exam, including:
        i. Physical exam for signs of trauma or neglect
        ii. Pupillary response

Treatment and Interventions

1. Monitoring
    a. Cardiac monitor
    b. Continuous pulse oximetry
    c. Check blood glucose
    d. Serial observations during transport for change in condition
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 the nose and/or mouth (via bulb, suction catheter) if excessive secretions are present
3. Utility of IV placement and fluids
    a. Routine IVs should not be placed on all BRUE patients
    b. IVs should only be placed in children for clinical concerns of shock, or when administering IV medications

Patient Safety Considerations

1. Regardless of patient appearance, all patients with a history of signs or symptoms of BRUE should be transported for further evaluation
2. Destination considerations
   a. Consider transport to a facility with pediatric critical care capability for patients with high risk criteria present:
      i. Less than 2 months of age
      ii. History of prematurity (less than or equal to 32 weeks gestation or corrected gestational age less than or equal to 45 weeks)
      iii. More than 1 BRUE, now or in the past
   b. All patients should be transported to facilities with baseline readiness to care for children

Notes/Educational Pearls

Key Considerations

1. BRUE is a group of symptoms, not a disease process
2. High risk BRUE patients may require ED or hospital intervention
3. All patients should be transported to an ED
4. Contact direct medical oversight if parent/guardian is refusing medical care and/or transport, especially if any high-risk criteria are present (see above)

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914197 – Medical- Apparent Life Threatening Event (ALTE)
  - ***NOTE:*** BRUE is the updated term replacing ALTE and NEMSIS will not be able to change the label for this code until at least mid-2018. Most ePCR software systems allow changing the displayed label for a value and local system swill be able to do this. The background NEMSIS code will remain the same however, regardless of whether the guideline is called ALTE or BRUE.

Key Documentation Elements

- Document key aspect of history
  - Color change
  - Apnea
  - Change in muscle tone
  - Caregiver resuscitation efforts
  - History of prematurity
  - Prior BRUE events
  - Past medical history
- Document key aspects of the exam to assess for a change after each intervention:
  - Full set of vitals signs (T, RR, BP, P, O_2 sat)
  - Respiratory effort
  - Mental status
  - Color
  - Presence of signs of trauma or neglect

Performance Measures

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

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Revision Date

September 8, 2017

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 yo typically with diffuse rhonchi or an otherwise 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. Treatments given
    f. Number of emergency department visits in the past year
    g. Number of admissions in the past year
    h. Number of ICU admissions ever
    i. History of prematurity
    j. Family history of asthma, eczema, or allergies
2. Exam
    a. Full set of vital signs (T, BP, RR, P, 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, stridor)

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, mucus membranes moist vs. tacky, fontanel flat vs. sunken)

Treatment and Interventions

1. Pulse oximetry and end-tidal CO_2 ($ETCO_2$) 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, in order to maintain normal oxygenation
    b. Suction the nose and/or mouth (via bulb, Yankauer®, or suction catheter) if excessive secretions are present
4. Inhaled medications – nebulized epinephrine (3 mg in 3 mL of normal saline) should be administered to children in severe respiratory distress with bronchiolitis (e.g. coarse breath sounds) in the prehospital setting if other treatments (e.g. suctioning, oxygen) fail to result in clinical improvement
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. Steroids are generally not efficacious, and not given in the prehospital setting
7. Improvement of oxygenation and/or respiratory distress with non-invasive airway adjuncts
    a. Continuous positive airway pressure (CPAP) or high flow nasal cannula (HFNC) should be administered, when available, for severe respiratory distress
    b. Bag-valve-mask ventilation should be utilized in children with respiratory failure
8. Supraglottic devices and intubation
    a. Supraglottic devices and intubation should be utilized only if bag-valve-mask 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. Though albuterol has previously been a consideration, the most recent evidence does not demonstrate a benefit in using it for bronchiolitis
5. Ipratropium and other anticholinergic agents should not be given to children with bronchiolitis in the prehospital setting
6. Though 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 or not

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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:

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

Performance Measures

1. CPAP utilization
2. Time to administration of specified interventions in the protocol
3. Rate of administration of accepted therapy (whether or not certain medications/ interventions were given)
4. Change in vital signs (heart rate, blood pressure, temperature, respiratory rate, pulse oximeter, capnography values)
5. Time to administration of specified interventions in the protocol
6. Number of advanced airway attempts
7. Mortality

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Revision Date

September 8, 2017

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, and 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 $less\ than$ 2 yo)
    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 (T, BP, RR, P, O_2 sat)
    b. Presence of stridor at rest or when agitated
    c. Description of cough
    d. Other signs of distress (grunting, nasal flaring, retracting)
    e. Color (pallor, cyanosis, normal)
    f. Mental status (alert, tired, lethargic, unresponsive)

Treatment and Interventions

1. Monitoring
    a. Pulse oximetry and end-tidal CO_2 ($ETCO_2$) should be routinely used as an adjunct to other forms of respiratory monitoring
    b. Perform EKG only if there are no signs of clinical improvement after treating respiratory distress
2. Airway
    a. Give supplemental oxygen. Escalate from a nasal cannula to a simple face mask to a non-breather mask as needed, in order to maintain normal oxygenation
    b. Suction the nose and/or mouth (via bulb, Yankauer®, or suction catheter) if excessive secretions are present
3. Inhaled medications
    a. Epinephrine 5 mL of 1 mg/mL (5 mg) nebulized, should be administered to all children with croup in respiratory distress with signs of stridor at rest - this medication should be repeated at this dose with unlimited frequency for ongoing distress
    b. Humidified oxygen or mist therapy is **not** indicated
4. Medications – 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. Bag-valve-mask ventilation should be utilized in children with respiratory failure
7. Supraglottic devices and intubation - supraglottic devices and intubation should be utilized only if bag-valve-mask ventilation fails. The airway should be managed in the least invasive way possible

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)
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)

- 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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Revision Date

June 29, 2018

Neonatal Resuscitation

Aliases

None noted

Patient Care Goals

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

Patient Presentation

Inclusion Criteria
Newly born infants

Exclusion Criteria
Documented gestational age 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, prolapsed or nuchal cord, maternal bleeding)
    e. Estimated gestational age (may be based on last menstrual period)
2. Exam
    a. Respiratory rate and effort (strong, weak, or absent; regular or irregular)
    b. Signs of respiratory distress (grunting, nasal flaring, retractions, gasping, apnea)
    c. Heart rate (fast, slow, or absent)
        i. Precordium, umbilical stump or brachial pulse may be used
        ii. 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 (appearance, pulse, grimace, activity, respiratory 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 prolonged resuscitative efforts or if supplemental oxygen is administered - goal: oxygen saturation at 10 minutes is 85-95%

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. Warm, dry, and stimulate
    a. Wrap infant in dry towel or thermal blanket to keep infant as warm as possible during resuscitation; keep head covered if possible
    b. If strong cry, regular respiratory effort, good tone, and term gestation, infant should be placed skin-to-skin with mother and covered with dry linen
3. If weak cry, signs of respiratory distress, poor tone, or preterm gestation then position airway (sniffing position) and clear airway as needed - if thick meconium or secretions present *and* signs of respiratory distress, suction mouth then nose
4. If heart rate greater than 100 beats per minute
    a. Monitor for central cyanosis - provide blow-by oxygen as needed
    b. Monitor for signs of respiratory distress. If apneic or in significant respiratory distress:
        i. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute
        ii. Consider endotracheal intubation as per local guidelines
5. If heart rate less than 100 beats per minute
    a. Initiate bag-valve-mask ventilation with room air at 40-60 breaths per minute
        i. Primary indicator of effective ventilation is improvement in heart rate
        ii. Rates and volumes of ventilation required can be variable, only use the minimum necessary rate and volume to achieve chest rise and a change in heart rate
    b. If no improvement after 90 seconds, change oxygen delivery to 30% FiO_2 if blender available, otherwise 100% FiO_2 until heart rate normalizes
    c. Consider endotracheal intubation per local guidelines if bag-valve-mask ventilation is ineffective
6. If heart rate less than 60 beats per minute
    a. Ensure effective ventilations with supplementary oxygen and adequate chest rise
    b. If no improvement after 30 seconds, initiate chest compressions - two-thumb-encircling-hands technique is preferred
    c. Coordinate chest compressions with positive pressure ventilation (3:1 ratio, 90 compressions and 30 breaths per minute)
    d. Consider endotracheal intubation per local guidelines
    e. Administer epinephrine (0.1mg/mL) 0.01 mg/kg IV/IO (preferable if access obtained) or 0.1 mg/kg via the ETT (if unable to obtain access)
7. Consider checking a blood glucose for ongoing resuscitation, maternal history of diabetes, ill appearing or unable to feed
8. 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. Check blood glucose and follow Hypoglycemia guideline as appropriate.

2. During transport, neonate should be appropriately secured in 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
2. Deliveries complicated by maternal bleeding (placenta previa, vas previa, or placental abruption) place the infant at risk for hypovolemia secondary to blood loss
3. Low birth weight infants are at high risk for hypothermia due to heat loss
4. If pulse oximetry is used as an adjunct, the preferred placement place of the probe is the right arm, preferably wrist or medial surface of the palm. Normalization of blood oxygen levels (SaO_2 85-95%) will not be achieved until approximately 10 minutes following birth
5. Both hypoxia and excess oxygen administration can result in harm to the infant. If prolonged oxygen use is required, titrate to maintain an oxygen saturation of 85-95%
6. While not ideal, a larger facemask than indicated for patient size may be used to provide bag-valve-mask ventilation if an appropriately sized mask is not available - avoid pressure over the eyes as this may result in bradycardia
7. Increase in heart rate is the most reliable indicator of effective resuscitative efforts
8. A multiple gestation delivery may require additional resources and/or providers
9. There is no evidence to support the routine practice of administering sodium bicarbonate for the resuscitation of newborns

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)

- 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 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) providers
- ROSC 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 providers
- Number of advanced airway attempts
- Mortality

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Revision Date

September 8, 2017

OB/GYN

Childbirth

Aliases

Labor, delivery, birth

Patient Care Goals

1. Recognize imminent birth
2. Assist with uncomplicated delivery of term newborn
3. Recognize complicated delivery situations
4. Apply appropriate techniques when delivery 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 and Eclampsia/Pre-Eclampsia guidelines]

Patient Management

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

Treatment and Interventions
1. If patient in labor but no signs of impending delivery, transport to appropriate receiving facility
2. Delivery should be controlled so as to allow a slow controlled delivery of infant – This will prevent injury to mother
   a. Support the infant's head as needed
3. Check for cord 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 1-3 minutes, clamp cord about 6 inches from the abdomen with 2 clamps; cut the cord between the clamps
    a. If resuscitation is needed, clamp cord and cut as soon as possible
9. Record APGAR scores at 1 and 5 minutes
    a. 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)
10. Dry and warm infant, wrap in towel and place on maternal chest unless resuscitation needed
11. The placenta will deliver spontaneously, often within 5-15 minutes of the infant
    a. Do not force the placenta to deliver; do not pull on umbilical cord
    b. Contain all tissue in plastic bag and transport
12. After delivery, massaging the uterus and allowing the infant to nurse will promote uterine contraction and help control bleeding
    a. Estimate maternal blood loss
    b. Treat for hypovolemia as needed
13. Transport infant secured in seat or isolette unless resuscitation needed
14. Keep infant warm during transport
15. Most deliveries proceed without complications – If complications of delivery occur, the following are recommended:
    a. Shoulder dystocia – if delivery fails to progress after head delivers, quickly attempt the following
        i. Hyperflex mother's hips to severe supine knee-chest position
        ii. Apply firm suprapubic pressure to attempt to dislodge shoulder
        iii. Apply high-flow oxygen to mother
        iv. Transport as soon as possible
        v. Contact direct medical oversight and/or closest appropriate receiving facility for direct medical oversight and to prepare team
    b. Prolapsed umbilical cord
        i. Placed gloved hand into vagina and gently lift head/body off of cord
            1. Assess for pulsations in cord
            2. Maintain until relieved by hospital staff.
        i. Consider placing mother in prone knee-chest position or extreme Trendelenburg
        ii. Apply high-flow oxygen to mother
        iii. Transport as soon as possible
        iv. Contact/transport to closest appropriate receiving facility for direct medical oversight and to prepare team
    c. Breech birth
        i. Place mother supine, allow the buttocks and trunk to deliver spontaneously, then support the body while the head is delivered
        ii. If head fails to deliver, place gloved hand into vagina with fingers between infant's face and uterine wall to create an open airway

iii. Apply high-flow oxygen to mother
iv. Transport as soon as possible
v. Contact direct medical oversight and/or closest appropriate receiving facility for direct medical oversight and to prepare team
vi. The presentation of an arm or leg through the vagina is an indication for immediate transport to hospital
vii. Assess for presence of prolapsed cord and treat as above

d. Excessive bleeding during active labor may occur with placenta previa
    i. Obtain history from patient
    ii. Placenta previa may prevent delivery of infant vaginally
    iii. C-Section needed – transport urgently
e. Maternal cardiac arrest
    i. Apply manual pressure to displace uterus from right to left
    ii. Treat per the Cardiac Arrest guideline 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 at receiving facility is most successful if done within 5 minutes of maternal cardiac arrest)
    iv. Contact direct medical oversight and/or closest appropriate receiving facility for direct medical oversight and to prepare team

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 is supine position necessary
    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. Do not pull on the umbilical cord while the placenta is delivering
5. If possible, transport between deliveries if mother is expecting twins

Notes/Educational Pearls

1. OB assessment:
    a. Length of pregnancy
    b. Number of pregnancies
    c. Number of viable births
    d. Number of non-viable births
    e. Last menstrual period
    f. Due date (gestational age)
    g. Prenatal care
    h. Number of expected babies (multiple gestations)
    i. Drug use and maternal medication use
2. Notify direct medical oversight if:
    a. Prepartum hemorrhage
    b. Postpartum hemorrhage
    c. Breech presentation

    d. Limb presentation
    e. Nuchal cord (around neck)
    f. Prolapsed cord
3. Some bleeding is normal with any childbirth
    a. Large quantities of blood or free bleeding are abnormal

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)

- 9914155 – OB/GYN-Childbirth/Labor/Delivery
- 9914161 – OB/GYN-Pregnancy Related Disorders
- 9914163 – OB/GYN-Post-Partum Hemorrhage

Key Documentation Elements

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

Performance Measures

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

References

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Revision Date

September 8, 2017

Eclampsia/Pre-Eclampsia

Aliases

Pregnant seizures, toxemia of pregnancy

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

1. Female patient, more than 20-weeks gestation, presenting with hypertension and evidence of end organ dysfunction, including renal insufficiency, liver involvement, neurological, or hematological involvement
2. May occur up to 4-weeks post-partum but is rare after 48 hours post-delivery.
3. Severe features of pre-eclampsia include:
    a. Severe hypertension (SBP $greater\ than$ 160, DBP $greater\ than$ 110)
    b. Headache
    c. Mental confusion
    d. Vision changes
    e. Right upper quadrant or epigastric pain
    f. Pulmonary edema
4. Eclampsia
    a. Pre-eclampsia symptoms plus seizures
5. Eclampsia/pre-eclampsia associated with abruptio placenta and fetal loss

Exclusion Criteria

Chronic hypertension without end organ dysfunction.

Patient Management

Assessment

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

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. Labetalol 20mg IV over 2 min
      i. May repeat every 10 min X 2 for persistent severe hypertension with preeclampsia symptoms
      ii. Goal is to reduce MAP by 20-25% initially
      iii. Ensure that HR is $greater\ than$ 60 bpm prior to administration

   OR

   b. Hydralazine 5 mg IV
      i. May repeat 10mg after 20 min for persistent severe hypertension with preeclampsia symptoms
      ii. Goal is to reduce MAP by 20-25%

   OR

   c. Nifedipine 10 mg. p.o.
      i. May repeat 10 - 20 mg p.o. every 20 minutes X 2 for persistent severe hypertension with pre-eclampsia symptoms
      ii. Goal is to reduce MAP by 20-25%
   d. Magnesium sulfate - 4 g IV (20% solution) over 20 min, followed by 1 g/hr IV if available
   e. Reassess vital signs every 10 min during transport
2. Seizures associated with pregnancy greater than 20-weeks gestation
   a. Magnesium sulfate
      i. 4 g IV (50% solution) over 10-20 min, followed by 1 g/hr IV if available
      ii. Contact direct medical oversight for additional orders if persistent seizure despite initial magnesium (may give additional 1-2 g IV over 5 min)
   b. Benzodiazepine, per Seizures guideline, for active seizure not responding to magnesium - Caution: respiratory depression
3. IV fluids:
   a. NS or LR at KVO rate but restrict maximum rate of fluids to 80 mL/hr

   OR

   b. Saline lock
4. Disposition
   a. Transport to closest appropriate receiving facility
   b. Patients in second or third trimester of pregnancy should be transported on left side or with uterus manually displaced to left if hypotensive

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 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 and anti-hypertensive significantly reduces the rate of eclampsia - use of magnesium encouraged if signs of severe pre-eclampsia present to prevent seizure

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)

- 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-weeks gestation or recent post-partum should be assessed for signs of pre-eclampsia
- Recognition and appropriate treatment of eclampsia

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Revision Date

September 8, 2017

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. Maternal age at pregnancy may range from 10 to 60 years of age

Exclusion Criteria

1. Childbirth and active labor [see Childbirth guideline]
2. Post-partum hemorrhage [see Childbirth guideline]

Differential Diagnosis

1. Abruptio placenta: Occurs in third trimester of pregnancy; placenta prematurely separates from the uterus causing intrauterine bleeding
   a. Lower abdominal pain and uterine rigidity
   b. Shock, with minimal or no vaginal bleeding
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 (ruptured)
   a. First trimester
   b. Abdominal/pelvic pain with or without minimal bleeding.
4. Spontaneous abortion (miscarriage)
   a. Generally first trimester
   b. Intermittent pelvic pain (uterine contractions) with vaginal bleeding

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

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, orthostatic vital signs, skin color
    b. Abdomen: distention, tenderness, peritoneal signs
    c. Genitourinary: visible bleeding
    d. Neurologic: mental status

Treatment and Interventions

1. If signs of shock or orthostasis:
    a. Position patient supine and keep patient warm
    b. Volume resuscitation - crystalloid 1-2 liters IV
    c. Reassess vital signs and response to fluid resuscitation
2. Disposition - transport to closest appropriate receiving facility

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 hemorrhage from ectopic pregnancy or causes of vaginal bleeding.

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)

- 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

September 8, 2017

Respiratory

Airway Management

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

Aliases

Asthma, upper airway obstruction, respiratory distress, respiratory failure, hypoxemia, hypoxia, hypoventilation, foreign body aspiration, croup, stridor, tracheitis, epiglottitis

Patient Care Goals

1. Provide effective oxygenation and ventilation
2. Recognize and alleviate respiratory distress
3. Provide necessary interventions quickly and safely to patients with the need for respiratory support
4. Identify a potentially difficulty airway in a timely fashion

Patient Presentation

Inclusion Criteria

1. Children and adults with signs of severe respiratory distress/respiratory failure
2. Patients with evidence of hypoxemia or hypoventilation

Exclusion Criteria

1. Patients with tracheostomies
2. Chronically ventilated patients
3. Newborn patients
4. Patients in whom oxygenation and ventilation is adequate with supplemental oxygen alone, via simple nasal cannula or face mask

Patient Management

Assessment

1. History – Assess for:
   a. Time of onset of symptoms
   b. Associated symptoms
   c. History of asthma or other breathing disorders
   d. Choking or other evidence of upper airway obstruction
   e. History of trauma
2. Physical Examination – Assess for:
   a. Shortness of breath
   b. Abnormal respiratory rate and/or effort
   c. Use of accessory muscles
   d. Quality of air exchange, including depth and equality of breath sounds
   e. Wheezing, rhonchi, rales, or stridor
   f. Cough
   g. Abnormal color (cyanosis or pallor)

h. Abnormal mental status
i. Evidence of hypoxemia
j. Signs of a difficult airway (short jaw or limited jaw thrust, small thyromental space, upper airway obstruction, large tongue, obesity, large tonsils, large neck, craniofacial abnormalities, excessive facial hair)

Treatment and Interventions

1. Non-invasive ventilation techniques
    a. Maintain airway and administer oxygen as appropriate with a target of achieving 94-98% saturation
    b. For severe respiratory distress or impending respiratory failure, use continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP), intermittent positive pressure breathing (IPPB), humidified high-flow nasal cannula (HFNC), and/or bilevel nasal CPAP
    c. Use bag-valve mask (BVM) ventilation in the setting of respiratory failure or arrest. Two-person, two-thumbs-up BVM ventilation is more effective than one-person technique and should be used when additional providers are available
2. Oropharyngeal airways (OPA) and nasopharyngeal airways (NPA) - Consider the addition of an OPA and/or NPA to make BVM ventilation more effective, especially in patients with altered mental status
3. Supraglottic airways (SGA) or extraglottic devices (EGD) - Consider the use of a SGA or EGD if BVM is not effective in maintaining oxygenation and/or ventilation. Examples include, but are not limited to the laryngeal mask airway (LMA) or King® laryngeal tube. This is especially important in children since endotracheal intubation is an infrequently performed skill in this age group and has not been shown to improve outcomes
4. Endotracheal intubation
    a. When less-invasive methods (BVM, SGA/EGD placement) are ineffective, use endotracheal intubation to maintain oxygenation and/or ventilation
    b. Other indications may include potential airway obstructions, severe burns, multiple traumatic injuries, altered mental status or loss of normal protective airway reflexes
    c. Monitor clinical signs, pulse oximetry, cardiac rhythm, blood pressure, and capnography for the intubated patient
    d. Video laryngoscopy may enhance intubation success rates, and should be used when available. Consider using a bougie, especially when video laryngoscopy is unavailable and glottic opening is difficult to visualize with direct laryngoscope
5. Post-intubation management
    a. Confirm placement of advanced airway (endotracheal tube, SGA, or EGD) with waveform capnography, absent gastric sounds, and bilateral breath sounds
    b. Continuously monitor placement with waveform capnography during treatment and transport
    c. Continuously secure tube manually until tube secured with tape, twill, or commercial device
        i. Note measurement of tube at incisors or gum line and monitor frequently for tube movement/displacement
        ii. Cervical collar and/or cervical immobilization device may help reduce neck movement and risk of tube displacement

d. 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 a recommended 20 cm H_2O pressure
e. Ventilation
    i. Tidal volume
        1. Ventilate with minimal volume to see chest rise, approximately 6-7 mL/kg ideal body weight
        2. Over-inflation may be detrimental
    ii. Rate
        1. Adult: 10-12 breaths/minute
        2. Child: 20 breaths/minute
        3. Infant: 30 breaths/minute
    iii. Continuously monitor $ETCO_2$ to maintain $ETCO_2$ of 35-40 mmHg - in head injury with signs of herniation (unilateral dilated pupil or decerebrate posturing), modestly hyperventilate to $ETCO_2$ 30 mmHg
f. Consider sedation with sedative or opioid medications if agitated

6. Gastric decompression may improve oxygenation and ventilation, so it should be considered when there is obvious gastric distention
7. When patients cannot be oxygenated/ventilated effectively by previously mentioned interventions, the provider should consider cricothryoidotomy if the risk of death for not escalating airway management seems to outweigh the risk of a procedural complication
8. Transport to the closest appropriate hospital for airway stabilization when respiratory failure cannot be successfully managed in the prehospital setting

Patient Safety Considerations

1. Avoid excessive pressures or volumes during BVM
2. Avoid endotracheal intubation, unless less invasive methods fail, since it can be associated with aspiration, oral trauma, worsening of cervical spine injury, malposition of the ET tube (right mainstem intubation, esophageal intubation), or adverse effects of sedation, especially in children
3. Once a successful SGA/EGD placement or intubation has been performed, obstruction or displacement of the tube can have further deleterious effects on patient outcome
    a. Tubes should be secured with either a commercial tube holder or tape
4. Providers who do not routinely use medications for rapid sequence intubation (RSI) should not use RSI on children, since the loss of airway protection with the use of RSI may increase complications
    a. RSI should be reserved for specialized providers operating within a comprehensive program with ongoing training and quality assurance measures

Notes/Educational Pearls

Key Considerations

1. When compared to the management of adults with cardiac arrest, paramedics are less likely to attempt endotracheal intubation in children with cardiac arrest. Further, paramedics are more likely to be unsuccessful when intubating children in cardiac arrest and complications such as malposition of the ET tube or aspiration can be nearly three times as common in children as compared to adults.

2. Use continuous waveform capnography to detect end-tidal carbon dioxide ($ETCO_2$). This is an important adjunct in the monitoring of patients with respiratory distress, respiratory failure, and those treated with positive pressure ventilation. It should be used as the standard to confirm SGA, EGD, and endotracheal tube placement.
3. CPAP, BiPAP, IBBP, HFNC
    a. Contraindications to these non-invasive ventilator techniques include intolerance of the device, severely impaired consciousness, increased secretions inhibiting a proper seal, or recent gastrointestinal and/or airway surgery
4. Bag-valve-mask:
    a. Appropriately-sized masks should completely cover the nose and mouth and maintain an effective seal around the cheeks and chin
    b. Ventilation should be delivered with only sufficient volume to achieve chest rise
    c. Ventilation rate:
        i. During CPR, ventilation rate should be 10 breaths per minute, one breath every 10 compressions (or one breath every 6 seconds). When advanced airway is in place, ideally ventilations should be on upstroke between two chest compressions
        ii. In adults who are not in cardiac arrest, ventilate at rate of 12 breaths per minute
        iii. In children, ventilating breaths should be delivered over one second, with a two second pause between breaths (20 breaths/minute) in children
5. Orotracheal intubation
    a. Endotracheal tube sizes

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(yr)/4]+4	[age(yr)/4]+3.5

    b. Approximate depth of insertion = (3) x (endotracheal tube size)
    c. In addition to preoxygenation, apneic oxygenation (high-flow oxygen by nasal cannula) may prolong the period before hypoxia during an intubation attempt
    d. Positive pressure ventilation after intubation can decrease preload and subsequently lead to hypotension - consider providing vasopressor support for hypotension
    e. Appropriate attention should be paid to adequate preoxygenation to avoid peri-intubation hypoxia and subsequent cardiac arrest
    f. Prompt suctioning of soiled airways before intubation attempt may improve first pass success
    g. Confirm successful placement with waveform capnography. Less optimal methods of confirmation include bilateral chest rise, bilateral breath sounds, and maintenance of adequate oxygenation. Color change on end-tidal CO_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. Visualization with video laryngoscopy, when available, may assist in confirming placement when unclear due to capnography failure or conflicting information.

   h. Ongoing education and hands-on practice is essential to maintain skills. This is especially true for children since pediatric intubation is an infrequently utilized skill for many prehospital providers.
   i. Video laryngoscopy may be helpful, if available, to assist with endotracheal intubation
6. Consideration should be made to dispatch the highest-level provider for an EMS system given the potential need for advanced airway placement for patients with severe respiratory distress or failure

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)

- 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
- Subsequent vital signs and physical exam to assess for change after the interventions
- Presence of peri-intubation hypoxia, bradycardia, hypotension or cardiac arrest
- Post-intubation with advanced airway, document $ETCO_2$ value and record capnograph wave initially after intubation, with each set of vital signs, when patient is moved, and at the time of patient transfer in the ED

Performance Measures

- Percentage of providers that have received hands-on airway training (simulation or non-simulation-based) within the past 2 years
- Respiratory rate and oxygen saturation are both measured and documented
- Percentage of patients with advanced airway who have waveform capnography used for both initial confirmation and continuous monitoring during transport
- Percentage of patients who were managed upon arrival to the emergency department (ED) with each of the following: Bag-valve-mask, SGA, EGD, or endotracheal intubation
- Percentage of intubated patients with endotracheal tube in proper position upon ED arrival
- First pass intubation success without hypoxia or hypotension.
- Survival upon ED arrival

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<u>Revision Date</u>

September 8, 2017

Bronchospasm (due to Asthma and Obstructive Lung Disease)

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

Aliases

Asthma, respiratory distress, wheezing, respiratory failure, bronchospasm, obstructive lung disease, albuterol, levalbuterol, duoneb, nebulizer, inhaler

Patient Care Goals

1. Alleviate respiratory distress due to bronchospasm
2. Promptly identify and intervene for patients who require escalation of therapy
3. Deliver appropriate therapy by differentiating other causes of respiratory distress

Patient Presentation

Inclusion Criteria

1. Respiratory distress with wheezing or decreased air entry in patients 2 yo or older, presumed to be due to bronchospasm from reactive airway disease, asthma, or obstructive lung disease – These patients may have a history of recurrent wheezing that improves with beta-agonist inhalers/nebulizers such as albuterol or levalbuterol
    a. Symptoms/signs may include:
        i. Wheezing - will have expiratory wheezing unless they are unable to move adequate air to generate wheezes
        ii. May have signs of respiratory infection (e.g. fever, nasal congestion, cough, sore throat)
        iii. May have acute onset after inhaling irritant
    b. This includes:
        i. Asthma exacerbation
        ii. Chronic obstructive pulmonary disease (COPD) exacerbation
        iii. Wheezing from suspected pulmonary infection (e.g. pneumonia, acute bronchitis)

Exclusion Criteria

1. Respiratory distress due to a presumed underlying cause that includes one of the following:
    a. Anaphylaxis
    b. Bronchiolitis (wheezing less than 2 yo)
    c. Croup
    d. Epiglottitis
    e. Foreign body aspiration
    f. Submersion/drowning
    g. Congestive heart failure
    h. Trauma

Patient Management

Assessment

1. History
    a. Onset of symptoms
    b. Concurrent symptoms (fever, cough, rhinorrhea, tongue/lip swelling, rash, labored breathing, foreign body aspiration)
    c. Usual triggers of symptoms (cigarette smoke, change in weather, upper respiratory infections)
    d. Sick contacts
    e. Treatments given
    f. Previously intubated
    g. Number of emergency department visits in the past year
    h. Number of admissions in the past year
    i. Number of ICU admissions
    j. Family history of asthma, eczema, or allergies
2. Exam
    a. Full set of vital signs (T, BP, RR, P, O_2 sat) - waveform capnography is a useful adjunct and will show a "sharkfin" waveform in the setting of obstructive physiology
    b. Air entry (normal vs. diminished, prolonged expiratory phase)
    c. Breath sounds (wheezes, crackles, rales, rhonchi, diminished, clear)
    d. Signs of distress (grunting, nasal flaring, retracting, stridor)
    e. Inability to speak full sentences (sign of shortness of breath)
    f. Color (pallor, cyanosis, normal)
    g. Mental status (alert, tired, lethargic, unresponsive)
    h. Signs of distress include:
        i. Apprehension, anxiety, combativeness
        ii. Hypoxia ($less\ than$ 90% oxygen saturation)
        iii. Intercostal/subcostal/supraclavicular retractions
        iv. Nasal flaring
        v. Cyanosis

Treatment and Interventions

1. Monitoring
    a. Pulse oximetry and end-tidal CO_2 ($ETCO_2$) should be routinely used as an adjunct to other forms of respiratory monitoring
    b. Check an EKG only if there are no signs of clinical improvement after treating respiratory distress
2. Airway
    a. Give supplemental oxygen. Escalate from a nasal cannula to a simple face mask to a non-rebreather mask as needed, in order to maintain normal oxygenation
    b. Suction the nose and/or mouth (via bulb, Yankauer, suction catheter) if excessive secretions are present
3. Inhaled Medications
    a. 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) either by BLS or ALS providers - this medication should be repeated at this dose with unlimited frequency for ongoing distress

    b. Ipratropium 0.5 mg nebulized should be given up to 3 doses, in conjunction with albuterol
4. Utility of IV Placement and Fluids - IVs should be placed when there are clinical concerns of dehydration in order to administer fluids, or when administering IV medications
5. Steroids – methylprednisolone (2 mg/kg, maximum dose 125 mg) IV/IM or dexamethasone (0.6 mg/kg, maximum dose of 16 mg) IV/IM/PO may be administered in the prehospital setting. Other steroids at equivalent doses may be given as alternatives
6. 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
7. Epinephrine (0.01 mg/kg of 1 mg/mL 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
8. Improvement of oxygenation and/or respiratory distress with non-invasive airway adjuncts
    a. Non-invasive positive pressure ventilation via continuous positive airway pressure (CPAP) or bi-level positive airway pressure (BiPAP) should be administered for severe respiratory distress
    b. Bag-valve-mask ventilation should be utilized in children with respiratory failure
9. Supraglottic devices and intubation – should be utilized only if bag-valve-mask ventilation fails - the airway should be managed in the least invasive way possible

Patient Safety Considerations

1. Routine use of lights and sirens is not recommended during transport
2. Giving positive pressure 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

Notes/Educational Pearls

Key Considerations

1. Inhaled magnesium sulfate should not be administered
2. Heliox should not be administered
3. COPD patients not in respiratory distress should be given oxygen to maintain adequate oxygen saturation above 90%
4. Nebulizer droplets can carry viral particles, so additional PPE should be considered, including placement of a surgical mask over the nebulizer to limit droplet spread
5. In the asthmatic patient, pharmacologic intervention should take priority over CPAP/BiPAP and be given in line with CPAP/BiPAP

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914139 – Respiratory Distress/Asthma/COPD/Croup/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
- Breath sounds
- Air entry
- Mental status
- Color

Performance Measures

- CPAP/BiPAP utilization
- Time to administration of specified interventions in the protocol
- Rate of administration of accepted therapy (whether or not certain edications/interventions were given)
- Change in vital signs (heart rate, blood pressure, temperature, respiratory rate, pulse oximeter, capnography values)
- Time to administration of specified interventions in the protocol
- Number of advanced airway attempts
- Mortality

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Revision Date

September 8, 2017

Pulmonary Edema

Aliases

Congestive heart failure, respiratory distress, respiratory failure, acute respiratory distress syndrome, myocardial infarct, pulmonary embolism, COPD, asthma, anaphylaxis

Patient Care Goals

1. Decrease respiratory distress and work of breathing
2. Maintaining adequate oxygenation and perfusion
3. Direct supportive efforts towards decreasing afterload and increasing preload

Patient Presentation

Inclusion Criteria

1. Respiratory distress with presence of rales
2. Clinical impression consistent with congestive heart failure

Exclusion Criteria

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

Patient Management

Assessment

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

Treatment and Interventions

1. Manage airway as necessary
2. Administer oxygen as appropriate with a target of achieving 94-98% saturation
3. Initiate monitoring and perform 12-lead EKG
4. Establish IV access

5. Nitroglycerin 0.4 mg SL, can repeat q 3-5 minutes as long as SBP greater than 100 mmHg (if range not desired use q 3 minutes)
6. CPAP/BiPAP Consider advanced airway for severe distress or if not improving with less invasive support
7. If suspect high altitude pulmonary edema, treat per the Altitude Illness guideline

Patient Safety Considerations

No recommendations

Notes/Educational Pearls

Key Considerations

1. Differential:
    a. MI
    b. CHF
    c. Asthma
    d. Anaphylaxis
    e. Aspiration
    f. COPD
    g. Pleural effusion
    h. Pneumonia
    i. PE
    j. Pericardial tamponade
    k. Toxin exposure
2. Non-invasive positive pressure ventilation:
    a. Contraindications:
        i. Hypoventilation
        ii. Altered level of consciousness
        iii. Airway compromise
        iv. Aspiration risk
        v. Pneumothorax
        vi. Facial trauma/burns
        vii. Systolic BP less than 90 mmHg
        viii. Recent oropharyngeal/tracheal/bronchial surgery
    b. Benefits:
        i. Increased oxygenation and perfusion by reducing work of breathing
        ii. Maintaining inflation of atelectatic alveoli
        iii. Improving pulmonary compliance
        iv. Decreases respiratory rate and the work of breathing, HR, and SBP
        v. Improves delivery of bronchodilators
        vi. Reduces preload and afterload, improving cardiac output
    c. Complications:
        i. Most common is anxiety
        ii. Theoretical risk of hypotension and pneumothorax as non-invasive positive pressure ventilation increases intrathoracic pressure which decreases venous return and cardiac output
        iii. Sinusitis
        iv. Skin abrasions

v. Conjunctivitis – minimized with proper size mask
vi. Potential for barotrauma – pneumothorax or pneumomediastinum (rare)

3. Allow patient to remain in position of comfort - patients may decompensate if forced to lie down
4. CHF is a common cause of pulmonary edema – Other causes include:
   a. Medications
   b. High altitude exposure
   c. Kidney failure
   d. Lung damage caused by gases or severe infection
   e. Major injury
5. The use of nitrates should be avoided in any patient who has used a phosphodiesterase inhibitor within the past 48 hours. Examples are: sildenafil (Viagra®, 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. Administer nitrates with extreme caution, if at all, to patients with an inferior STEMI or suspected STEMI with right ventricular involvement because these patients require adequate RV preload.
6. 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. Although some have advocated early use of ACE inhibitors in patients with acute decompensated heart failure, we do not recommend this approach. There are limited data on the safety and efficacy of initiating new ACE inhibitors or angiotensin receptor blockers therapy in the early phase of therapy of acute decompensated heart failure (i.e. the first 12 to 24 hours).
7. Use of furosemide (Lasix®) is not recommended in the prehospital setting. Pulmonary edema is more commonly a problem of volume distribution than overload, so administration of furosemide provides no immediate benefit for most patients. Misdiagnosis of CHF and subsequent inducement of inappropriate diuresis can lead to increased morbidity and mortality in patients.
8. 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. Because many CHF patients present with very elevated arterial and venous pressure, frequent doses of nitrates may be required to control blood pressure and afterload. High dose nitrate therapy, nitroglycerin SL, 0.8–2 mg q 3–5 minutes has been used in patients in severe distress such as hypoxia, altered mentation, diaphoresis, or speaking in one-word sentences. An approach is to give two SL NTG (0.8 mg) for SBP greater than 160 mmHg or three SL NTG (1.2 mg) when SBP is greater than 200 mmHg every 5 minutes. A concern with high doses of nitrates is that some patients are very sensitive to even normal doses and may experience marked hypotension. It is therefore critical to monitor blood pressure during high-dose nitrate therapy.

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914137 – Pulmonary Edema/CHF

Key Documentation Elements

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

Performance Measures

- Time to initiation of non-invasive positive pressure ventilation
- Number of CPAP/BiPAP patients who require intubation
- Time to clinical improvement
- Assessment/auscultation of lung sounds before and after each intervention

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Revision Date

September 8, 2017

Trauma

General Trauma Management

Aliases

None noted

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

1. Patients of all ages who have sustained an injury as a result of mechanical trauma, including:
    a. Blunt injury
    b. Penetrating injury
    c. Burns

Exclusion Criteria

No recommendations

Patient Management

Assessment

1. Primary survey
    a. Hemorrhage control
        i. Assess for and stop severe hemorrhage [see Extremity Trauma/External Hemorrhage Management guideline]
    b. Airway
        i. Assess airway patency by asking the patient to talk to assess stridor and ease of air movement
        ii. Look for injuries that may lead to airway obstruction including unstable facial fractures, expanding neck hematoma, blood or vomitus in the airway, facial burns/inhalation injury
        iii. Evaluate mental status for ability to protect airway (patients with a GCS less than or equal to 8 are likely to require airway protection)
    c. Breathing
        i. Assess respiratory rate and pattern
        ii. Assess symmetry of chest wall movement
        iii. Listen bilaterally on lateral chest wall for breath sounds
    d. Circulation
        i. Assess blood pressure and heart rate
        ii. Signs of hemorrhagic shock include: tachycardia, hypotension, pale, cool clammy skin, capillary refill $greater\ than$ 2 seconds
    e. Disability
        i. Perform neurologic status assessment [see Appendix VII]

        ii. Assess 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
    f. Exposure
        i. Rapid evaluation of entire body to identify sites of penetrating wounds or other blunt injuries. Be sure to roll patient and examine the back
        ii. Prevent hypothermia

Treatment and Interventions

1. Hemorrhage control
    a. Stop severe hemorrhage [see Extremity Trauma/External Hemorrhage Management guideline]
2. Airway
    a. Establish patent airway with cervical spine precautions, per the Airway Management and Spinal Care guidelines
    b. If respiratory efforts are inadequate, assist with bag-mask ventilation and consider airway adjuncts. If patient is unable to maintain airway, consider oral airway (nasal airway should not be used with significant facial injury or possible basilar skull fracture)
    c. If impending airway obstruction or altered mental status resulting in inability to maintain airway patency, secure definitive airway
3. Breathing
    a. If absent or diminished breath sounds in a hypotensive patient, consider tension pneumothorax and perform needle decompression
    b. For open chest wound, place semi-occlusive dressing
    c. Monitor oxygen saturation and, if indicated, provide supplemental oxygen
4. Circulation
    a. If pelvis is unstable and patient is hypotensive, place pelvic binder or sheet to stabilize pelvis
    b. Establish IV access
    c. Fluid resuscitation
        i. Adults
            1. If SBP greater than 90 mmHg, no IV fluids required
            2. If SBP less than 90 mmHg or HR greater than 120, administer IV fluids and reassess
            3. Penetrating trauma: target SBP 90mmHg (or palpable radial pulse)
            4. Head injury: target SBP 110-120 mmHg. Hypotension should be avoided to maintain cerebral perfusion
        ii. Pediatrics
            1. If child 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 20ml/kg crystalloid bolus and reassess.
            2. Target normal BP for age [see Appendix VIII – Abnormal Vital Signs]
2. Disability
    a. If clinical signs of traumatic brain injury [see Head Injury guideline]

3. Exposure
    a. Avoid hypothermia
        i. Remove wet clothing
        ii. Cover patient to prevent further heat loss
4. **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.
5. Decisions regarding transport destination should be based on the CDC Field Triage Guidelines for Injured Patients [see Appendix X]

Secondary Assessment, Treatment, and Interventions

1. Assessment
    a. Obtain medical history from patient or family including:
        i. Allergies
        ii. Medications
        iii. Past medical and surgical history
        iv. Events leading up to the injury
    b. Secondary survey: Head to toe physical exam
        i. Head
            1. Palpate head and scalp and face and evaluate for soft tissue injury or bony crepitus
            2. Assess pupils
        ii. Neck
            1. Check for:
                a. Contusions
                b. Abrasions
                c. Hematomas
                d. JVD
                e. Tracheal deviation
            2. Palpate for crepitus
            3. Spinal assessment per the Spinal Care guideline
        iii. Chest
            1. Palpate for instability/crepitus
            2. Listen to breath sounds
            3. Inspect for penetrating or soft tissue injuries
        iv. Abdomen
            1. Palpate for tenderness
            2. Inspect for penetrating or soft tissue injuries
        v. Pelvis
            1. Inspect for penetrating or soft tissue injuries
            2. Palpate once for instability by applying medial pressure on the iliac crests bilaterally
        vi. Back
            1. Maintain spinal alignment. Refer to Spinal Care guideline
            2. Inspect for penetrating or soft tissue injuries
        vii. Neurologic status assessment [see Appendix VII]
            1. Serial assessment of mental status

            2. Gross exam of motor strength and sensation in all four extremities
      viii. Extremities
            1. Assess for fracture/deformity
            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 managed immediately with rapid transport to a trauma center, while the secondary survey is performed enroute
2. Monitor patient for deterioration over time with serial vital signs and repeat neurologic status assessment [see Appendix VII]
   a. Patients with compensated shock may not manifest hypotension until severe blood loss has occurred
   b. Patients with traumatic brain injury may deteriorate as intracranial swelling and hemorrhage increase
3. Anticipate potential for progressive airway compromise in patients with trauma to head and neck

Notes/Educational Pearls

Key Considerations

1. Optimal trauma care requires a structured approach to the patient emphasizing ABCDE (Airway, Breathing, Circulation, Disability, Exposure)
2. Target scene time less than 10 minutes for unstable patients or those likely to need surgical intervention
3. Provider training should include the *CDC Guidelines for 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 ABCs and repeat neurologic status assessment [see Appendix VII]

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)
- 9914207 – General Trauma Management

Key Documentation Elements
- Mechanism of injury
- Primary and secondary survey
- Serial vital signs and 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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org*
    - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - o *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - o *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - o *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
        - * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
        - ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

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Revision Date

September 8, 2017

Blast Injuries

Aliases

None noted

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

1. Patients exposed to explosive force. Injuries may include any or all of the following:
    a. Blunt trauma
    b. Penetrating trauma
    c. Burns
    d. Pressure-related injuries (barotrauma)
    e. Toxic chemical contamination

Exclusion Criteria

No recommendations

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 airway
3. Breathing
    a. Evaluate adequacy of respiratory effort, oxygenation, quality of lung sounds, and chest wall integrity
    b. Consider possible pneumothorax or tension pneumothorax (as a result of penetrating/ blunt trauma or barotrauma)
4. Circulation
    a. Look for evidence of external hemorrhage
    b. Assess BP, pulse, skin color/character, and distal capillary refill for signs of shock
5. Disability
    a. Assess patient responsiveness (AVPU) and level of consciousness (GCS) [see Appendix VII]
    b. Assess pupils
    c. Assess gross motor movement and sensation 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. Secure airway, utilizing airway maneuvers, airway adjuncts, supraglottic device, or endotracheal tube [see Airway Management guideline]
    b. If thermal or chemical burn to airway is suspected, early airway control is vital
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 semi-occlusive dressing
    d. If patient has evidence of tension pneumothorax, perform needle decompression
4. Circulation:
    a. Establish IV access with two large bore IVs or IOs
        i. Administer NS or LR, per the General Trauma Management guideline
        ii. If patient is burned, administer NS or 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. Consider possibility of subsequent explosions, structural safety, possible toxic chemical contamination, the presence of noxious gasses, and other hazards
    b. In a possible terrorist event, consider the possibility of secondary explosive devices
2. Remove patient from the scene as soon as is practical and safe
3. If the patient has sustained burns (thermal, chemical, or airway), consider transport to specialized burn center

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

5. 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
6. 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)

- 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 Total Burn Surface Area (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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
      * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
      ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

References

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Revision Date

September 8, 2017

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%, 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 CO and cyanide (CN)
   c. Pediatric or elder abuse

2. Follow ABCs 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]
    b. First- degree 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 – Consider SPCO monitoring, if available
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 distal circulation in circumferentially burned extremities
7. Consider early management of pain and nausea/vomiting
8. 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 – Initial Fluid Rate Chart for Burns as appropriate to patient weight]
        ii. Ppediatric 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
9. 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
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)

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. $ETCO_2$ 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 burns are not included in this calculation

Quality Improvement

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

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
      * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
      ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

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Revision Date

September 8, 2017

Crush Injury

Aliases

Crush, compartment syndrome

Patient Care Goals

1. Recognizing traumatic crush injury mechanism
2. Minimize systemic effects of the crush syndrome

Patient Presentation

Inclusion criteria
Traumatic crush mechanism of injury

Exclusion criteria
Non-crush injuries

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

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. Administer high-flow oxygen
4. Intravenous access should be established with normal saline initial bolus of 10-15 ml/kg (prior to extrication if possible)
5. 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
6. Attach cardiac monitor. Obtain/interpret 12-lead EKG, if available. Carefully monitor for dysrhythmias or signs of hypokalemia before and immediately after release of pressure and during transport (e.g. peaked T waves, wide QRS, lengthening QT interval, loss of P wave)
7. For pain control, consider analgesics [see Pain Management guideline]
8. Consider the following post extrication
    a. Continued resuscitation with normal saline (500-1000 cc/hr for adults, 10 cc/kg/hr for children)
    b. If EKG suggestive of hyperkalemia, 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
        OR
        ii. Calcium gluconate – 2 gm IV/IO over 5 minutes with constant cardiac monitoring

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

Patient Safety Considerations

Scene safety for both rescuers and patients is 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. Hyperkalemia (potassium is released from injured muscle cells)
      ii. Hypovolemia/shock
   c. Late
      i. Renal failure (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 Therefore, 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, or prolonged QTc
4. Avoid lactated Ringer's solution as it contains potassium
5. Continue fluid resuscitation through extrication and transfer to hospital

Pertinent Assessment Findings

1. Mental status/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)

- 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

References

1. Better OS. The crush syndrome revisited (1940-1990). *Nephron.* 1990;55:97-103.
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Revision Date

September 8, 2017

Extremity Trauma/External Hemorrhage Management

Aliases

None noted

Patient Care Goals

1. Minimize blood loss from extremity hemorrhage
2. Avoid hemorrhagic shock as a result of extremity hemorrhage
3. Minimize pain and further injury as a result of potential fractures or dislocations

Patient Presentation

Inclusion Criteria

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

Exclusion Criteria

No recommendations

Patient Management

Assessment

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

Treatments and Interventions (also, see protocol diagram below)

1. Manage bleeding
   a. Apply direct pressure to bleeding site followed by pressure dressing.
   b. If direct pressure/pressure dressing is ineffective or impractical:
      i. If the bleeding site is amenable to tourniquet placement, apply tourniquet to extremity
         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 to eliminate distal pulse
      ii. If the bleeding site is not amenable to tourniquet placement (i.e. junctional injury), pack wound tightly with a hemostatic gauze and apply direct pressure

c. Groin/axillary injury
    i. Apply direct pressure to wound
    ii. If still bleeding, pack wound tightly with hemostatic gauze and apply direct pressure
    iii. Consider using a junctional hemostatic device if available
2. Manage pain [see Pain Management guideline]
    a. Pain management should be strongly considered for patients with suspected fractures
    b. If tourniquet placed, an alert patient will likely require pain medication to manage tourniquet 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
    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 - do not apply ice directly to skin
    f. Reassess distal neurovascular status after any manipulation or splinting of fractures/dislocations

Patient Safety Considerations

1. If tourniquet use:
    a. Ensure that it is sufficiently tight to occlude the distal pulse, in order to avoid compartment syndrome
    b. Ensure that it is well marked and visible and that all subsequent providers are aware of the presence of the tourniquet
    c. Do not cover with clothing or dressings
2. Mark time of tourniquet placement prominently on the patient
3. If pressure dressing or tourniquet used, frequently re-check to determine if bleeding has restarted. Check for blood soaking through the dressing or continued bleeding distal to the tourniquet. Do not remove tourniquet or dressing in order to assess bleeding

Notes/Educational Pearls

Key Considerations

1. Tourniquet may be placed initially to stop obvious severe hemorrhage, then replaced later with pressure dressing after stabilization of ABCs and packaging of patient. Tourniquet should not be removed if:
    a. Transport time short (less than 30 minutes)
    b. Amputation or near-amputation
    c. Unstable or complex multiple-trauma patient
    d. Unstable clinical or tactical situation
2. If tourniquet is replaced with pressure dressing, leave loose tourniquet in place so it may be retightened if bleeding resumes
3. Survival is markedly improved when a tourniquet is placed *before* shock ensues
4. Commercial/properly tested tourniquets are preferred over improvised tourniquets
5. If hemostatic gauze is not available, plain gauze tightly packed into a wound has been shown to be effective

6. Arterial pressure points are not effective in controlling hemorrhage
7. 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

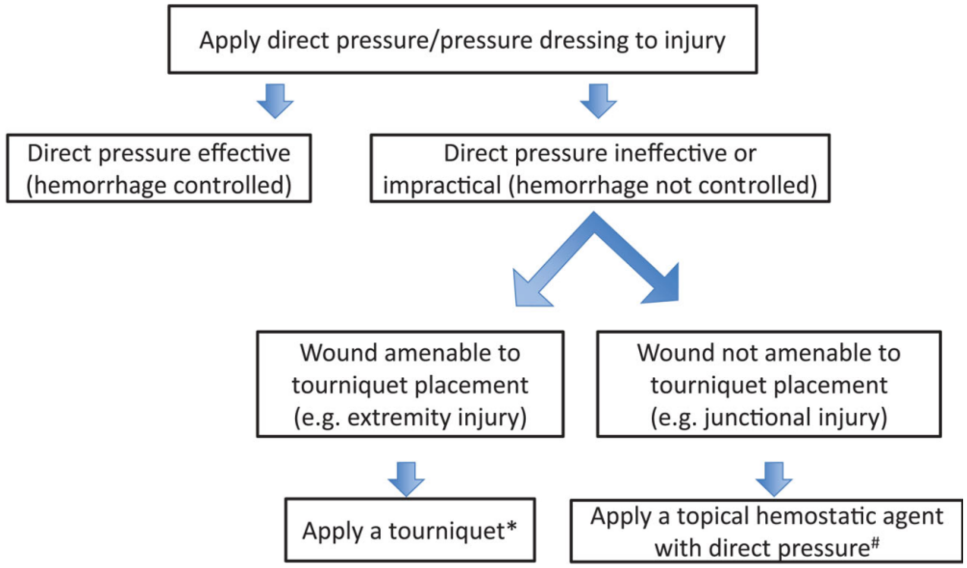
Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)
- 9914097 – Injury-Extremity
- 9914083 – Injury-Bleeding/Hemorrhage Control

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

Performance Measures
- Proper placement of tourniquet (location, elimination of distal pulse)
- Proper marking and timing of tourniquet placement and notification of subsequent providers of tourniquet placement
- Appropriate splinting of fractures
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - PEDS-03: *Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
      * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
      ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4.

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

September 18, 2017

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. Patient medications with focus on blood thinners/anti-platelet agents
2. ABCs with particular focus on ability to keep airway patent
   a. Stable midface
   b. Stable mandible
   c. Stable dentition (poorly anchored teeth require vigilance for possible aspiration)
3. Bleeding (which may be severe – epistaxis, oral trauma, facial lacerations)
4. Cervical spine pain or tenderness [see Spinal Care guideline]
5. Mental status assessment for possible traumatic brain injury [see Head Injury guideline]
6. Gross vision assessment
7. Dental avulsions
8. Any tissue or teeth avulsed should to be collected
9. Lost teeth not recovered on scene may be in the airway
10. Overall trauma assessment
11. 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, do not put back into socket. Cover with moist saline dressings and then place cup 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 it does not waste scene time
    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. 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
3. 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 sterile dressing for ear and nose cartilage

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)

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

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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
      * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
      ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4.

References

1. Bord S, Linden J. Trauma to the globe and orbit. *Emerg Med Clin N Am.* 2008;26(1):97-123.
2. Patel P, Stanton D, Granquist E. Common dental and orofacial trauma: evaluation and management. *Med Clin N Am.* 2014;98(6):1261-79.

Revision Date

September 8, 2017

Head Injury

Aliases

None noted

Patient Care Goals

1. Limit disability and mortality from head injury by:
   a. Promoting adequate oxygenation
   b. Promoting adequate cerebral perfusion
   c. Limiting development of increased intracranial pressure
   d. Limiting secondary brain injury

Patient Presentation

Inclusion Criteria

Adult or pediatric patient with blunt or penetrating head injury - LOC or amnesia not required

Exclusion Criteria

No recommendations

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 oxygen as appropriate with a target of achieving 94-98% saturation
    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. Oral endotracheal intubation or supraglottic airway insertion can be used if BVM ventilation ineffective in maintaining oxygenation or if airway is continually compromised
    d. Nasal intubation should not be used in patients with head injury
2. Breathing:
    a. For patients with a moderate or/severe head injury who are unable to maintain their airway: use continuous waveform capnography, and $EtCO_2$ measurement if available, with a target $EtCO_2$ of 35-40 mmHg
    b. Supraglottic airway placement or/endotracheal intubation should only be performed if BVM ventilation is inadequate to maintain adequate oxygenation with a target $EtCO_2$ of 35-40 mmHg
    c. For patients with a severe head injury with signs of herniation: hyperventilate to a target $EtCO_2$ of 30-35 mmHg as a short-term option, and only for severe head injury with signs of herniation
3. Circulation:
    a. Wound care
        i. Control bleeding with direct pressure if no suspected open skull injury
        ii. Moist sterile dressing to any potential open skull wound
        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 yo): maintain SBP greater than or equal to 110 mmHg
            2. Pediatric: maintain SBP:
                a. less than 1 month: greater than 60 mmHg
                b. 1-12 months: greater than 70 mmHg
                c. 1-10 yo: greater than 70 + 2x age in years
    c. Closed head injury
        i. consider administering NS/LR fluid bolus to maintain blood pressure to above numbers and maintain cerebral perfusion
    d. Do not delay transport to initiate IV access
4. Disability:
    a. Evaluate for other causes of altered mental status - check blood glucose
    b. Spinal assessment and management, per Spinal Care guideline
    c. Perform and trend neurologic status assessment (moderate/severe: GCS 3-13, P {pain} or U {unresponsive} on AVPU scale)
        i. Early signs of deterioration:
            1. Confusion
            2. Agitation
            3. Drowsiness
            4. Vomiting
            5. Severe headache

        ii. Monitor for signs of herniation
    d. Severe head injury – Elevate head of bed 30 degrees
5. Transport destination specific to head trauma
    a. Preferential transport to highest level of care within trauma system:
        i. GCS 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 patient unless signs of herniation
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

Notes/Educational Pearls

Key Considerations

1. Head injury severity guideline:
    a. Mild: GCS 13-15 / AVPU = (A)
    b. Moderate: GCS 9-12 / AVPU = (V)
    c. Severe: GCS 3-8 / AVPU = (P) or (U)
2. Important that providers 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
4. Signs of herniation
    a. Decreasing mental status
    b. Abnormal respiratory pattern
    c. Asymmetric/unreactive pupils
    d. Decorticate posturing
    e. Cushing's response (bradycardia and hypertension)
    f. Decerebrate posturing

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914101 – Injury-Head

Key Documentation Elements

- Adequate oxygenation
- Airway status and management
- $ETCO_2$ monitored and documented for moderate/severe head injury (avoidance of inappropriate hyperventilation)

- Neurological status with vitals: AVPU, GCS
- Exams: Neurological and Mental Status Assessment

Performance Measures

- No oxygen desaturation $less\ than$ 90%
- No hypotension:
  - o Adults: $less\ than$ 90 mmHg
  - o Pediatrics:
    - $less\ than$ 1 month: $less\ than$ 60 mmHg
    - 1-12 months: $less\ than$ 70 mmHg
    - 1-10 yo: $less\ than$ 70 + 2x age in years
- No $EtCO_2$ lower than 35 for mild head injury, 30 if severe head injury with signs of herniation
- Appropriate triage to trauma center
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
  - o *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
  - o *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
  - o *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
  - o *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
    * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
    ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

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1. Ambrosi PB, Valença MM, Azevedo-Filho H. Prognostic factors in civilian gunshot wounds to the head: a series of 110 surgical patients and brief literature review. *Neurosurg Rev.* 2012;35(3):429-35; discussion 435-6.
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prehospital risk factors on outcome in severe traumatic brain injury in the context of fast access to trauma care. *J Trauma.* 2011;71(4):826-32.
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Revision Date

September 8, 2017

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 danger exists.

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

High threat environment – when greater than normal conditions exist that are likely to cause damage or danger to provider or patient

Exclusion Criteria

No significant threat exists to provider and patient allowing for the performance of routine care

Patient Management

Assessment, Treatment, and Interventions

1. Hot Zone/Direct Threat care considerations:
    a. Defer in depth medical interventions if engaged in ongoing direct threat (e.g. active shooter, unstable building collapse, improvised explosive device, hazardous material threat)
    b. Threat mitigation techniques will minimize risk to patients and providers
    c. Triage should be deferred to a later phase of care
    d. Prioritization for extraction is based on resources available and the situation
    e. Minimal interventions are warranted
    f. Encourage patients to provide self-first aid or instruct aid from uninjured bystander
    g. Consider hemorrhage control:
        i. Tourniquet application is the primary “medical” intervention to be considered in Hot Zone/Direct Threat
        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. Do not delay patient extraction and evacuation for non-life-saving interventions
e. Consider establishing a casualty collection point if multiple patients are encountered
f. 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, provider safety should be considered in balancing the risks and benefits of patient treatment

Notes/Educational Pearls

Key Considerations

1. In high threat situations, novel risk assessment should be considered. Provider 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. Depending on the situation, a little risk may reap significant benefits 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)

None recommended

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

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Revision Date

September 8, 2017

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 use of immobilization devices

Patient Presentation

Inclusion criteria
Traumatic mechanism of injury

Exclusion criteria
No recommendations

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 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 is present
    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 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, in order 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 Centers for Disease Control "Guidelines for Field Triage of Injured Patients" [Appendix X]
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 sand bags

Patient Safety Considerations

1. Be aware of potential airway compromise or aspiration in immobilized patient with nausea/vomiting, or with facial/oral bleeding
2. Excessively tight immobilization straps can limit chest excursion and cause hypoventilation
3. Prolonged immobilization on spine board can lead to ischemic pressure injuries to skin
4. Prolonged immobilization on spine board can be very uncomfortable for patient
5. Children are abdominal breathers, so immobilization straps should go across chest and pelvis and not across the abdomen, when possible
6. Children have disproportionately larger heads. When securing pediatric patients to a spine board, the board should have a recess for the head, or the body should be elevated approximately 1-2 cm to accommodate the larger head size and avoid neck flexion when immobilized
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 should 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 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
   Providers should not manually stabilize these alert 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. Age alone should not be a factor in decision-making for prehospital spine care, yet the patient's ability to reliably be assessed at the extremes of age should be considered. Communication barriers with infants/toddlers or elderly patients with dementia may prevent the provider from accurately assessing the patient
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
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 trauma with other severe injuries

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914107 – Injury-Spinal Cord
- 9914073 – General-Spinal Precautions/Clearance

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:
    - Any and 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
- Patients under age and not emancipated: 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
- ***EMS Compass Measures*** *(for additional information, see www.emscompass.org)*
    - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
      * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
      ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

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Revision Date

September 8, 2017

Toxins and Environmental

Poisoning/Overdose Universal Care

Aliases

Toxin, overdose, poison, exposure

Patient Care Goals

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

Patient Presentation

Inclusion (Suspect Exposure) Criteria

1. Presentation may vary depending on the concentration and duration of exposure. Signs and symptoms may include, but are not limited to, the following:
   a. Absorption:
      i. Nausea
      ii. Vomiting
      iii. Diarrhea
      iv. Altered mental status
      v. Abdominal pain
      vi. Rapid heart rate
      vii. Dyspnea
      viii. Wheezing
      ix. Seizures
      x. Arrhythmias
      xi. Respiratory depression
      xii. Sweating
      xiii. Tearing
      xiv. Defecation
      xv. Constricted/dilated pupils
      xvi. Rash
      xvii. Burns to the skin
   b. Ingestion:
      i. Nausea
      ii. Vomiting
      iii. Diarrhea
      iv. Altered mental status
      v. Abdominal pain
      vi. Rapid or slow heart rate
      vii. Dyspnea
      viii. Seizures

ix. Arrhythmias
x. Respiratory depression
xi. Chemical burns around or inside the mouth
xii. Abnormal breath odors

c. Inhalation:
   i. Nausea
   ii. Vomiting
   iii. Diarrhea
   iv. Altered mental status
   v. Abnormal skin color
   vi. Dyspnea
   vii. Seizures
   viii. Burns to the respiratory tract
   ix. Stridor
   x. Sooty sputum
   xi. Known exposure to toxic or irritating gas
   xii. Respiratory depression
   xiii. Sweating
   xiv. Tearing
   xv. Constricted/dilated pupils
   xvi. Dizziness
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

1. **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
   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. "Tachy" 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, respirations, blood pressure)

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

<u>Exclusion Criteria</u>

No recommendations

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 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 $ETCO_2$ 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) in the environment
10. Obtain an accurate ingestion history (as patient may become unconscious before arrival at ED):
    a. Time of ingestion
    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 decide to re-check
15. Obtain pertinent patient history
16. Perform 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 treatment medication and/or lactated Ringer's or normal saline if indicated, and obtain blood samples if EMS management might change value (e.g. glucose, lactate, cyanide)
4. Fluid bolus (20 mL/kg) if evidence of hypoperfusion
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)
            1. Loading dose is acetylcysteine 150 mg/kg IV; mix in 200 mL of D5W and infuse over 1 hr

2. Then dose 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
      1. As aspirin 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 breath on their own, even if tachypnea, 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) for the hypotensive patient
d. Caustic substances ingestion (e.g. acids and alkali):
   i. Evaluate for airway compromise secondary to spasm or direct injury associated with oropharyngeal burns
   ii. In the few minutes immediately after ingestion, consider administration of water or milk if available. Adults: maximum 240 mL (8 ounces); Pediatrics: maximum 120 mL (4 ounces) to minimize risk of vomiting
      1. Do <u>not</u> attempt dilution in patients with respiratory distress, altered mental status, severe abdominal pain, nausea or vomiting, or patients who are unable to swallow or protect their airway.
      2. Do not force fluids in anyone who refuses to drink.
e. Dystonia (symptomatic), extrapyramidal signs or symptoms, or mild allergic reactions
   i. Consider administration of diphenhydramine
      1. <u>Adult</u>: diphenhydramine 25- 50 mg IV or IM
      2. <u>Pediatric</u>: 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 (Marplan®), phenelzine (Nardil®), selegiline (Emsam®), tranylcypromine (Parnate®))
   i. Consider administration of midazolam (benzodiazepine of choice) for temperature control
   ii. <u>Adult and Pediatric</u>: 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 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) or prolonged transport to definitive care.

iii. Patients who have ingested medications with extended release or delayed absorption should also be administered activated charcoal

i. Selective serotonin reuptake inhibitors (SSRIs)
   i. Consider early airway management
   ii. Treat arrhythmias following 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) for the hypotensive patient [see Shock guideline]
   vi. For agitation, consider midazolam (benzodiazepine of choice)
      1. <u>Adult</u>: 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. <u>Pediatric</u>: 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 or midazolam 0.2 mg/kg IN to maximum dose of 4 mg
   vii. For seizures, treat per Seizures guideline
j. Tricyclic Antidepressant (TCA) 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 (benzodiazepine of choice)
      1. <u>Adult</u>: 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. <u>Pediatric</u>: 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 or midazolam 0.2 mg/kg IN to maximum dose of 4 mg
   vi. For seizure, treat per Seizures guideline

<u>Patient Safety Considerations</u>

1. Scene/environmental safety for patient and provider
   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 protocol
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 as long as 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 no longer 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 you 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)

- 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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Revision Date

September 8, 2017

Acetylcholinesterase Inhibitors (Carbamates, Nerve Agents, Organophosphates) Exposure

Aliases

Acetylcholinesterase inhibitor, ATNAA®, carbamate, Duodote®, 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 over-the-counter 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 B's)
   e. **E**mesis
   f. **L**acrimation
   g. **S**alivation/**S**weating

Exclusion Criteria

No recommendations

Patient Management

1. Don the appropriate PPE
2. Remove the patient's clothing and wash the skin with soap and 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 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 ingestion history (as patient may become unconscious before arrival at 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 or all of the signs and symptoms of the toxidrome based on the route of exposure, agent involved, and concentration of the agent:
    a. Vapor exposures will have a direct effect on the eyes and pupils causing miosis
    b. Patients with isolated skin exposures will have normally reactive pupils
    c. Certain acetylcholinesterase inhibitor agents can place the patient at risk for both a vapor and skin exposure

Treatment and Interventions (see dosing tables below)

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
        iii. Commercially available atropine auto-injectors include:
            1. Atro-Pen® 1 mg of atropine (dark red container)
            2. Atro-Pen® 2 mg of atropine (green container)
            3. Pediatric Atro-Pen® 0.25 mg of atropine (yellow container)
            4. Pediatric Atro-Pen® 0.5 mg of atropine (blue container)
    b. Pralidoxime chloride (2-PAM)
        i. Pralidoxime chloride is a secondary treatment and should be given concurrently in an effort to reactivate the acetylcholinesterase
        ii. Pralidoxime chloride may be provided in a single dose vial, pre-filled syringes, or auto-injectors
        iii. Auto-injectors contain 600 mg of pralidoxime chloride
        iv. In order to be beneficial to the victim, a dose of pralidoxime chloride should be administered shortly after the nerve agent or organophosphate poisoning as it has minimal clinical effect if administration is delayed
    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
    iii. In the scenario of an acetylcholinesterase inhibitor agent exposure, the administration of diazepam or midazolam is preferable due to their more rapid onset of action
    iv. Benzodiazepines may be provided in multi-dose or single-dose vials, pre-filled syringes, or auto-injectors
    v. CANA® (Convulsive Antidote Nerve Agent) is a commercially available auto-injector that contains 10 mg of diazepam
  d. Mark I® Kits
    i. A commercially available kit of nerve agent/organophosphate antidote auto-injectors. These are being phased out and replaced with Duodote by the CDC
    ii. A Mark I® kit consists of one auto-injector containing 2 milligrams of atropine and a second auto-injector containing 600 milligrams of pralidoxime chloride
  e. Duodote®
    i. A commercially available auto-injector of nerve agent/organophosphate antidote
    ii. Duodote® is one auto-injector that contains 2.1 milligrams of atropine and 600 milligrams of pralidoxime chloride
  f. 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 milligrams of atropine and 600 milligrams of pralidoxime chloride
    iii. ATNAA® may be seen in civilian supplies assets when Duodote® is unavailable or in short supply
  g. CHEMPACK
    i. Federally-owned 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 are 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. <u>EMS Containers</u>: CHEMPACK assets for EMS contain a large portion of auto-injectors for rapid administration of antidotes by EMS providers of all levels of licensure/certification – They contain enough antidote to treat roughly 454 patients
      2. <u>Hospital Containers</u>: CHEMPACK assets contain a large portion of multidose vials and powders for reconstitution – they contain enough antidote to treat roughly 1000 patients
2. <u>Medication Administration</u>:
  a. Atropine in extremely 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 secretions resolve

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 providers is usually not sufficient to fully treat the victim of an acetylcholinesterase inhibitor agent exposure; however, EMS providers 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 direct medical oversight

3. Recommended Doses (see dosing tables below)
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 is likely to 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. It may require up to 2000 mg of atropine over several days to weeks
b. Since the antidotes in the Mark I® kit are in two separate vials, the atropine auto-injector in the kit can be administered to the patient in the event that Atro-Pen® or generic atropine auto-injectors are not available and/or intravenous atropine is not an immediate option
c. Due to the fact that Duodote® auto-injectors contain pralidoxime chloride, they should not be used for additional dosing of atropine beyond the recommended administered dose of pralidoxime chloride
d. All of 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
e. 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

Mild Acetylcholinesterase Inhibitor Agent Exposure

Patient (Weight)	Atropine Dose IM or via Auto-injector
Infant: 0-2 yo	0.05 mg/kg IM or via auto-injector (*e.g. 0.25 and/or 0.5 mg auto-injector(s)*)
Child: 3-7 yo (13-25 kg)	1 mg IM or via auto-injector (*e.g. one 1 mg or two 0.5 mg auto-injectors)*
Child: 8-14 yo (26-50 kg)	2 mg IM or via auto-injector (*e.g. 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

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	0.05 mg/kg IM or via auto-injector (*e.g. 0.25 mg and/or 0.5 mg auto-injector*)	15 mg/kg IM
Child: 3-7 yo (13-25 kg)	1 mg IM or via auto-injector (*e.g. 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 yo (26-50 kg)	2 mg IM or via auto-injector (*e.g. 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)

Severe 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 yo	0.1 mg/kg IM or via auto-injector (*e.g. 0.25 mg and/or 0.5 mg auto-injector*)	45 mg/kg IM
Child: 3-7 yo (13-25 kg)	0.1 mg/kg IM **OR** 2 mg via auto-injector (*e.g. one 2 mg auto-injector or four 0.5 mg auto-injectors*)	45 mg/kg IM **OR** One auto-injector (600mg)
Child: 8-14 yo (26-50 kg)	4 mg IM or via auto-injector (*e.g. two 2 mg auto-injectors or four 1 mg auto-injectors*)	45 mg/kg IM **OR** Two auto-injectors (1200 mg)
Adolescent: 14 yo or older	6 mg IM or via auto-injector (*e.g. three 2 mg auto-injectors*)	Three auto-injectors (1800 mg)
Adult	6 mg IM or via auto-injector (*e.g. three 2 mg auto-injectors*)	Three auto-injectors (1800 mg)
Pregnant Women	6 mg IM or via auto-injector (*e.g. three 2 mg auto-injectors*)	Three auto-injectors (1800 mg)
Geriatric/ Frail	2-4 mg IM or via auto-injector (*e.g. one to two 2 mg auto-injectors*)	25 mg/kg IM **OR** two to three auto-injectors (1200 mg-1800 mg)

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

Patient	Diazepam	Midazolam
Infant (0-2 yo)	0.2-0.5 mg/kg IM Repeat every 2-5 minutes	0.2 mg/kg IM Repeat prn in 10 minutes
	0.2-0.5 mg/kg IV every 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 yo)	0.2-0.5 mg/kg IM Repeat every 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 every 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 younger 1 CANA® auto-injector	
Adolescent (14 yos 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 every 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 every 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 every 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 every 15 minutes	May repeat dose once
	Total maximum dose: 30 mg	Total maximum dose: 20 mg

Tables adapted from: U.S. Department of Health and Human Services, ASPR, National Library of Medicine, *Chemical Hazards Emergency Medical Management: Nerve Agents- Prehospital Management*, www.chemm.nlm.nih.gov

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 provider should consider administering the lower recommended adult dose of intravenous pralidoxime chloride
5. Considerations during the use of auto-injectors
    a. If an auto-injector is administered, a dose calculation prior to administration is not necessary
    b. For atropine, additional auto-injectors should be administered until secretions diminish.
    c. Mark I® kits, 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 (certain Insecticides)
    a. Can be legally purchased by the general public
    b. Organophosphates (e.g. pesticides) penetrate tissues and bind to the patient's body fat producing a prolonged period of illness and ongoing toxicity even during aggressive treatment

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 above]

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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

September 8, 2017

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. Identification and treatment of life-threatening injuries and medical problems takes priority over decontamination
2. 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)
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 20Gy), 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 providers
2. Contaminated patients pose very little threat to medical providers who use appropriate PPE including N95 masks or respirators, gloves, gowns, and face and eye protection
3. Sources of radiation
    a. Legal
        i. Industrial plants
        ii. Healthcare facilities that provide radiologic services
        iii. Nuclear power plants
        iv. Mobile engineering sources (e.g. construction sites that are installing cement)
    b. Illegal
        i. Weapons of mass destruction
        ii. "Dirty bomb" design to contaminate widespread areas
4. Physiology of radiation poisoning
    a. Contamination – Poisoning from direct exposure to a radioactive source, contaminated debris, liquids, or clothing where radiation continues to be emitted from particles on surface
    b. Exposure – Poisoning from radioactivity, in the form of ionizing rays, penetrating through the bodily tissues of the patient
5. Common types of radioactivity that cause poisoning
    a. Gamma rays
        i. Highest frequency of ionizing rays
        ii. Penetrates the skin deeply
        iii. Causes the most severe radiation toxicity
    b. Beta rays - can penetrate up to 1 cm of the skin's thickness
    c. Alpha rays
        i. Lowest frequency of ionizing rays
        ii. Short range of absorption
        iii. Dangerous only if ingested or inhaled
    d. Radioactive daughters
        i. Products of decay of the original radioactive substance
        ii. Can produce gamma and beta rays (e.g. uranium decays into a series of radon daughters)
6. In general, trauma patients who have been exposed to or contaminated by radiation should be triaged and treated on the basis of the severity of their conventional injuries
7. A patient who is contaminated with radioactive material (e.g. flecks of radioactive material embedded in their clothing and skin) generally poses a minimal exposure risk to medical personnel
8. EMS providers 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

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 20Gy, 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)

- 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 provider
- Scene measurements of radioactivity

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Revision Date

September 8, 2017

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 alkali, acids, mustard agent, and lewisite

Exclusion criteria

None recommended

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 providers who did not participate in the decontamination process, and in an emergency response vehicle that has not been exposed to the chemical
5. Information regarding the chemical should be gathered while on scene 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 spasm 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. Although generally low yield, there may be benefit to intravenous pain medication along with the topical calcium gluconate gel for pain control
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 amps 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 provider 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]
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)

- 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

September 8, 2017

Stimulant Poisoning/Overdose

Aliases

Stimulant, cocaine, methamphetamine, amphetamines, PCP, phencyclidine, bath salts

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. Synthetic cathinones (bath salts)
    i. Spice
    j. K2
    k. Synthetic THC
    l. Khat

Exclusion Criteria

No recommendations

Patient Management

Assessment

1. Begin with the ABCDs:
    a. Airway is patent
    b. Breathing is oxygenating
    c. Circulation is perfusing
    d. 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 decide 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 and Hyperthermia/Heat Exposure guidelines]
3. Treat chest pain as ACS and follow STEMI protocol 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 physicalmanagement 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 for the safety of the patients and providers. This may improve behavior and compliance [see Agitated or Violent Patient/Behavioral Emergency guideline]
   a. If haloperidol or droperidol is used, monitor 12-lead for QT-interval if feasible
7. Consider prophylactic use of anti-emetic:
   a. Adult: administer ondansetron 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

Patient Safety Considerations

1. Apply the least amount of physical management devices that are necessary to protect the patient and the providers [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 physical management devices are in place before law enforcement leaves and ambulance departs from scene

3. If patient has signs and symptoms of ACS, strive to give nitroglycerin SL q 3-5 minutes as long as 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 excited delirium
3. If the patient is found naked, this may elevate the suspicion for stimulant use or abuse and increase the risk for excited delirium. Neuroleptic malignant syndrome, serotonin syndrome and excited delirium can present in 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)

- 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

References

1. Warrcik BJ, Hill M, Hekman K, et al. A 9-state analysis of designer stimulant, “bath salt,” hospital visits reported to poison control centers. *Ann Emerg Med.* 2013;62(3):244-51.
2. *White Paper Report on Excited Delirium Syndrome.* ACEP Excited Delirium Task Force, American College of Emergency Physicians; September 10, 2009.

Revision Date

September 8, 2017

Cyanide Exposure

Aliases

Cyanide, hydrogen cyanide, blood agent

Patient Care Goals

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

Patient Presentation

Cyanide is a colorless, "bitter almond smell" (genetically only 40% of population can smell) gas or white crystal which 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.

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

No recommendations

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 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 or bag valve mask
2. Collect a pre-treatment blood sample in the appropriate tube for lactate and cyanide levels
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 D5W (25 mg/mL) and administered at 10-15 mL/minute
        iii. Maximum single dose is 5 g

    OR

    b. Sodium thiosulfate
        i. Adult: Sodium thiosulfate12.5 g IV (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 patient

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
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)

- 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

September 8, 2017

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
2. Beta blocker agents 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®, InnoPran®)
    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

No recommendations

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
   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 (i.e. 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) – every 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 1-2meq/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 produce a patient where airway management is 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 should 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 dysrhythmia
4. Frequent reassessment is essential as patient deterioration can be rapid and catastrophic

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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

September 8, 2017

Bites and Envenomation

Aliases

Stings

Patient Care Goals

Bites, stings, and envenomations can come from a variety of insects, marine and terrestrial animals. There is a spectrum of toxins or envenomations with very limited EMS interventions.

1. Assure adequate ventilation, oxygenation and correction of hypoperfusion
2. Pain control which also includes limited external interventions to reduce pain

Patient Presentation

Inclusion Criteria

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

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. 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 (e.g. black widow spider, bark scorpions, crotalid snakes, coral snakes)
        i. For these envenomations, consider transport to hospital that has access to antivenom, if feasible
    b. Jellyfish (*Medusozoan cnidarians*):
        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). Except for certain species of jellyfish (e.g. *Physalia*, a species found in Australian waters) which may have mematocysts activated by vinegar (acetic acid), it may be used to reduce pain due to deactivation of the nematocysts remaining in the skin. 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. Incision and/or suction wound to remove toxin
    c. Apply cold packs or immerse the effect extremity in ice water (cryotherapy)
2. EMS providers should not try to capture the offending marine or terrestrial animal or insect
3. If the offending organism has been killed, beware that many dead insect, marine, or fanged animals can continue to bite or sting with venom and should be safely placed in a hard sided and closed container for future identification
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

1. Vinegar has potential to increase pain associated jellyfish sting as it can increase nematocysts discharge in certain species. Providers 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)

- 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 provider
- 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

September 8, 2017

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

No recommendations

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

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. 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/IO (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 initial 5 mg then 1 mg every 5 minutes IVP (may require 5-15 mg to see effect)
    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); every 5 minutes as necessary
7. Consider transcutaneous pacing if refractory to initial pharmacologic interventions
8. If seizure, consider midazolam (benzodiazepine of choice)
    a. Adult: Midazolam 0.1 mg/kg IV in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg (Reduce by 50% for patients 69 years or older)
    b. Pediatric: Midazolam 0.1 mg/kg IV in 2 mg increments slow IV push over one to two minutes per increment with maximum single dose 5 mg or midazolam 0.2 mg/kg IN to maximum dose of 4 mg

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)
- 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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Revision Date

September 8, 2017

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 hypoxia (pulse oximetry less than 94%). 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

No recommendations

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 including pulse oximetry, temperature, 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 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
4. A patient light wavelength analysis device to detect carboxyhemoglobin is useful to indicate if there is a carbon monoxide exposure in a non-arrested patient - do not anticipate an immediate change in readings with oxygen administration.

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)

- 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

September 8, 2017

Opioid Poisoning/Overdose

Aliases

Carfentanil, Dilaudid®, drug abuse, EVZIO®, fentanyl, heroin, hydrocodone, hydromorphone, methadone, morphine, naloxone, Narcan®, opiate, opioid, overdose, oxycodone, Oxycontin®, Percocet®, Percodan®, Suboxone, 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

Patents exhibiting miosis (pinpoint pupils), decreased mental status, and respiratory depression of all age groups with known or suspected opioid use or abuse.

Exclusion Criteria:

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

Patient Management

1. Don the appropriate PPE
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
   a. Adults: The typical initial adult dose ranges between 0.4-2 mg IV, IM, or ETT or up to a dose of 4 mg IN
   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
4. 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
5. 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 providers 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
2. Some opioids have additional toxic effects (e.g. 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. DEA and Opioids:
   a. Legally prescribed opioids are controlled under the Drug Enforcement Administration (DEA)
   b. Opioids have a high potential for abuse, but have an accepted medical use in patient treatment and can be prescribed by a physician
   c. Frequent legally prescribed opioids include codeine, fentanyl, hydrocodone, morphine, hydromorphone, methadone, morphine, oxycodone, and oxymorphone
   d. Opioid derivatives, such as heroin, are illegal in the United States
5. 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
6. 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 (e.g. W-18, are 10,000 times more potent than morphine) – many synthetic opioids are not detectable by routine toxicology screening assays
7. The IN route has the benefit of no risk of needle stick to the provider
8. 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

9. PPE that provides additional cutaneous, respiratory, or ocular protection may be considered when providing care in jurisdictions experiencing an increased incidence of overdose from high potency opioids

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)

- 9914219 – Medical-Opioid Poisoning/Overdose

Key Documentation Elements

- Rapid and accurate identification of signs and symptoms of opioid poisoning
- 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
- 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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Revision Date:

September 8, 2017

Airway Respiratory Irritants

Aliases

Respiratory irritant, airway injury, respiratory injury, chemical respiratory injury, 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 mucus 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 airway 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 obstruction 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 to 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. The abusers 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 Agents 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 to 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 (e.g. 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

<u>Patient Management</u>

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

<u>Assessment</u>

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 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 - cricothryoidotomy may be required in rarer severe cases
   b. Non-invasive ventilation techniques.
      i. Use continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP), intermittent positive pressure breathing (IPPB), humidified high-flow nasal cannula (HFNC), and/or bilevel nasal CPAP for severe respiratory distress or impending respiratory failure
      ii. Use bag-valve-mask (BVM) ventilation in the setting of hypoventilation, respiratory failure or arrest
3. 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 providers. 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 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 hyperbaric oxygen therapy

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) symptom 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, COPD) and precipitated 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 recommended 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 time are core elements of care as there are no specific antidotes for any of these inhaled agents with the exception of heavy metals that may be chelated by physicians 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 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 a varied of these 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 the heart to beat rapidly and erratically and cause cardiac arrest
   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)

- 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 providers injured while managing these incidents

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Revision

September 8, 2017

Riot Control Agents

Aliases

CN (Mace®), CS, OC (pepper spray), tear gas, harassing agents, incapacitating agents, chemical crowd control agents, lacrimators

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

1. 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 commonly 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

September 8, 2017

Hyperthermia/Heat Exposure

Aliases

Hyperthermia, heat cramps, heat exhaustion, heat syncope, heat edema, heat stroke

Definitions

1. Heat Cramps: are minor 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 (sweating) ceases due to temperature overload and/or electrolyte imbalances. Patient temperature is usually $greater\ than$ 104°F. When no thermometer is available, it is distinguished from heat exhaustion by altered level of consciousness
4. Heat Syncope: is a transient loss of consciousness with spontaneous return to normal mentation attributable to heat exposure
5. Heat Edema: is dependent extremity swelling caused by interstitial fluid pooling

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. Excited delirium [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. 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 and level of consciousness

7. If 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 but may not be available to EMS - If shivering occurs during cooling:
        i. Adult:
            1. Midazolam
                a. 2.5mg IV/IN, may repeat once in 5 minutes
                   OR
                b. 5mg IM may repeat once in 10 minutes
            2. Lorazepam
                a. 1mg IV, may repeat once in 5 minutes
                   OR
                b. 2mg IM, may repeat once in 10 minutes
                c. Diazepam – 2mg IV, may repeat once in 5 minutes
        ii. Pediatric:
            1. Midazolam (single maximum dose 1mg)
                a. 0.1mg/kg IV
                   OR
                b. 0.2mg/kg IN/IM
                c. ***NOTE***: a 5mg/mL concentration is recommended for IN/IM administration
            2. Lorazepam (single maximum dose 1mg)
                a. 0.1mg/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. 0.5mg/kg PR (maximum single dose 10 mg)
                d. May repeat once for maximum total PR dose 20 mg
    b. Continually misting the exposed skin with tepid water while fanning the victim (most effective)
    c. Truncal ice packs may be used, but are less effective than evaporation
    d. DO NOT apply wet cloths or wet clothing, as they may trap heat and prevent evaporative cooling
8. Cooling efforts should continue until the patient's temperature is less than 102.2°F (39°C) and 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 guidelines]
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. Do not forget to look for other causes of altered mental status such as low blood glucose level, or, in the proper circumstances (e.g. endurance exercise events), consider exercise associated hyponatremia (EAH), especially in the patient with altered mental status, normal blood glucose, and normal temperature
6. *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
7. 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
8. There is no evidence supporting EMS utilizing orthostatic vital signs

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 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

Performance Measures

- Blood glucose level obtained.
- Fluids given for hypotension
- Attempts to reduce core temperature
- All decompensations during EMS care reviewed
- ***EMS Compass Measures*** *(for additional information, see www.emscompass.org)*
    - *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia
    - *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms

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Revision Date

September 8, 2017

Hypothermia/Cold Exposure

Aliases

Hypothermia, frost bite, cold induced injuries

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 (e.g. 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 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 providers should perform core body temperature measurements and categorize patients into one of the three follow levels of hypothermia:
    a. Mild: normal body temperature 35-32.1°C/95-89.8°F
    b. Moderate: 32°-28°C – 89.7°-82.5°F
    c. Severe: 28°-24°C – 82.4°- 75.2°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 ability 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 31-30° C), and general slowing of bodily functions; the body loses ability to thermo-regulate

Treatment and Interventions

1. Maintain patient and rescuer safety - the patient has fallen victim to cold injury and rescuers have likely had to enter the same environment. Maintain rescuer safety by preventing cold injury to rescuers
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 104-108°F (40-42°C) 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, below
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
    iii. Bolus therapy is preferable to continuous drip
    iv. The recommended fluid for volume replacement in the hypothermic patient is normal saline
h. If alterations in mental status, consider measuring blood glucose and treat as indicated (treat per Hypoglycemia or Hyperglycemia guidelines) 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, 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 are best measured by esophageal probe, if one is available, the patient's airway is secured, and the provider has been trained in its insertion and use.
        ii. If esophageal temperature monitoring is not available or appropriate, use an epitympanic thermometer designed for field conditions with an isolating ear cap
        iii. Rectal temperatures may also be used, but only once the patient is in a warm environment - rectal temperatures are not reliable or suitable for taking temperatures in the field and should only be done in a warm environment (such as a heated ambulance)
    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 NS bolus – Repeat as necessary
    h. If alterations in mental status, consider measuring blood glucose and treat as indicated (treat per Hypoglycemia or Hyperglycemia guidelines) 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 24°C (75.2°F) during transport
5. Frostbite:
    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 rewarm effected 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 provider 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 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)

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

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
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain

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Revision Date

September 8, 2017

Drowning

Aliases

Near-drowning, non-fatal drowning, fatal drowning, submersion, immersion

Patient Care Goals

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

Patient Presentation

Inclusion Criteria

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

Exclusion Criteria

Patients without history of drowning.

Patient Management

Assessment

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

Treatment and Interventions

1. Ensure scene safety for patient and rescuers. Remove patient from water as soon as possible
   a. Practice the safest water rescue technique possible, given circumstances on scene
   b. Evacuate to land or a water craft 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 strategy for drowning victims in cardiac arrest
   a. Initiate 5 rescue breaths followed by 30 chest compressions
   b. After the initial 5 breaths, use a 2 breaths to 30 compression ratio
4. If mechanism or history suggest cervical spine injury, manage c-spine, per the Spinal Care guideline
5. Monitor vital signs including oxygen saturations

6. If O_2 saturations are less than 92%, administer oxygen as appropriate with a target of achieving 94-98% saturation. CConsider 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 direct medical oversight 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, resultant from drowning
3. Submersion refers to situations in which the patient's airway is underwater. Immersion refers to situations in which the patient's body is in water but the patient's airway remains out of the water
4. **Pediatric Considerations:**
   a. Drowning is a common cause of death in children
   b. Risk factors for drowning include male gender, age less than 14 yo, alcohol use, lack of supervision, and risky behavior
5. Rescue efforts should be coordinated between all responding agencies to ensure patient is rapidly accessed and removed from the water
6. Initiation of in-water ventilations may increase survival – In-water chest compressions are futile
7. The European Resuscitation Council recommends 5 initial breaths be provided to the drowning victim
   a. The initial ventilations may be more difficult to achieve as water in the airways may impede alveolar expansion
   b. After the initial 5 breaths and 30 compressions, the standard ratio of 2 breaths to 30 compressions may be resumed

8. Active efforts to expel water from the airway (by abdominal thrusts or other means) should be avoided as they delay resuscitative efforts and increase the potential for vomiting and aspiration
9. 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 <u>unless</u> 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 providers may consider not initiating resuscitation or termination of resuscitation on scene
    b. If water temperature is greater than 43°F (6°C) and the patient is submerged with evidence of cardiac arrest:
        i. Survival is possible for submersion time less than 30 minutes and resuscitative efforts should be initiated
        ii. Survival is not likely for submersion time greater than 30 minutes and providers may consider not initiating resuscitation or termination of resuscitation on scene
11. Patients may develop subacute respiratory difficulty after drowning and therefore all victims of drowning should be transported for observation

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

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

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 guideline

References

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Revision Date

September 8, 2017

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. Follow Universal Care guideline
2. 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)
3. Be alert for signs of barotrauma (pulmonary barotrauma, arterial gas embolism, pneumothorax, ear/sinus/dental barotrauma etc.) and/or decompression sickness (joint pain, mental status change, other neurologic symptoms including paralysis) or nitrogen narcosis (confusion, intoxication).
4. 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
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]
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 direct medical oversight and discussing need for hyperbaric treatment and primary transport to facility with 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 (e.g. most helicopter (HEMS) services), 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

Pertinent Assessment Findings

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

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

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

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 (e.g. air vs. mixed gases such as Nitrox, Heliox or Trimix)
- Timing of onset of symptoms
- History of altitude exposure after diving (air travel)
- Any associated injuries or exposures

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

References

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Revision Date

September 8, 2017

Altitude Illness

Aliases

Altitude sickness, High Altitude Cerebral Edema (HACE), High Altitude Pulmonary Edema (HAPE), Acute Mountain Sickness (AMS)

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. 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). Patients may or may not exhibit 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

Patients who have not been exposed to altitude.

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 ABCs 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, provider should start positive pressure ventilation
   b. Establish IV and perform fluid bolus with goal to maintain systolic BP $greater\ than$ 90 mm Hg
   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 direct medical oversight permits, the EMS provider 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
      ii. Ondansetron 4 mg IV, PO, or sublingual every 6 hours for vomiting
      iii. Acetazolamide – up to 250 PO mg twice a day
         1. <u>Pediatric</u> dosing is 2.5 mg/kg up to a maximum of 250 mg twice a day
         2. Acetazolamide speeds acclimatization and therefore helps in treating acute mountain sickness
      iv. Dexamethasone – 4 mg IM, IV, or PO every 6 hours until symptoms resolve
         1. <u>Pediatric</u> dosing is 0.15 mg/kg IM, IV, or PO every 6 hours
         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 every 6 hours
         1. <u>Pediatric</u> 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

d. HAPE - All therapies listed below should be considered as adjunctive to descent. Descent should always be the primary treatment modality
   i. Nifedipine – 30 mg ER PO twice a day – If nifedipine is not available:
      1. Tadalafil – 20-40 mg PO once daily may be used
         OR
      2. Sildenafil – 20 mg PO three times a day may be used
   ii. Multiple pulmonary vasodilators should <u>not</u> be used concurrently

<u>Patient Safety Considerations</u>

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

<u>Notes/Educational Pearls</u>

<u>Key Considerations</u>

1. Patients suffering from altitude illness have exposed themselves to a dangerous environment. By entering the same environment, providers are exposing themselves to the same altitude exposure. Be vigilant in looking for symptoms of altitude illness amongst rescuers
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

<u>Pertinent Assessment Findings</u>

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

<u>Quality Improvement</u>

<u>Associated NEMSIS Protocol(s) (eProtocol.01)</u>

- 9914021 – Environmental-Altitude Sickness

<u>Key Documentation Elements</u>

- 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 (e.g. weather, inability to descend)

References

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Revision Date

September 8, 2017

Conducted Electrical Weapon Injury (e.g. 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 excited delirium [see Agitated or Violent Patient/Behavioral Emergency guideline]
2. Make sure patient is appropriately secured or restrained with assistance of law enforcement to protect the patient and staff [see Agitated or Violent Patient/Behavioral Emergency guideline]
3. Perform comprehensive trauma and medical assessment as patients who have received conducted electrical weapon may have already been involved in physical confrontation
4. If discharged from a distance, two single barbed darts (13mm 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 the direct contact discharge or the distance two barbed dart discharge of the conducted electrical weapon
2. Patient may have sustained fall or physical confrontation trauma
3. Patient may be under the influence of toxic substances and or may have underlying medical or psychiatric disorder

Exclusion Criteria

No recommendations

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 excited delirium manifested by varied combination of agitation, reduced pain sensitivity, elevated temperature, persistent struggling, or hallucinosis

Treatment and Interventions

1. Make sure patient is appropriately secured 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. Conservative programs treat all barbed darts as a foreign body and leave them for physician removal while more progressive programs allow EMS or law enforcement to remove barbed darts except for sensitive areas (head, neck, hands, feet or genitals)
3. Treat medical and traumatic injury

Patient Safety Considerations

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 to signs and symptoms that may indicate agitated delirium
5. Transport the patient to the hospital if they have concerning signs or symptoms
6. EMS providers who respond for a conducted electrical weapon patient should not perform a "medical clearance" for law enforcement

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 EKG 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 tased 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)

- 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 EKG or 12-lead EKG evaluation
- If indicated, review for appropriate securing technique

References

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Revision Date

September 8, 2017

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

Patient Management

Assessment
1. Verify scene is secure. The electrical source must be disabled prior to assessment
2. Assess primary survey with specific focus on dysrhythmias or cardiac arrest - apply a cardiac monitor
3. Identify all sites of burn injury – If the patient became part of the circuit, there will be an additional site near the contact with ground - electrical burns are often full thickness and involve significant deep tissue damage
4. Assess for potential associated trauma and note if the patient was thrown from contact point - 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, and also time of injury

Treatment and Interventions
1. Identify dysrhythmias or cardiac arrest – even patients who appear dead (particularly dilated pupils) may have good outcomes with prompt intervention [see appropriate guideline for additional information and patient assessment/treatment]
2. Immobilize if associated trauma suspected [see Trauma section guidelines]
3. Apply dry dressing to any wounds
4. Remove constricting clothing and jewelry since additional swelling is possible
5. Administer fluid resuscitation per burn protocol - remember that external appearance will underestimate the degree of tissue injury

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
1 mA	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)

- 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

- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
      * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
      ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

References

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Revision Date

September 8, 2017

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. Parasthesias
   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)

- 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)
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
  - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
  - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
  - *Trauma-04*: *Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
    * Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria
    ** 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

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Revision Date

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III. 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
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

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 *(e.g. 911 vs interfacility)*
    c. eResponse.07 - Primary Role of the Unit *(e.g. 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 *(e.g. 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 providers 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 *(Combined steps 1 and 2 of CDC's "Guidelines for Field Triage of Injured Patients")*
   d. eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor *(Combined steps 3 and 4 of CDC's "Guidelines for Field Triage of Injured Patients")*
   e. eInjury.07 - Use of Occupant Safety Equipment
   f. Destination Pre-Arrival Alerts (e.g. trauma alerts)
      i. eDisposition.24 - Destination Team Pre-Arrival Alert or Activation
      ii. eDisposition.25 - Date/Time of Destination Pre-Arrival Alert or Activation

7. Cardiac Arrest History and Situation
   NOTE: The following fields meet the needs of Utstein Criteria reports and many of the fields in CARES. CARES has additional custom fields that may be available from your software vendor.
   a. eArrest.01 - Cardiac Arrest [Yes/No]
   b. eArrest.02 - Cardiac Arrest Etiology
   c. eArrest.03 - Resuscitation Attempted By EMS
   d. eArrest.04 - Arrest Witnessed By
   e. eArrest.05 - CPR Care Provided Prior to EMS Arrival
   f. eArrest.06 - Who Provided CPR Prior to EMS Arrival
   g. eArrest.07 - AED Use Prior to EMS Arrival
   h. eArrest.08 - Who Used AED Prior to EMS Arrival
   i. eArrest.09 - Type of CPR Provided
   j. eArrest.11 - First Monitored Arrest Rhythm of the Patient
   k. eArrest.12 - Any Return of Spontaneous Circulation
   l. eArrest.14 - Date/Time of Cardiac Arrest
   m. eArrest.15 - Date/Time Resuscitation Discontinued
   n. eArrest.16 - Reason CPR/Resuscitation Discontinued
   o. eArrest.17 - Cardiac Rhythm on Arrival at Destination
   p. eArrest.18 - End of EMS Cardiac Arrest Event
   q. eScene.02 - Other EMS or Public Safety Agencies at Scene
   r. eScene.03 - Other EMS or Public Safety Agency ID Number
   s. eScene.04 - Type of Other Service at Scene

Provider Impressions and Incident/Patient Disposition

1. Provider Impressions (Provider Field Working Diagnosis)
   a. eSituation.11 - Provider'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 - Provider'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 *(e.g. 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 (e.g. there is no value for whole arm, it would need to be entered as shoulder, upper arm, elbow, forearm and wrist with separate exam findings for each component, meaning a single exam finding of paralysis for an arm would take ten steps to enter) and the same information is often reflected in the provider'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 providers. *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 provider 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 direct medical oversight.*
   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. <u>Trauma/Injury</u>
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 provider actually performed the assessment, but did not find any injury/abnormality.

<u>Vitals</u>

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)*

Medications Given

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

Procedures Performed

1. eProcedures.01 - Date/Time Procedure Performed
2. eProcedures.02 - Procedure Performed Prior to this Unit's EMS Care

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

Narrative

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

Notes/Educational Pearls

Documenting Signs and Symptoms Versus Provider Impressions

1. Signs and Symptoms
    a. Signs and Symptoms should support the provider impressions, treatment guidelines and overall care given. A symptom is something the patient experiences and tells the provider; it is subjective. A sign is something the provider sees; it is objective.
    b. Symptoms should not be confused with provider impressions. The provider impressions are the EMS working field diagnosis of the patient's actual medical condition.
2. Provider Impressions
    a. There is often a great deal of confusion on the part of EMS providers about the difference between symptoms and provider impressions. Provider impressions should be *supported* by symptoms but not *be* the symptoms except on *rare* occasions where they may be the same (e.g. weakness when no etiology for the weakness can be determined by the EMS provider).
    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 providers are incorrectly entering provider 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 provider 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 provider saw, heard, or did. The Narrative is the place for the EMS provider 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 providers 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 providers learn this skill on the job, and often proficient mentors are sparse. Therefore, it is essential that the EMS provider uses a standard format to ensure they are consistent and complete in their documentation. There are three standard formats for EMS documentation. EMS providers 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 providers use as it is intuitive and easy to learn. Some more experienced providers 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 providers. 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 (e.g. aspirin for cardiac chest pain), *pertinent negatives* should be used to show that a medication protocol was considered but was satisfied by other than provider 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 9-1-1 pre-arrival instructions. EMS providers 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 be 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 (e.g. 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 (e.g. 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 (e.g. 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 (e.g. 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

(e.g. intubation caused minor airway trauma, but the intubation successfully secured the airway).

3. <u>Unchanged</u>:
   a. The procedure performed did not have the clinical effect intended, but did not directly worsen the patient's symptoms or clinical condition (e.g. attempted defibrillation and the person remained in VF);
   or
   b. Had a sub-therapeutic effect and the symptoms continued (e.g. 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 (e.g. patient assessment).
   NOTE: "Not Applicable" would also be appropriate to choose for these cases
4. <u>Worse</u>:
   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 provider performed the procedure incorrectly.

<u>NEMSIS Data Standards and Limitations</u>

1. NEMSIS is a national dataset and standard used by all EMS software systems. Currently there are three versions of the data standard available for documentation and in which data is stored:
   a. NEMSIS Version 2.2.1 (v2.2.1)
      i. Adopted in 2006, there have been no changes since release
      ii. Most states or systems have used this standard since its release, and the majority of most states' data available since approximately 2016 is in this format.
      iii. NEMSIS accepted v2.2.1 data through 12/31/2016, and some states may continue to collect data in this standard until they transition to NEMSIS v3 standards.
   b. NEMSIS Version 3 (v3)
      i. NEMSIS v3 was created and finalized in 2011 to replace v2.2.1 in order to allow the dataset to become more flexible for updates and adopt technical standards making linkage to other health records possible.
         a. 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.
         b. 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 01/01/2018, 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 medications 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 provider use of “Not Applicable” is appropriate documentation (e.g. using “Not Applicable” under *eInjury.03 - Trauma Center Criteria*, which combines step 1 and 2 of CDC’s Guidelines for 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 aspirin for chest pain by the EMS provider 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 providers 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 provider in the ePCR, but rather the provider 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 provider.
        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 providers 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 ePRC, 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

September 8, 2017

IV. 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 July 14, 2014, July 15, 2014, July 2017 and August 2017. Additional references include the 2015 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 providers 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

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 < 90 mm Hg), 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/akasthesia
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 > 450 msec in females or > 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, i.e. QT prolongation, hypotension, tachycardia, and torsades de pointes

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

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

Fentanyl
Name –Currently only available in the generic form (formerly Sublimaze®)
Class – Synthetic opioid, opioid analgesics

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

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

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

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

Hydralazine
Name – No listed brand name
Class – Vasodilator
Pharmacology – Direct vasodilator at the level of arterioles, with little effect on veins. Decreases systemic resistance.
Indications – Severe hypertension with pre-eclampsia symptoms

Contraindications – Hypersensitivity, coronary artery disease, mitral valve rheumatic heart disease. Use with caution in CVA, known renal disease, hypotension

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

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

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

Ibuprofen
Name – There are multiple over-the-counter medications that include ibuprofen, such as Advil®, Motrin®
Class – Non-steroidal anti-inflammatory drug (NSAID)
Pharmacologic Action - Inhibits synthesis of prostaglandins in body tissues by inhibiting at least 2 cyclo-oxygenase (COX) isoenzymes, COX-1 and COX-2. May inhibit chemotaxis, alter lymphocyte activity, decrease proinflammatory cytokine activity, and inhibit neutrophil aggregation; these effects may contribute to anti-inflammatory activity
Indications – For the acute management of pain or as an antipyretic
Contraindications - Aspirin allergy; perioperative pain in setting of coronary artery bypass graft (CABG) surgery; preterm infants with untreated proven or suspected infection; bleeding with active intracranial

hemorrhage or GI bleed; thrombocytopenia, coagulation defects, proven or necrotizing enterocolitis, significant renal impairment, congenital heart disease where patency or the patent ductus arteriosis (PDA) is necessary for pulmonary or systemic blood flow

<u>**Ipratropium**</u>
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 COPD
Contraindications - Documented hypersensitivity to ipratropium, atropine, or derivatives.

<u>**Isopropyl Alcohol**</u>
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

<u>**Ketamine**</u>
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

<u>**Ketoralac**</u>
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. 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 sino-atrial (SA) node impulse formation in myocardium and prolongs conduction time. Promotes movement of calcium, potassium, and sodium in and out of cells and stabilizes excitable membranes

Indications – For the management of torsades de pointes or for severe bronchoconstriction with impending respiratory failure, seizure during the third trimester of pregnancy or in the postpartum patient
Contraindications – Hypersensitivity, myocardial damage, diabetic coma, heart block, hypermagnesemia, hypercalcemia

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

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

Metoprolol
Name – Lopressor®, Toprol XL®
Class – Beta blocker, beta-1 selective
Pharmacologic Action - Blocks response to beta-adrenergic stimulation; cardio selective for beta-1 receptors at low doses, with little or no effect on beta-2 receptors
Indications - For management of narrow complex tachycardias
Contraindications – Hypersensitivity. *When administered for hypertension or angina*: Sinus bradycardia, second or third 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 < 45 beats/minute, systolic BP < 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®, EVZIO®

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 O2 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 < 90 mm Hg or ≥30 mm Hg below baseline), extreme bradycardia (< 50 bpm), tachycardia in the absence of heart failure (> 100 bpm), and right ventricular infarction

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

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

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

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

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

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

<u>Pralidoxime chloride (2-PAM)</u>
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

<u>Procainamide</u>
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

<u>Prochlorperazine</u>
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 < 2 years or weighing < 9 kg

<u>Sildenafil</u>
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

<u>Sodium Bicarbonate</u>
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

<u>Sodium Nitrite</u>
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

<u>Sodium Thiosulfate</u>
Name- Nithiodote®
Class – Cyanide antidote
Pharmacologic Action - Thiosulfate is sulfur donor utilized by rhodenase to convert cyanide to less toxic thiocyanate
Indications – For the management of cyanide toxicity
Contraindications – Documented hypersensitivity

<u>Sorbitol</u>
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

<u>Tadalafil</u>
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

<u>Ziprasidone</u>
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

V. 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.

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	neurological status measure: alert, verbal, pain, unresponsive
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

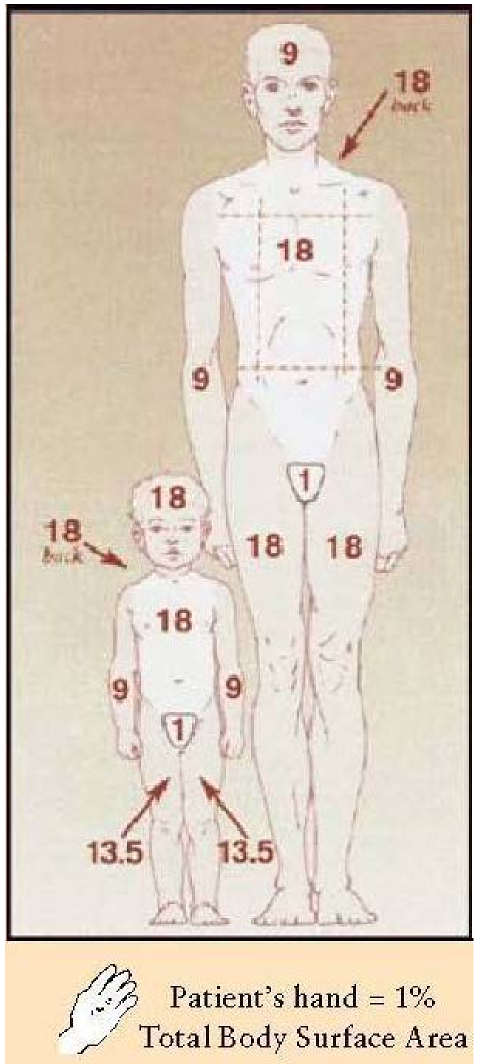
Abbreviation	Description
C-SECTION	caesarean section
C-SPINE	cervical spine
CT	cat scan, Cardiac Technician
CVA	cerebrovascular accident (stroke)
D5W	5% dextrose in water
DKA	diabetic ketoacidosis
DNI	do not intubate
DNR	do not resuscitate
DT	delirium tremens
Dx	diagnosis
ECPR	extracorporeal cardiopulmonary 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 CO_2
ETOH	ethanol (alcohol)
ETT	endotracheal tube
FBAO	foreign body airway obstruction
FiO_2	fraction of inspired oxygen
g	gram(s)
GI	gastrointestinal
gtts	drops
GU	gastrourinary
GYN	gynecology (gynecological)
HFNC	high flow nasal cannula
HR	heart rate (hour)
ICU	intensive care unit
IM	intramuscular
IO	intraosseous

Abbreviation	Description
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 minutes
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

Abbreviation	Description
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 under-water 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
yo	years old (years of age)

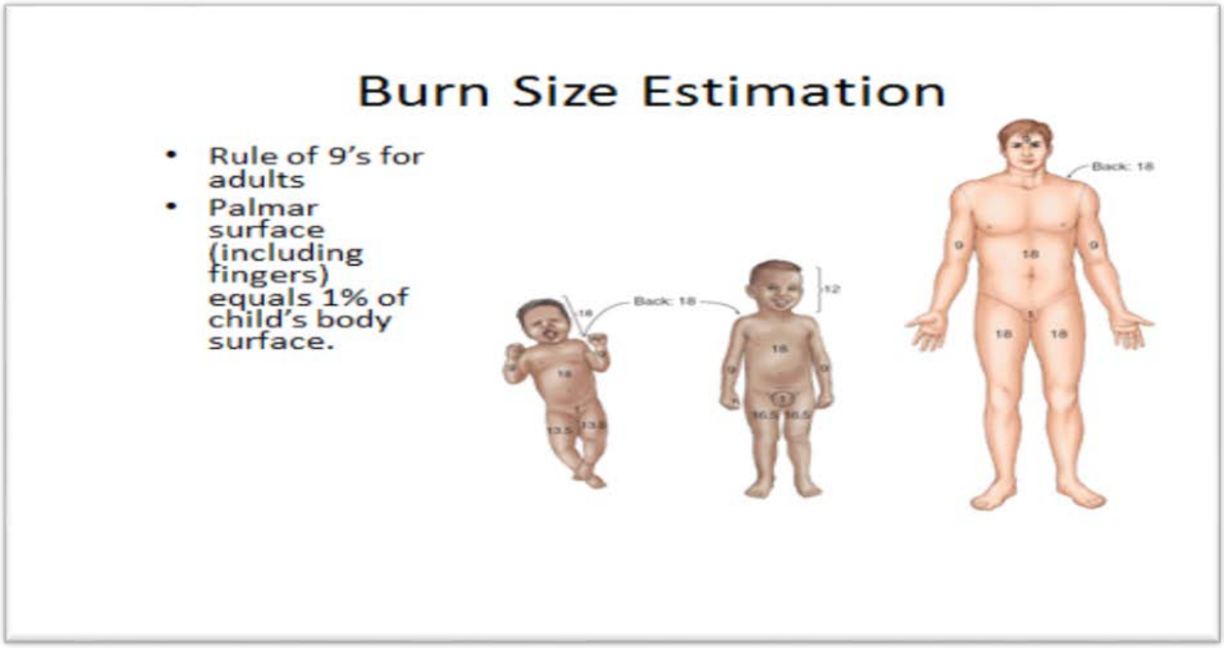
VI. Burn and Burn Fluid Charts

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).

VII. 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 – see below) or only the motor component of the GCS may more effectively serve in this capacity.

Glasgow Coma Score

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

AVPU

A: The patients is alert

V: The patient responds to verbal stimulus

P: The patient responds to painful stimulus

U: The patient is completely unresponsive

VIII. Abnormal Vital Signs

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

IX. 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:

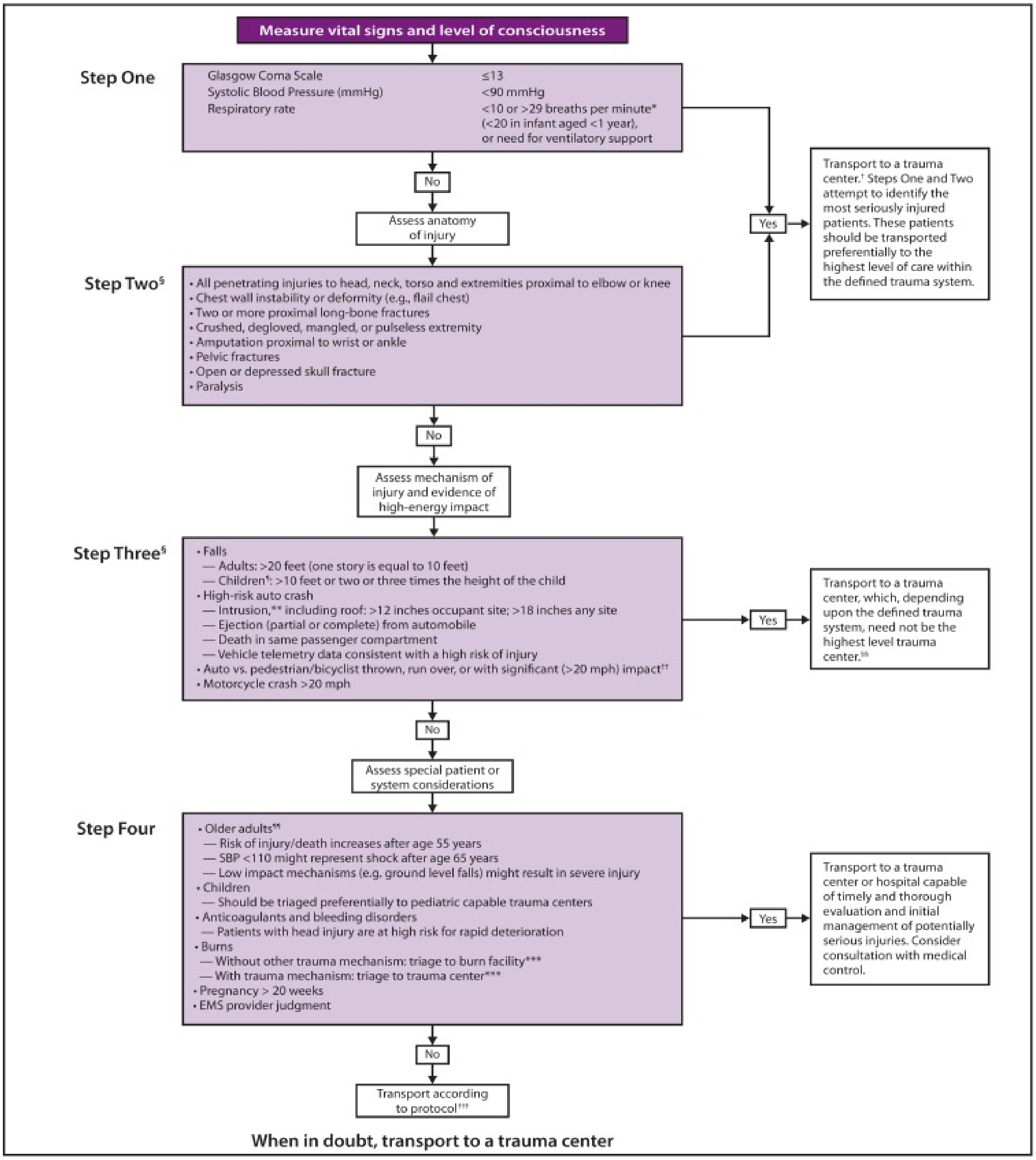
- Assemble the expert panel and provide GRADE training
- Define the EBG content area and establish the specific clinical questions to address in patient, intervention, comparison, and outcome (PICO) format
- Prioritize outcomes to facilitate systematic literature searches
- Create GRADE tables (or evidence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

The current 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

X. 2011 Guidelines for Field Triage of Injured Patients



Source: Adapted from American College of Surgeons. Resources for the optimal care of the injured patient. Chicago, IL: American College of Surgeons; 2006. Footnotes (see following page) have been added to enhance understanding of field triage by persons outside the acute injury care field. https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6101a1.htm

* The upper limit of respiratory rate in infants is greater than 29 breaths per minute to maintain a higher level of overtriage for infants

† Trauma centers are designated Level I–IV, with Level I representing the highest level of trauma care available.

§ Any injury noted in Steps Two and Three triggers a "yes" response.

¶ Age less than 15 years.

** Intrusion refers to interior compartment intrusion, as opposed to deformation which refers to exterior damage.

†† Includes pedestrians or bicyclists thrown or run over by a motor vehicle or those with estimated impact greater than 20 mph with a motor vehicle.

§§ Local or regional protocols should be used to determine the most appropriate level of trauma center; appropriate center need not be Level I.

¶¶ Age greater than 55 years.

*** Patients with both burns and concomitant trauma for whom the burn injury poses the greatest risk for morbidity and mortality should be transferred to a burn center. If the nonburn trauma presents a greater immediate risk, the patient may be stabilized in a trauma center and then transferred to a burn center.

††† Injuries such as an open fracture or fracture with neurovascular compromise.

§§§ Emergency medical services.

¶¶¶ Patients who do not meet any of the triage criteria in Steps One through Four should be transported to the most appropriate medical facility as outlined in local EMS protocols.