National Continued Competency Requirements

PARAMEDIC EDUCATION GUIDES

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NCCR Topic	**VENTILATION**
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	*By the end of this lesson, the student will be able to:* • Differentiate between alveolar ventilation and minute ventilation • Differentiate between adequate and inadequate breathing • Differentiate between respiratory distress and respiratory failure • Recognize and manage a patient that requires assisted ventilations • Articulates the effect of ventilation on venous return and cardiac output o Spontaneously breathing patient o Artificially ventilated patient • Recognize and discuss the management of a patient that would benefit from CPAP • Decide when to oxygenate and when to ventilate a patient • Recognize the use of automated transport ventilators when managing patients • Justify the use of padding during ventilation of the pediatric patient • Recite the AHA's position on routine suctioning of the newborn
Curriculum Hours	2 hours
CONTENT	**Ventilation** **Minute ventilation – The volume of air a person moves in and out of the respiratory system in one minute** • Minute ventilation (MV) consists of: Tidal volume(V_t) x Respiratory rate in one minute • Tidal Volume (V_t) – The volume of air a person moves in and out of the respiratory system in each breath • Respiratory rate (Frequency (F)) – The number of times a person breathes per minute • Minute ventilation = Tidal volume x Respiratory rate (example: 500mL of air x 12 breaths per minute = 6000mL/minute) • Explain adequate and inadequate breathing based on minute ventilation o Adequate breathing - In order to have adequate breathing, you must have an adequate minute ventilation (adequate rate AND adequate tidal volume.) →→

Adequate breathing does not require positive pressure ventilation.

- Inadequate breathing is caused by
  - An inadequate tidal volume
  - An inadequate rate
  - A combination of both

Inadequate breathing requires immediate management with positive pressure ventilation.

Alveolar Ventilation – The amount of air that moves in and out of the alveoli per minute

- Alveolar ventilation (Va) consists of: (tidal volume minus dead air space) multiplied by respiratory rate in one minute.
  - Va = (Vt – Vd) * F
- Alveolar ventilation = (Tidal volume – Dead Air Space) x Respiratory rate (example: (500mL of air – 150mL) x 12 breaths per minute = 4200mL/minute)

The difference between minute ventilation and alveolar ventilation is important because alveolar ventilation is the volume of air reaching the alveoli that participates in gas exchange (what oxygenates the blood.) By increasing the rate of ventilation in a patient with shallow breathing (inadequate tidal volume) may maintain the minute ventilation near normal, however alveolar ventilation (gas exchange) would be inadequate.

Example: Mrs. Smith has increased her respiratory rate from 12 to 24 times per minute, however her tidal volume with each breath has decreased from 500mL to 250mL. This means that she is breathing faster but shallow. Her minute ventilation is now (250mL x 24 per minute) 6000mL which appears to be normal. Because of her respiratory rate increase she is able to move what appears to be an adequate volume of air per minute. Mrs. Smith's tidal volume is 250mL, however dead air space is taking up 150mL per breath. This means that only 100mL of air is available for gas exchange per breath. She is inadequately oxygenating her blood. Although her minute ventilation appears to be within normal limits, her alveolar ventilation ([250mL – 150mL] x 24 per minute = 2400mL/minute) is inadequate. This will lead to hypoxemia and will result in a decrease in her SpO_2 reading. She requires positive pressure ventilation.

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Effect of ventilation on venous return and cardiac output

In the normal patient, the negative pressure that causes inhalation facilitates venous return necessary for adequate cardiac output and perfusion.

Remind the class what cardiac output is -

Cardiac output is the amount of blood ejected from the left ventricle in one minute (Stroke volume x Heart rate)

Stroke volume = Amount of blood ejected from the left ventricle with each contraction

Heart rate = Number of times the heart contracts in one minute.

To demonstrate this, take a full breath of air and explain to the student that during that inhalation, a large volume of venous blood returned to the heart because of the extreme negative pressure generated during the inhalation.

Negative pressure during inhalation allows venous blood return to the right side of the heart, which is necessary for adequate cardiac output.

When artificial ventilation is being delivered, air is pushed into the chest (positive pressure ventilation). The increase in intrathoracic pressure impedes the amount of blood flow back to the heart. Each time you deliver ventilations, you are making the intrathoracic pressure positive. More frequent ventilations cause a greater duration of positive pressure in the chest than a patient with normal spontaneous breathing, which further impedes blood return and reduces cardiac output and perfusion of the vital organs.

Positive pressure in the thorax during ventilation impedes venous blood return to the right side of the heart, decreasing cardiac output. Excessive ventilation rates during positive pressure ventilation result in a decrease in cardiac output and perfusion.

In the adult patient, artificial ventilatory rates greater than 12 times per minute (one ventilation every 5-6 seconds) decrease cardiac output and perfusion; therefore if you are artificially ventilating a patient, do not exceed a ventilatory rate of 10-12 times per minute (one ventilation every 5-6 seconds). High artificial ventilatory rates (greater than 12 times per minute, one breath every 5-6 seconds) result in poor patient outcomes.

[This must be clearly reinforced and integrated into scenarios that include artificial ventilation.]

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Exercise: Ask each student to breathe 10 times per minute and count out their breaths while you count the seconds between breaths (one breath every 5-6 seconds).

Respiratory distress vs. failure

All respiratory conditions are dynamic and fall with a spectrum from minor respiratory distress to respiratory arrest. Respiratory conditions can be acute, chronic, or chronic with acute exacerbation. Signs and symptoms that are present when EMS arrives are dynamic and could change over time depending on the state of the patient's disease process. Many patients with respiratory diseases remain in some phase of distress and need only comfort care. What remains important for EMS providers is to know when exactly to provide an intervention (such as artificial ventilation) in order to increase the likelihood of patient improvement. Recognizing the transition of a respiratory disease from distress to respiratory failure is of paramount importance in EMS care.

Continuous Positive Airway Pressure (CPAP) can be used in a patient needing ventilatory support who is in moderate to severe respiratory distress or early respiratory failure. The patient must be awake, be able to obey commands, and have intact airway reflexes. CPAP is not designed to ventilate patients, but to provide better oxygenation to patients who are hypoxic. CPAP provides continuous positive airway pressure that reduces the effort for the patient to breathe, improves oxygenation and reduces hypercarbia. CPAP can prevent the exacerbation of respiratory distress or respiratory failure. CPAP applies positive airway pressures above atmospheric pressure during inhalation and provides positive end expiratory pressure (PEEP) during exhalation.

Contraindications

- Inability of the patient to maintain an open airway
- Severe hypotension (systolic BP < 90)
- A respiratory rate of less than 8 breaths/min

When a patient in respiratory distress begins to exhibit deterioration in mental status because of hypoxia and hypercarbia, the EMS provider needs to deliver assisted artificial ventilations.

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Many other signs or symptoms can accompany this deterioration in mental status including decrease in SpO_2, cyanosis, hypercarbia, accessory muscle use, head bobbing, grunting, nasal flaring or confusion. Patients in respiratory failure have inadequate alveolar ventilation which will be exhibited by either a decrease in or an excessively high respiratory rate (reducing tidal volume and amount of air available for alveolar gas exchange) a decrease in tidal volume, or both. Patients in respiratory failure are severely ill. When providing artificial ventilation it is critical that you ventilate no more than 10-12 times per minute (every 5-6 seconds). Artificial ventilations provided at a rate greater than 10-12 times per minute could compromise cardiac output and perfusion.

Lab Skills

1. Your assessment draws you to the conclusion that the patient needs artificial ventilation. Patients receiving assisted ventilation will be anxious when you cover their face and force air into their lungs. You must explain this procedure to the patient and reassure him you will be helping him breathe easier and improve his ability to receive oxygen. Tell the patient that it may be necessary to take occasional breaks if he becomes anxious.
2. This procedure is best accomplished with the patient in the semi-Fowler's position.
3. The head should be placed in a sniffing position and no airway adjunct should be placed.
4. Attach the BVM to supplemental oxygen to deliver the highest concentration of oxygen.
5. Observe the patient's respirations and when they begin to inhale, gently squeeze the BVM and deliver the ventilation over 1-2 seconds and with a low volume. (Do not squeeze the bag with high pressure)
6. Allow the patient to exhale normally.
7. During the next inhalation deliver another ventilation over 1-2 seconds until you observe some chest rise.
8. Continue this process until the patient's mental status improves or you are ventilating 10-12 times per minute with adequate tidal volume.

Patients who are breathing at a rate of less than 10 times per minute should receive assisted ventilations at a rate of 10-12 times per minute.

Patients who are breathing at an excessively high rate (greater than 30) should receive assisted ventilations to bring their rate down to 10-12 times per minute.

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Some patients in respiratory failure may have a severely altered mental state and no longer have a gag reflex. In this case, insertion of an airway adjunct is indicated. Ventilate the patient at a rate of 10-12 per minute (every 5-6 seconds).

Assisted ventilation practice – It is suggested that each student in the class should assist the ventilation of a spontaneously breathing person. It is required that each student watch a video of an awake and spontaneously breathing patient receiving assisted ventilations.

Some recommended methods to complete this practice session include high fidelity simulator, anesthetized patients in an operating room or outpatient clinical setting.

Automated Transport Ventilators

A patient requiring artificial ventilation for a period of time may benefit the use of an Automated Transport Ventilator (ATV). An ATV can be used whether a patient is intubated or not.

Advantages

- Can be used for breathing and non-breathing patients, intubated and non-intubated patients
- Can be used in patients in respiratory failure and apneic patients
- Frees the rescuer for other tasks when used in intubated patients
- In patients who are not intubated, the rescuer has both hands free to apply the mask and maintain the airway
- Adjustable settings; once set, provides a specific tidal volume, respiratory rate and minute ventilation

Disadvantages

- Need for an oxygen source, and sometimes electric power
- Inability to detect increasing airway resistance
- Some ATVs should not be used in children younger than 5 years old

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	Positioning in the pediatric patient for artificial ventilation According to the American Heart Association Pediatric Advanced Life Support Provider Manual (2011): *"A "sniffing" position without hyperextension of the neck is usually best for infants and toddlers. To achieve a sniffing position, place the child supine. Flex the child's neck forward at the level of the shoulders while extending the head. Position the opening of the external ear canal at the level of or in front of the anterior aspect of the shoulder while the head is extended. Avoid hyperextending the neck because this may obstruct the airway.* *Children under 2 years of age may require padding under the occiput. Younger children and infants may need padding under the shoulders or upper torso to prevent excessive flexion of the neck that can occur when the prominent occiput rests on a flat surface."* Show the class the drawings of the sniffing position in the 2011 PALS book, figure 4 page 64. **Newborn Care – Suctioning the Airway** According to the 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, suctioning the airway in the newborn may cause bradycardia. It is recommended that suctioning the newborn immediately following birth (including the use of a bulb syringe) should only be done in newborns who have an obvious obstruction to spontaneous breathing or who require positive pressure ventilation. The presence of meconium does not in itself require suctioning.

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NCCR Topic	**CAPNOGRAPHY**
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	*By the end of this lesson, the student will be able to:* Compare and contrast the difference between ventilation and oxygenation Interpret blood oxygenation through the use of a pulse oximeter Discuss how $ETCO_2$ measures ventilation and perfusion Break down the phases of the $ETCO_2$ waveform of a capnography Interpret $ETCO_2$ readings • To assess and monitor proper endotracheal tube placement • To determine and monitor effective ventilation • To determine and monitor effective perfusion • To determine and monitor effective diffusion
Curriculum Hours	1 hour
CONTENT	**Oxygenation and Ventilation - What is the difference?** **Oxygenation and Ventilation** • Two completely different and separate functions • Oxygenation is the transport of O_2 via the bloodstream to the cells • Oxygen is required for metabolism • Ventilation is the exhaling of CO_2 via the respiratory tract • Carbon dioxide is a byproduct of metabolism **Oxygenation - Measured by pulse oximetry (SpO_2)** • Noninvasive measurement • Percentage of oxygen in red blood cells • Changes in ventilation take minutes to be detected • Affected by motion artifact, poor perfusion and some dysrhythmias →→

Ventilation - Measured by the end-tidal CO_2

- Partial pressure (mmHg) or volume (% vol) of CO_2 in the airway at the end of exhalation
- Breath-to-breath measurement provides information within seconds
- Not affected by motion artifact, poor perfusion or dysrhythmias
- SpO_2 measures percentage of O_2 in red blood cells
- Reflects change in oxygenation within 5 minutes
- Ventilation
- Carbon dioxide from metabolism
- $ETCO_2$ measures exhaled CO_2 at point of exit
- Reflects change in ventilation within 10 seconds

Physiology

- Carbon dioxide can be measured
- Arterial blood gas is $PaCO_2$
- Normal range: 35-45mmHg
- Mixed venous blood gas $PeCO_2$
- Normal range: 46-48mmHg
- Exhaled carbon dioxide is $ETCO_2$
- Normal range: 35-45mmHg

End-tidal CO_2 ($ETCO_2$) Reflects changes in

- Ventilation - movement of air in and out of the lungs
- Diffusion - exchange of gases between the air-filled alveoli and the pulmonary circulation
- Perfusion - circulation of blood
- End-tidal CO_2 ($ETCO_2$)
- Monitors changes in
    - Ventilation – (e.g. asthma, COPD, airway edema, foreign body, stroke)
    - Diffusion – (e.g. pulmonary edema, alveolar damage, CO poisoning, smoke inhalation)
    - Perfusion – (e.g. shock, pulmonary embolus, cardiac arrest, severe dysrhythmias)

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Why Measure Ventilation— Intubated Patients

Discuss the $ETCO_2$ findings and show example capnographs regarding the following situations:

- Verify and document ET tube placement
- Immediately detect changes in ET tube position
- Assess effectiveness of chest compressions
- Earliest indication of ROSC
- Indicator of probability of successful resuscitation
- Optimally adjust manual ventilations in patients sensitive to changes in CO_2

Why Measure Ventilation— Non-Intubated Patients

Discuss the $ETCO_2$ findings and show example capnographs regarding the following situations:

- Objectively assess acute respiratory disorders
  - Asthma
  - COPD
- Possibly gauge response to treatment
- Gauge severity of hypoventilation states
- Congestive heart failure
- Sedation and analgesia
- Stroke
- Head injury
- Assess perfusion status
- Noninvasive monitoring of patients in DKA
- Interpreting $ETCO_2$ and the capnography waveform

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Capnography Waveform

Normal waveform of one respiratory cycle (Similar to ECG)

- Height shows amount of CO_2
- Length depicts time
- Waveforms on screen and printout may differ in duration
- On-screen capnography waveform is condensed to provide adequate information the in 4-second view
- Printouts are in real-time
- Capnograph detects only CO_2 from ventilation
- No CO_2 present during inspiration
- Baseline is normally zero

Capnogram Phase I - Dead Space Ventilation

- Beginning of exhalation
- No CO_2 present
- Air from trachea, posterior pharynx, mouth and nose
- No gas exchange occurs there
- Called “dead space”

Capnogram Phase II - Ascending Phase

- CO_2 from the alveoli begins to reach the upper airway and mix with the dead space air
- Causes a rapid rise in the amount of CO_2
- CO_2 now present and detected in exhaled air

Capnogram Phase III - Alveolar Plateau

- CO_2 rich alveolar gas now constitutes the majority of the exhaled air
- Uniform concentration of CO_2 from alveoli to nose/mouth
- CO_2 exhalation wave plateaus

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Capnogram Phase III - End-Tidal

- End of exhalation contains the highest concentration of CO_2
- The "end-tidal CO_2"
- The number seen on your monitor
- Normal $ETCO_2$ is 35-45mmHg
- End of the wave of exhalation

Capnogram Phase IV - Descending Phase

- Inhalation begins
- Oxygen fills airway
- CO_2 level quickly drops to zero
- Inspiratory downstroke returns to baseline
- Capnography Waveform
- Normal range is 35-45mm Hg (5% vol)

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NCCR Topic	**ADVANCED AIRWAY MANAGEMENT IN THE PERFUSING PATIENT**
Patient Group	Adult
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	*By the end of this lesson, the student will be able to:* • Differentiate between airway management, ventilation, and oxygenation • Compare and contrast the advantages and disadvantages of various advanced airway adjuncts • Justify the use of an endotracheal tube to protect a patient's airway • Recognize correct endotracheal tube placement using clinical assessment techniques • Analyze the efficacy of endotracheal tube confirmation placement devices • Demonstrate competency in placing an endotracheal tube in a simulated airway • Evaluate and report proper endotracheal tube placement using clinical assessment and available devices
Curriculum Hours	1 hour
CONTENT	*This lesson plan does not address airway management in the cardiac arrest patient. Please see the "Cardiac Arrest" lesson plan for airway management in the pulseless, apneic patient.* Many EMS providers lump "airway" topics together which fails to focus providers on three important decisions and/or skills that are necessary to assure adequate respiratory function. This topic is about "airway," a passage for air from the nares to the alveoli. It is not a topic about air movement (ventilation), or a topic about oxygenation (saturation of hemoglobin). When respiratory system function is less than optimal EMS providers need to keep these three functions separate. A breathing person can aspirate gastric contents • One ounce of aspirated gastric juice is a lethal dose. If it can digest a hamburger, imagine what it does to your lungs →→

Blood can flow around the body that is very desaturated of oxygen and opening an airway on this patient will not resolve the desaturation.

Airway, ventilation and oxygenation are three separate issues and must be thought of as three separate considerations during patient care.

- Airway management is establishing a conduit for air passage
    - Some patients need airway management without ventilation (ex: Edema to the upper airway)
- Ventilation is a mechanical process of moving air into and out of the alveoli
    - Some patients require ventilation who do not require advanced airway management
- Oxygenation is the saturation of hemoglobin with oxygen
    - Some patients need oxygenated that have an open airway and are ventilating adequately (ex: SpO_2 less than 94% on room air)

Multiple Airway Tools Available

- Supraglottic
    - Examples
        - Laryngeal mask airway (e.g. LMA)
        - Esophageal-tracheal tube (e.g. Comb tube™)
        - Laryngeal tube (e.g. King LT™)
    - Advantages
        - Does not require visualization of the glottis (blind insertion)
        - Initial training and maintenance of skills are easier
        - Chest compressions do not need to be interrupted to insert
        - Minimal equipment required for insertion
    - Disadvantages
        - Some devices contraindicated in patients at risk for regurgitation which can lead to aspiration (e.g. LMA)
        - Unrecognized improper placement can occur
        - Explain the specific contraindications that are in use in your system

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- Endotracheal Tube (ETT)
  - Advantages
    - Keeps the airway patent
    - May protects the airway from aspiration
    - Allows suctioning of deep airway secretions
    - Potential route for drug administration
  - Disadvantages
    - Initial training difficult
    - Skill maintenance insufficient
    - Trauma to the oropharynx
    - Hypoxemia from prolonged intubation attempt
    - Failure to recognize tube displacement or misplacement

There is a high incidence of complications when intubation is performed by inexperienced providers or monitoring of tube placement is inadequate.

Techniques to open the airway

- Must be proficient at basic airway management before performing advanced airway management

ETT as an airway protective skill

- Requires back-up adjunct
- Effective preoxygenation
- Perfusing vs. non-perfusing
- Facilitates some ventilation decisions
  - Unprotected airway
  - Prolonged need for ventilation
  - Restricted airflow
  - Head injuries
  - Rapidly deteriorating airway
    - Anaphylaxis
    - Airway burns
    - Severe asthma
  - Severe facial trauma
    - Poor mask seal
  - Rapidly deteriorating mental status

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Verifying Endotracheal Tube Placement

The following statement should be read to the class:

2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (Part 8: Adult Advanced Cardiovascular Life Support pp. S733) states:

> *"Providers should always use both clinical assessment and devices to confirm endotracheal tube location immediately after placement and throughout the resuscitation. All confirmation devices should be considered adjuncts to other confirmation techniques."*

Detection of exhaled CO_2 is one of several independent methods of confirming ETT position. Continuous waveform capnography is recommended in addition to clinical assessment as the most reliable method of confirming and monitoring correct placement of an endotracheal tube (Class I, LOE A).

Given the simplicity of colorimetric and non-waveform exhaled CO_2 detectors, these methods can be used in addition to clinical assessment as the initial method for confirming correct tube placement in a patient in cardiac arrest when waveform capnography is not available (Class II, LOE B) However, studies of colorimetric exhaled CO_2 detectors and non-waveform $PETCO_2$ capnometers indicate that the accuracy of these devices does not exceed that of auscultation and direct visualization for confirming the tracheal position of an endotracheal tube in victims of cardiac arrest."

Psychomotor Standard

No person should be given credit for meeting this National Core Competency Requirement without successfully demonstrating this skill and receiving a passing score on an NREMT developed skill sheet for endotracheal intubation. Examiners that validate this skill should be the instructor or training officer of the class. If the cognitive class lecture takes place at a different location, the skill of endotracheal intubation must be validated by the training officer.

You may retrieve the NREMT developed skill sheet for endotracheal intubation on the NREMT website.

https://www.nremt.org/nremt/downloads/Ventilatory_Management_Adult.pdf

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NCCR Topic	**POST-RESUSCITATION CARE** • Recognition of Return of Spontaneous Circulation (ROSC) • Oxygenation • Induced hypothermia (only limited depth and breadth)
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	*By the end of this lesson, the student will be able to:* • Identify the signs of ROSC • Describe the principles of optimization of ventilation and oxygenation • Identify signs of hemodynamic instability and state the correct management • Identify the potential cause of a cardiac arrest, and correctly manage the patient based on that cause (including appropriate destination) • Appreciate the benefits of induced hypothermia in post cardiac arrest management • Describe the process of induced hypothermia • Describe systems of care necessary for improving post cardiac arrest outcomes
Curriculum Hours	2 hours
CONTENT	**Recognition of ROSC** • In the cardiac arrest patient, CPR must be continued until signs of life are observed o Sudden increase of $ETCO_2$ level o Presence a pulse after an organized rhythm is observed o Patient breathing o Patient movement →→

Optimizing ventilation and oxygenation in the post cardiac arrest patient

The goal for oxygenation in the post cardiac arrest patient is to

- Maintain an SpO_2 of greater than or equal to 94%
    - Once your patient's SpO_2 is 94%, more oxygen is not necessarily better
- Avoid excessive ventilation (over-bagging)
    - Reduces cardiac output
    - Decreases cerebral blood flow
- $ETCO_2$ between 35-40mm/Hg

Consider elevating the head of the stretcher approximately 30° if the patient will tolerate it

- Reduces cerebral edema
- Reduces aspiration and pneumonia

Hemodynamic instability in the post-cardiac arrest patient

- Monitor vital signs
- Assure vascular access
- Monitor and manage cardiac hemodynamics

Management

- Hypotension – Systolic BP less than 90mm/Hg
    - Fluid bolus
        - Cold fluids may be used to initiate induced hypothermia protocol
    - Vasopressors (drips) titrated to systolic BP of at least 90mm/Hg or Mean Arterial Pressure (MAP) of 65
        - Dopamine
        - Dobutamine
        - Norepinephrine
        - Epinephrine
- Arrhythmias
    - Treat cardiac arrhythmias as required
    - Do not administer antiarrhythmics prophylactically

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Identifying the potential cause of cardiac arrest

- Obtain and interpret a 12-lead EKG
  - Evidence of AMI may require transport to a specialized facility for further treatment
- Consider and manage reversible causes

Induced hypothermia

- Following cardiac arrest cellular damage begins an inflammatory cascade that often results in hyperthermia which has been associated with negative outcomes
- Intentional reduction of core body temperature which can be accomplished by a variety of methods
  - Application of cold packs to the axilla, groin and neck
  - Administration of chilled IV fluid boluses
    - Can vary with protocol
    - May be as much as 30mL/kg
  - Target temperature 32-34° C
    - Can be held at that temperature up to 24 hours
    - Temperature measurement is an in-hospital consideration
      - Axillary and oral temperatures are inadequate for measuring core temperature
      - Tympanic is rarely available and may be unreliable
- Has been shown to increase the survivability in patients with ROSC
- Requires coordination between the out-of-hospital systems and receiving facilities
- Controlling the patient's core temperature slows cellular metabolism, reducing cell damage and death
- In some systems, this is initiated in the out-of-hospital environment and continued in the Emergency Department

System of care to ensure coronary reperfusion

Most deaths following ROSC occur within the first 24 hours

- Triage to the most appropriate facility for the patient
  - May include transport or transfer to an alternate facility
    - STEMI/PCI Center
    - Cardiac Center
    - Therapeutic Hypothermia Centers

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NCCR Topic	**VENTRICULAR ASSIST DEVICES (VADs)**
Patient Group	Adult
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Equipment Needed	
Learning Objectives	*By the end of this lesson, the student will be able to:* • Discuss the function of ventricular assist devices (VAD) assessment and care of patients who have VADs
Curriculum Hours	0.5 hour
CONTENT	**Ventricular Assist Devices (VADs)** A mechanical device that is placed inside a person's chest, where it helps the heart pump oxygen-rich blood throughout the body. • Implanted in heart failure patients • Replaces the function of the ventricles in circulating blood • Sometimes implanted as a temporary treatment, and sometimes used as a permanent solution to very low cardiac output **Assessment** • Initial assessment remains the same • *Most VADs produce continuous flow, therefore these patients will not have a palpable pulse, or measurable blood pressure* • Attempt to auscultate over the lest chest for a "whirling" or "smooth, humming" sound indicating that the VAD is working • SpO_2 readings may be inaccurate because of a weak or absent pulse • Mental status and skin findings are most helpful with assessment of perfusion • A cable exits the abdominal wall that connects the device to power and the control unit • Many VAD patients also have an implanted cardiac defibrillator (ICD) • Many ER admits in VAD patients are secondary to infection, not cardiac problems. Assess for signs of infection (especially at the insertion point) or sepsis • Your patient and family members are experts on the device • The patient and/or family will have an identification card that has contact information for the VAD coordinator (call them) • Review local protocol for transport destination →→

	Management
	• Verify the patient's DNR status
	• Allow the patient and caregiver to guide your interaction with the device
	• *Keep batteries and controller within reach and secured to the patient*
	• Use caution when cutting and removing clothes, to avoid damaging the device
	• Administer fluid boluses and vasopressors as you would with any other patient as indicated by signs of inadequate perfusion
	  o When in doubt, administer a fluid bolus
	• Verify if chest compressions are indicated with the patient's specific device
	  o Consult family
	  o View VAD identification card
	  o Consult with VAD coordinator
	• Use electrical therapy as you would with any other patient. Avoid placing the pads directly over the device (consider anterior-posterior pad placement)

NCCR Topic	**STROKE** • Assessment • Oxygen administration • Time of onset (duration) • Transport destination • Fibrinolytics check sheet
Patient Group	Adult
Provider Level	Paramedic
Instructor Prep	Review National EMS Education Standards Review current AHA Guidelines
Curriculum Hours	1.5 hours
Learning Objectives	*By the end of this lesson, the student will be able to:* • Using an out-of-hospital stroke assessment tool, identify patients who are possibly experiencing cerebral ischemia • Discuss the proper administration of oxygen in the presence of cerebral ischemia • Discuss the importance of determining when the patient was last seen without signs or symptoms • Identify patients that can benefit from rapid transport most appropriate stroke hospital • Argue the importance of starting the fibrinolytics check sheet
CONTENT	**Out-of-hospital stroke assessment tool** • Specific tool used will be determined by local protocol • Examples include o Cincinnati Prehospital Stroke Scale o Los Angeles Prehospital Stroke Screen o Miami Emergency Neurologic Deficit Checklist • Signs and Symptoms assessed by these tools o Symmetry of the face o Weakness of extremities o Speech difficulties o Coordination →→

- Evaluate blood glucose levels
  - Treat only if less than 60 mg/dL
  - Hyperglycemia is associated with a poor clinical outcome
  - Hypoglycemia may mimic stroke

- Communicate assessment findings to the hospital while en route
  - Allows for early activation of the stroke team

The goal for oxygenation in the stroke patient is to maintain an SpO_2 of 94% to avoid oxygen toxicity

- High flow oxygen decreases cerebral blood flow
- High levels of oxygen produce free-radicals result in cerebral edema and vasodilation

Importance of accurately determining the time that the patient was last seen normal

- Some strokes are treated with fibrinolytics (tPA) which has a limited therapeutic window
- Some strokes are treated with endovascular interventions
  - Angioplasty and stenting
  - Mechanical clot disruption
  - Clot extraction

Definitive care for the stroke patient is delivered at a hospital that specializes in the management for stroke patients. Optimal out-of-hospital care for the stroke patient is recognition and rapid transport.

Fibrinolytics check sheet should be started during transport when patient condition permits. Use is determined by local protocol

- Expedites the care at receiving hospital
- May be the only time the information can be gathered if the patient's condition deteriorates

NCCR Topic	**CARDIAC ARREST**
	• Chain of survival
	• Optimal chest compressions
	  o Depth, rate, recoil and pause
	• Airway issues in cardiac arrest
	  o Halting CPR to intubate
	  o Hyperventilation
	  o Supraglottic vs. ETT vs. BVM
	• Termination decision criteria
	  o NAEMSP/AHA position
	• $ETCO_2$ changes during arrest and ROSC

Patient Group	Adult
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Curriculum Hours	2 hours

Learning Objectives	*By the end of this lesson, the student will be able to:*
	• Review the chain of survival
	• Describe the current techniques of one and 2-Rescuer CPR
	• Discuss airway issues in cardiac arrest management
	• Determine criteria for field termination of cardiac arrest
	• Review ALS management of cardiac arrest
	  o Airway management
	  o Vascular access
	  o Pharmacology
	• Demonstrate the current techniques of single and 2-Rescuer CPR
	• Demonstrate the current techniques of cardiac arrest management

CONTENT	**Chain of survival** **There are 5 links in the adult Chain of Survival** • Immediate recognition of cardiac arrest and activation of the emergency response system • Early cardiopulmonary resuscitation (CPR) with an emphasis on chest compressions • Rapid defibrillation • Effective advanced life support • Integrated post-cardiac arrest care →→

A strong chain of survival can improve chances of survival and recovery for victims of heart attack, stroke, and other emergencies.

Optimal Chest compressions

- Push hard, push fast
- Minimum of 100 per minute
- The number of compressions per minute is an important determinant of return of spontaneous circulation and good neurological outcomes
- Heel of one hand over the center of the patient's chest (lower half of the sternum) and the heel of the other hand over the first so the hands are overlapped and parallel
- Compress approximately 2 inches
- Allow complete recoil of chest between compressions
- Minimize interruption
    - Ventilation/Compression Ratio
        - 2 breaths after every 30 compressions
        - Each breath should take about 1 second
        - Ventilate with enough volume to observe chest rise

ALS Management of Cardiac Arrest

- Airway management
    - BVM
        - Avoid hyperventilation as it decreases preload
        - Best technique is the 2-Rescuer technique with one rescuer holding mask seal and the other squeezing the bag with both rescuers watching for chest rise
        - 2 breaths for every 30 compressions without an advanced airway
        - One breath every 6-8 seconds after placement of advanced airway
        - May need to adjust ventilator rate based on capnography
    - Endotracheal Tube (ETT)
    - Compressions should not be interrupted in the placement of an ETT
    - Supraglottic airways
        - Considered an advanced airway
        - Alternative to ETT placement
        - Acceptable during CPR
        - Capnography should be attached to these airways

→→

- Continuous waveform capnography
  - Typically 35-45mm/Hg in a normally perfusing patient
  - Greater than 45 mm/Hg
    - Ensure adequate ventilatory rate and volume
  - 15-35 mm/Hg
    - common in cardiac arrest patients with CPR in progress
  - less than 10-15 mm/Hg
    - Focus efforts on improving chest compressions
    - Make sure the victim is not receiving excessive ventilations
  - A sudden increase in $ETCO_2$ could indicate a return of spontaneous circulation (ROSC)

Use caution with interpretation of $ETCO_2$ values within 1-2 minutes after administration of epinephrine due to decreased pulmonary blood flow.

Termination of Efforts in Cardiovascular Resuscitation

According to AHA guidelines, the EMT is able to terminate resuscitative efforts if all three of the following conditions are present:

- Arrest not witnessed
- Bystander CPR was not performed
- No ROSC after full ACLS (minimum of 20 minutes)
- No AED shocks were delivered

The AHA guidelines also recommend contacting medical direction when considering terminating resuscitative efforts. EMS providers should follow local protocol.

No student should be granted credit for completing this lesson without completion of a scenario-based cardiac arrest skills station. This section of the lesson should only be performed after completion of the Crew Resource Management lesson. This scenario should include the principles of crew resource management identified in that section.

→→

	Cardiac Arrest Scenario **The following psychomotor skills must be performed during this scenario** • Ventilation • Compressions • Electrical therapy • Two minutes of 2-Rescuer CPR before ALS scenario begins • Team leader/team member scenario centered on adult cardiac arrest **During management of the cardiac arrest, each student must:** • Direct the team management of this patient using proper crew resource management techniques • Correctly interpret and physically manage a rhythm that requires electrical therapy • Draw up and administer the correct amount of a medication appropriate to the scenario *At all times, the paramedic must ensure that effective chest compressions, airway management and ventilations are maintained.*

NCCR Topic	**CONGESTIVE HEART FAILURE (CHF)** • Recognition • Treatment
Patient Group	Adult
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	*By the end of this lesson, the student will be able to:* • Recognize the patient who is experiencing congestive heart failure • Discriminate appropriate and inappropriate treatment modalities in CHF
Curriculum Hours	0.5 hour
CONTENT	**Recognize the patient who is experiencing congestive heart failure** **Congestive heart failure is compensated cardiogenic shock** • Review the blood flow through the heart and lungs o No valves between left atria and lungs ▪ Can allow fluid back-up • Review heart valves • Differentiate the pressure difference between circulatory vessels and the capillary beds o Lungs o Periphery **COMMON CAUSES OF CHF** **Increased peripheral vascular resistance (PVR)** • Chronic hypertension o Increased left ventricular workload o Hypertrophy/cardiomegaly o P mitrale • Chronic COPD • Pulmonary emboli • Non-compliance with medications →→

Ventricular failure

- Myocardial Infarction
  - AMI
  - Previous MI with ventricular involvement
  - Non-compliance with medications

Fluid overload

- Non-compliance with medications
- Renal failure

PRESENTATION

Congestive heart failure can refer to right or left sided heart failure.

Common signs and symptoms of CHF can include

- Distended neck veins
- Peripheral edema
  - Can be pitting (late sign)
- Crackles and wheezes in dependent portions of the lungs

Treatment

- Continuous Positive Airway Pressure (CPAP)
  - Positive end expiratory pressure
  - Forces alveoli open and helps keep them open
  - Forces fluid out of alveoli
  - Increases oxygenation
  - Contraindications
    - Inability for the patient to maintain their own airway
    - Hypotension (systolic BP of 90mm/Hg or less) may be a contraindication. Follow local protocol or guidelines.
    - Recent esophageal surgery

→→

	• Nitroglycerin o Peripheral vasodilator o Reduces oxygen demand in the heart o Dilates coronary arteries o Contraindications ▪ Hypotension (systolic BP of 90mm/Hg or less) ▪ If unable to tolerate sublingually, use nitroglycerin paste

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NCCR Topic	**PEDIATRIC CARDIAC ARREST**
	• Optimal chest compressions
	  o Techniques
	• Ventilation/Compression ratio
	  o Single and 2-Rescuer
	• ALS Management
	• Unique causes of pediatric cardiac arrest (only limited depth and breadth)
	  o HOCM
	  o Commotio Cordis
	  o Long QT
	  o AHA channelopathy

Patient Group	Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Curriculum Hours	2.5 hours

Learning Objectives	*By the end of this lesson, the student will be able to:*
	• Describe the current techniques of single and 2-Rescuer CPR in pediatric patients
	• Review ALS management of pediatric cardiac arrest
	  o Airway management
	  o Vascular access
	  o Pharmacology
	• Demonstrate the current techniques of single and 2-Rescuer CPR in pediatric patients
	• Demonstrate the current techniques of pediatric cardiac arrest management
	• Discuss unique causes of pediatric cardiac arrest

CONTENT	**Techniques of single rescuer CPR**
	• Infant (less than one year of age)
	  o Chest compressions
	  ▪ Push hard, push fast
	  ▪ Minimum of 100 per minute
	  ▪ 1/3 depth of chest wall (about 1 ½ inches)
	  ▪ Allow complete recoil of chest between compressions
	  ▪ Minimize interruption
	  ▪ 2-fingers just below the inter-mammary (nipple) line
	→→

- Ventilation/Compression Ratio
  - Resuscitation outcomes in infants and children are best if compressions are combined with ventilations
  - Two breaths after every 30 compressions
  - Each breath should take about 1 second
  - Ventilate with enough volume to observe chest rise

- Child (1 year of age until onset of puberty)
  - Chest compressions
    - Push hard, push fast
    - Minimum of 100 per minute
    - Use one or two hands on the lower half of the sternum
    - Compress 1/3 depth of chest wall (approximately 2 inches)
    - Allow complete recoil of chest between compressions
    - Minimize interruption
  - Ventilation/Compression Ratio
    - Resuscitation outcomes in infants and children are best if compressions are combined with ventilations
    - Two breaths after every 30 compressions
    - Each breath should take about 1 second
    - Ventilate with enough volume to observe chest rise

Techniques of 2-Rescuer CPR

- Rescuer fatigue can lead to inadequate rate, depth and recoil in CPR in minutes, even when the rescuer does not feel fatigued

- When performing 2-Rescuer CPR, rotate the rescuer who is performing compressions with the rescuer who is performing ventilations every two minutes.

- Infant (less than one year of age)
  - Chest compressions
    - Push hard, push fast
    - Minimum of 100 per minute
    - 1/3 depth of chest wall (about 1 ½ inches)
    - Allow complete recoil of chest between compressions
    - Minimize interruption
    - Two thumb encircling hands technique, just below the inter-mammary (nipple) line

→→

- Ventilation/Compression Ratio
  - Resuscitation outcomes in infants and children are best if compressions are combined with ventilations
  - 2 breaths after every 15 compressions
  - Each breath should take about 1 second
  - Ventilate with enough volume to see chest rise

- Child (one year of age until onset of puberty)
  - Chest compressions
    - Push hard, push fast
    - Minimum of 100 per minute
    - Use one or two hands on the lower half of the sternum
    - Compress 1/3 depth of chest wall (approximately 2 inches)
    - Allow complete recoil of chest between compressions
    - Minimize interruption
  - Ventilation/Compression Ratio
    - Resuscitation outcomes in infants and children are best if compressions are combined with ventilations
    - 2 breaths after every 15 compressions
    - Each breath should take about 1 second
    - Ventilate with enough volume to see chest rise

ALS Management of Pediatric Cardiac Arrest

- Airway management
  - BVM
    - 2 breaths for every 30 compressions (one-rescuer)
    - 2 breaths for every 15 compressions (2-Rescuer)
  - Endotracheal Tube (ETT)
    - Requires special training because of different anatomy in the pediatric patient
    - Can use cuffed or un-cuffed ETT
    - Compressions should not be interrupted in the placement of an ETT

- Continuous waveform capnography
  - Typically 35-45mm/Hg in a normally perfusing patient
  - Greater than 45 mm/Hg
    - Ensure adequate ventilatory rate and volume
  - 15-35 mm/Hg
    - Common in cardiac arrest patients with CPR in progress

→→

- less than 10-15 mm/Hg
  - Focus efforts on improving chest compressions
  - Make sure the victim is not receiving excessive ventilations

- A sudden increase in $ETCO_2$ could indicate a return of spontaneous circulation (ROSC)
- Use caution with interpretation of $ETCO_2$ values within 1-2 minutes after administration of epinephrine due to decreased pulmonary blood flow

- Vascular access
  - Limit the amount of time spent obtaining vascular access
  - Intraosseous (IO)
    - Rapid, safe and effective
    - All IV fluids and resuscitation medications can be administered via IO
  - IV
    - Placement may be difficult in a critically ill patient

- Pharmacology
  - Length based resuscitation devices (e.g. Broslow® tape)
    - Have been clinically validated as a predictor of body weight
    - Often have the doses for common resuscitation medications

- Unique causes of pediatric cardiac arrest
  - Drug overdose –toxic levels of drugs can occur, even if small amounts are ingested
  - Hypertrophic Cardiomyopathy (HOCM) – Heart muscle becomes thick. Many patients have no symptoms. Often, the first symptom of HOCM in young patients is sudden collapse and possible sudden cardiac arrest. Almost half of sudden cardiac arrests due to HOCM occur immediately after physical activity
  - Commotio Cordis – Cardiac arrest secondary to blunt trauma to the chest (R on T). Most common in young, healthy patients
  - Long QT - AHA channelopathy – Previously undiagnosed conduction abnormalities leading to sudden cardiac arrest

No student should be granted credit for completing this lesson without completion of a scenario-based pediatric cardiac arrest skills station.

→→

	Pediatric Cardiac Arrest Scenario should include
	
	• Two minutes of 2-Rescuer CPR before ALS scenario begins
	• Team leader/team member scenario centered on pediatric cardiac arrest
	• During management, the student must
	  o Demonstrate the accurate use of a length-based resuscitation tape by determining
	  o The dose of appropriate resuscitation medications
	  o Appropriate ETT size
	  o Defibrillation energy
	• Establish appropriate vascular access
	• Draw up and administer the correct amount of a medication appropriate to the scenario
	
	At all times, the paramedic must ensure that effective chest compressions, airway management and ventilations are maintained.

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NCCR Topic	**ACUTE CORONARY SYNDROME (ACS)** • 12-lead review • STEMI imposters
Patient Group	Adult
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	*By the end of this lesson, the student will be able to:* • Recognize injury patterns on a 12-lead EKG • Differentiate STEMI from STEMI imposters
Curriculum Hours	1 hour
CONTENT	**Recognize injury patterns on a 12-lead EKG** • Review the anatomical view of the heart with each lead • Provide 12-lead examples that demonstrate STEMI's from each area of the heart **Differentiate STEMI from STEMI imposters** • Common STEMI imposters (provide examples of 12-lead EKGs that show imposters) o Left ventricular hypertrophy o Bundle branch blocks ▪ It is difficult to determine an acute from a chronic left bundle branch block without access to a previous 12-lead EKG ▪ A left bundle branch block, without other signs or symptoms of MI is not a STEMI o Implanted pacemakers o Pericarditis

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NCCR Topic	**CENTRAL NERVOUS SYSTEM (CNS) INJURY** • Sports injuries o Concussion • $ETCO_2$ Monitoring
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	*By the end of this lesson, the student will be able to:* • Recognize the signs, symptoms, and the historical findings of a patient with a concussion • Advocate for patient transport and proper patient education around the effects of concussions • Discuss using $ETCO_2$ readings as a guide for altering ventilation rates in head injury patients
Curriculum Hours	2 hours
CONTENT	**Signs And Symptoms Of A Concussion** **Observed Signs** • Appears dazed or stunned • Is confused about events • Repeats questions • Answers questions slowly • Can't recall events prior to the hit, bump, or fall • Can't recall events after the hit, bump, or fall • Loses consciousness (even briefly) • Shows behavior or personality changes • Forgets class schedule or assignments →→

Physical Symptoms

- Headache or “pressure” in head
- Nausea or vomiting
- Balance problems or dizziness
- Fatigue or feeling tired
- Blurry or double vision
- Sensitivity to light
- Sensitivity to noise
- Numbness or tingling
- Does not “feel right”

Cognitive Symptoms

- Difficulty thinking clearly
- Difficulty concentrating
- Difficulty remembering
- Feeling more slowed down
- Feeling sluggish, hazy, foggy, or groggy

Emotional Symptoms

- Irritable
- Sad
- More emotional than usual
- Nervous

→→

Care And Education Of The Concussion Patient

- If you suspect your patient has a concussion, transport them to the appropriate facility
- If the patient refuses transport, educate them over the following warning signs and tell them if any are present, to seek medical attention
    - One pupil larger than the other
    - Drowsiness or cannot be awakened
    - A headache that gets worse and does not go away
    - Weakness, numbness, or decreased coordination
    - Repeated vomiting or nausea
    - Slurred speech
    - Convulsions or seizures
    - Difficulty recognizing people or places
    - Increasing confusion, restlessness, or agitation
    - Unusual behavior
    - Loss of consciousness (even a brief loss of consciousness should be taken seriously)

$ETCO_2$ as a guide for ventilations

Using $ETCO_2$ measurements to determine the appropriate ventilatory rate in patients with isolated head injuries is controversial.

There is little evidence to support the titration of ventilation according to specific $ETCO_2$ values.

In one study (Davis et. all, J Trauma 2004 57;1, 1-10), patients with $ETCO_2$ readings under 27mm/Hg had higher mortality.

According to the Traumatic Brain Foundation guidelines, patients should be maintained with normal breathing rates ($ETCO_2$ 35-40mm/Hg) and hyperventilation ($ETCO_2$ less than 35mm/Hg) should be avoided unless the patient shows signs of cerebral herniation.

Some experts recommend the use of $ETCO_2$ for trending purposes with the understanding that $ETCO_2$ and $PaCO_2$ do not correlate well in the severely ill or injured patient.

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NCCR Topic	**TOURNIQUETS**
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	*By the end of this lesson, the student will be able to:* • Weigh the benefits vs. the risks of tourniquet application • Advocate for the early application of a tourniquet • Demonstrate rapid application of a tourniquet
Curriculum Hours	0.5 hour
CONTENT	The instructor should demonstrate the application of both an improvised and a commercially available tourniquet commonly used in your area. **Risks And Benefits Of Early Tourniquet Application** (PHTLS p.211 cite 13, 14) • Direct pressure is the primary bleeding control technique, followed by the application of a tourniquet in ongoing and uncontrolled bleeding • Battlefield application of tourniquets has reduced mortality • Tourniquet does not require a provider at the patient's side; thus capable of completing other tasks • Risk of permanent tissue is less than previously thought if used correctly for short periods of time (under 2hrs) • Small risk of limb being sacrificed does not compare to conserving life • Pressure points are no longer recommended. No evidence suggests benefit • Do not delay use of an improvised tourniquet while waiting for a commercial device **Early application** • If direct pressure doesn't immediately control the hemorrhage, a tourniquet should be applied. **Psychomotor** *No student should receive credit for this lecture unless he or she has properly applied a tourniquet on a simulated patient.*

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NCCR Topic	**FIELD TRIAGE** • MUCC (Model Uniform Core Criteria) • CDC Field Triage Decision Scheme • SALT (Sort, Assess, Lifesaving Interventions, Treatment/Transport)
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review CDC Trauma Triage Decision Scheme
Learning Objectives	*By the end of this lesson, the student will be able to:* • Recognize the impact that MUCC had on the development of the CDC Field Triage Decision Scheme and SALT • Identify the triage criteria in the CDC's Field Triage Decision Scheme • Compare and contrast your local trauma triage practices and the CDC's Field Triage Decision Scheme • Triage patients using the SALT algorithm in a simulated multiple casualty scenario
Curriculum Hours	1 hour
CONTENT	**MUCC (Model Uniform Core Criteria)** A science and consensus-based national guideline that recommends 24 core criteria for all mass casualty triage systems. • Used as the basis for CDC Field Triage Decision scheme and SALT (Sort, Assess, Lifesaving Interventions, Treatment/Transport) • http://www.ems.gov/pdf/2011/December/10-MUCC_Options_Paper_Final.pdf **CDC Field Triage Decision Scheme** http://www.cdc.gov/mmwr/pdf/rr/rr6101.pdf →→

	SALT Triage Construct a mock MCI with either simulated patients or note cards, and have each student practice triaging patients with the SALT tool. http://www.naemsp.org/PublishingImages/SALT%20Mass%20Casualty%20Triage_Final.jpg *If time permits, have groups of students evaluate the local MCI protocol for MUCC compliance. Otherwise, the instructor should demonstrate the evaluation of the local MCI protocol for MUCC compliance.*

NCCR Topic	**FLUID RESUSCITATION** • Physiology • Effects of over-loading
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	*By the end of this lesson, the student will be able to:* • Explain the concept of permissive hypotension and the dangers of excessive crystalloid administration • Debate local interpretation of evidence based practice regarding fluid resuscitation
Curriculum Hours	0.5 hour
Content	**Fluid Therapy** Permissive hypotension - allowing specific patients to experience some degree of hypotension in certain settings. • The goal of fluid resuscitation is to maintain vital organ perfusion • Level of consciousness is an indicator of vital organ perfusion • Assessment of the level of consciousness may guide the need for fluid administration • Normalization of blood pressure through fluid administration may be harmful and is discouraged **Dangers of excessive crystalloid administration** • Dilution of clotting factors and platelets • Physical disruption of a clot • Expanding the area of vascular defect as blood pressure increases • Enhances red blood cell loss, thus reducing the total oxygen carrying capacity of the blood →→

	Discussion Out of hospital fluid resuscitation is a controversial topic. Below are several different organizations' opinions on fluid resuscitation. Review and discuss current research and position statements from relevant sources. • Restrictions on IV fluid administration have been suggested by some to protect trauma patients from preventable death • Another consensus paper asserts that IV fluids should not be administered in penetrating trauma patients if a central pulse is present, and that under no circumstances should IV administration delay transport • Current military teaching often recommends the hypotensive resuscitation strategy, suggesting fluid administration based on physiologic signs rather than using IV fluids in all patients • Advanced Trauma Life Support still currently recommends IV fluid administration for many patients, but suggests that small fluid boluses should be given to "maintain life until definitive care is possible" and suggesting that "a less than normal blood pressure is acceptable" in the austere or hostile environments • Defend the merits of the current local fluid resuscitation protocol and contrast it to best available research

NCCR Topic	**SPECIAL HEALTHCARE NEEDS** • Tracheostomy care • Dialysis shunts • How to deal with patients and equipment o Feeding tubes, CSF shunts, etc. • Cognitive issues
Patient Group	Adult and Pediatric (as appropriate)
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	*By the end of this lesson, the student will be able to:* • Identify and describe common special needs patients seen in EMS • Describe the involvement of caregivers in emergency care of the special needs patient • Describe the difference in patient assessment when dealing with a special needs patient
Curriculum Hours	2 hours

CONTENT	**General considerations when managing a special needs patient**
	
	• Maintain traditional EMS priorities of airway, breathing and circulatory support
	
	• Involve parents/caregivers in the assessment and management of care
	  o Medical history
	  o Is the patient acting appropriately?
	  o Normal baseline vital signs
	  o Medications
	  o Caregiver's "go bag" for the patient
	  ▪ Supplies necessary to manage the patient's special needs
	
	• Speak quietly and calmly
	
	• Employ slower movements and firm, secure contact
	
	• Request that the caregiver accompany EMS when transporting the patient
	
	→→

Special considerations and questions when assessing a special needs patient:

- Latex allergy (greater incidence)
- Developmental level
- Vision or hearing problems
- Do not assume that a child with a physical disability is cognitively impaired
- Preferred hospital

Common devices that can malfunction at home:

- Tracheostomy tube
  - Surgical opening in the trachea (stoma)
  - Oxygen delivery
    - Blow-by
    - Face mask/non-rebreather mask
    - BVM
      - May need an adapter

- Indwelling central venous catheters
  - Can provide nutrition or medications parenterally
  - Potential for infection or occlusion

- Feeding tubes
  - Provide nutrition to patients who are unable to eat by mouth
  - Common complications
    - Infection
    - Occlusion
    - Malpositioned/dislodged tube
    - Tube deterioration

- Cerebrospinal fluid (CSF) shunts
  - Device used to drain excess CSF from the brain
  - Shunt runs from a ventricle in the brain, under the skin, and down the neck into either the peritoneum of the abdomen or the right atrium
  - Common complications
    - Brain infection
    - Obstruction
    - Peritonitis

→→

Cognitive Impairments

Cognitively impaired or non-communicative patients may still be aware of your actions and words.

Despite their apparent age, cognitively impaired patients might still need their caregiver.

Common difficulties encountered in emergency medicine when dealing with cognitively impaired patients in the EMS setting is obtaining an accurate and complete history. Accommodations may be necessary when providing patient care. Allow adequate time for gathering a history, performing assessment and patient management procedures, and preparing the patient for transport.

Common Cognitive Impairments

Mental retardation (MR)

- Generalized disorder appearing before adulthood characterized by significantly impaired cognitive functioning and deficits in two or more adaptive behaviors.
- Syndromic mental retardation - intellectual deficits associated with other medical and behavioral signs and symptoms.
- Non-syndromic mental retardation - intellectual deficits that appear without other abnormalities.

Down Syndrome (Downs)

- A complex of symptoms associated with mental retardation caused by chromosomal abnormalities
- Common physical signs
    - Mental retardation
    - Decreased muscle tone at birth
    - Upward slanting eyes
    - Wide, short hands with short fingers
- Common mental and social complications
    - Impulsive behavior
    - Poor judgment
    - Short attention span
    - Slow learning

→→

	Cerebral Palsy (CP)
	
	• A group of chronic, non-progressive disorders caused by damage to the motor centers of the brain in the early stages of life
	• Most of these problems occur in the womb, but can happen any time during the first two years of life while the brain is developing
	• Characterized by
	  o abnormal muscle tone and posture
	  o muscular spasms
	  o hearing and vision problems
	  o seizures
	• Cause is difficult to determine
	  o May be caused by
	  ▪ Low levels of oxygen
	  ▪ Infection
	  ▪ Head injury
	  ▪ RH incompatibility
	  ▪ Infections in the mother (e.g. Rubella, Herpes Simplex)

**Information from SCOPE (Special Children's Outreach and Prehospital Education)

NCCR Topic	**OB EMERGENCIES**
	• Abnormal presentations
	  o Nuchal cord
	• Neonatal resuscitation
	  o Routine suctioning of the neonate

Patient Group	Adult and Pediatric as applicable
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Time Allotted	1 hour
Learning Objectives	*By the end of this lesson, the student will be able to:* • Understand abnormal presentations present during childbirth • Discuss the actions the EMT would take when managing a patient with an abnormal presentation during delivery • Describe a nuchal cord presentation • Discuss the actions the EMT should take when a nuchal cord is present during delivery • Recognize the need for neonatal resuscitation during delivery • Discuss the management principles of neonatal resuscitation • Discuss the AHA's position on routinely suctioning the airway of a newborn
Curriculum Hours	1 hour

CONTENT	**Abnormal Presentations In Childbirth**
	
	Show pictures of and discuss the following abnormal presentations:
	
	• Breech
	  o Descriptions
	  ▪ Frank - the buttocks are presenting and the legs are up along the fetal chest
	  ▪ Footling - either one foot or both feet are presenting
	  ▪ Complete - the fetal thighs are flexed along the fetal abdomen, but the fetal shins and feet are tucked under the legs
	  o Management - Provide supportive care and transport in the knee-chest position
	
	→→

- Limb presentation
  - One leg or one arm presents first
  - Management - Provide supportive care and transport in the knee-chest position

- Compound
  - Fetal hand coming out with fetal head
  - Management - Provide supportive care and transport in the knee-chest position

- Shoulder presentation
  - The fetal shoulder is presenting first
  - Management - Provide supportive care and transport in the knee-chest position

- Multiple births
  - More than one fetus
  - Management - Provide supportive care, transport and deliver as necessary

- Prolapsed cord
  - The umbilical cord is presenting first
  - Management- Provide supportive care, transport in the knee-chest position and insert gloved hand to apply pressure on the presenting part of the baby between contractions to relieve pressure on the umbilical cord. Relieving compression on the cord will enhance fetal circulation

- Shoulder dystocia
  - Cephalic presentation but the shoulders are unable to be passed beyond the symphysis pubis
  - "Turtle sign"
  - Management - Provide supportive care, perform the McRoberts maneuver (flexion and abduction of the maternal hips and knees to chest to open the pelvic ring) and apply pressure above the symphysis pubis with the heel of your gloved hand to help dislodge the shoulder from beneath the pubic bone

- Nuchal cord
  - Cephalic presentation but umbilical cord is around the neck
  - According to current research Nuchal cords are common and are rarely associated with morbidity or mortality in neonates

→→

Additional OB Emergency Resources

1. Mastrobattista JM et al. Effects of nuchal cord on birth weight and immediate neonatal outcomes. Am J Perinatol. 2005;22(2):83-5.
2. Schäffer L, Burkhardt T, Zimmermann R, Kurmanavicius J. Nuchal cords in term and postterm deliveries—do we need to know? Obstet Gynecol. 2005;106(1):23-8.
3. Sheiner E, Abramowicz JS, Levy A, Silberstein T, Mazor M, Hershkovitz R. Nuchal cord is not associated with adverse perinatal outcome. Arch Gynecol Obstet. 2006 May;274(2):81-3. Epub 2005 Dec 23.

Neonatal Resuscitation

Newborns who do **not** require resuscitation can generally be identified by a rapid assessment of the following 3 characteristics:

- Full term gestation – 37 weeks
- Crying or breathing adequately – ensures patent airway
- Good muscle tone – moving all extremities

If the answer to any of these assessment questions is "no," resuscitation efforts should be attempted in the following sequence:

First 30 seconds post-partum

1. Warm, clean airway if necessary, dry, stimulate

30-60 seconds post-partum

2. If pulse rate below 100, gasping or apnea, initiate positive pressure ventilation with room are and monitor. If labored breathing or persistent cyanosis, clean the airway monitor SpO_2 and consider CPAP

After 1 minute post-partum

3. If pulse rate >100, provide post-resuscitation care. If pulse rate < 100, take ventilation corrective steps (consider intubation)

4. If pulse rate < 60, begin chest compressions, consider intubation, assess for hypervolemia and pneumothorax

→→

	Newborn Care – Routine Suctioning Of The Airway According to the 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, suctioning the airway in the newborn may cause bradycardia. It is recommended that suctioning the newborn immediately following birth (including the use of a bulb syringe) should only be done in newborns who have an obvious obstruction to spontaneous breathing or who require positive pressure ventilation. The presence of meconium does not in itself require suctioning.

NCCR Topic	**COMMUNICABLE DISEASES** • Hygiene (hand washing, etc.) • Vaccines • Antibiotic resistant infections • Influenza • Public health – epidemics, pandemics, reporting, etc. • SIRS vs. sepsis vs. septic shock o Fluid resuscitation • Appropriate precautions
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review CDC recommendations
Learning Objectives	*By the end of this lesson, the student will be able to:* • Understand proper hand washing technique • Identify appropriate use of alcohol-based hand cleaner • Discuss the CDC's recommendations of vaccines for healthcare providers • Describe the risks and prevalence of drug resistant infections • Understand the transmission of influenza virus • Discuss the role of the EMS provider in disease and injury surveillance and reporting • Distinguish between an epidemic and pandemic • Distinguish between SIRS, sepsis and septic shock
Curriculum Hours	1 hour
CONTENT	**Hand washing using soap and water** **When to wash your hands** • Before and after patient contact • Before eating • After cleaning the ambulance or equipment • After using the toilet • After blowing your nose, coughing or sneezing →→

CDC Recommendations

- Remove all jewelry
- Wet your hands with clean running water, and apply soap
- Be sure to scrub the back of your hands, and clean underneath your fingernails
- Continue rubbing your hands for at least 20 seconds
- Rinse your hands well under running water
- Dry your hands using a clean towel or air dry

Alcohol-based hand cleaner

Washing hands with soap and water is the best way to reduce the number of germs on them. If soap and water are not available, use an alcohol-based hand sanitizer that contains at least 60% alcohol. Alcohol-based hand sanitizers can quickly reduce the number of germs on hands in some situations, but sanitizers do **not** eliminate all types of germs.

Alcohol-based hand sanitizers do not kill viruses, but create an inhospitable environment for viruses to live.

Hand sanitizers are not effective when hands are visibly dirty. When your hands are visibly dirty, use soap and water.

How to use alcohol-based hand sanitizers

- Apply the product to the palm of one hand.
- Rub your hands together
- Rub the product over all surfaces of your hands and fingers until your hands are dry
- When soap and water become available, wash your hands

→→

Vaccines available to healthcare provider

Vaccines are an effective means to help prevent the transmission of certain diseases. Some vaccines are attenuated (weakened or killed) viruses, and some vaccines mimic certain diseases to produce antibodies in the blood. Other vaccines provide the antibodies directly.

The instructor should review and discuss the CDC's current vaccine recommendations on vaccines for the health care provider. (http://www.cdc.gov/vaccines/hcp.htm)

Some vaccines that are recommended for the health care provider include (but are not limited to)

- Hepatitis
- Influenza
- MMR (measles, mumps and rubella)
- Varicella
- Pneumococcal
- Pertussis

Antibiotic resistant infections

People infected with drug-resistant organisms are more likely to have longer and more expensive hospital stays, and may be more likely to die as a result of the infection. When the drug of choice for treating their infection doesn't work, they require treatment with second- or third-choice drugs that may be less effective, more toxic, and more expensive. This means that patients with an antimicrobial-resistant infection may suffer more and pay more for treatment.

Antimicrobial drug resistance occurs everywhere in the world and is not limited to industrialized nations. Hospitals and other healthcare settings are battling drug-resistant organisms that spread inside these institutions. Drug-resistant infections also spread in the community at large. Patients with open skin wounds, those that have had recent surgery, or have undergone invasive procedures (e.g. PICC lines, IVs, or other in-dwelling catheters) are more likely to contract an antibiotic resistant infection.

→→

Some common antibiotic resistant infections that the EMS provider will come into contact with are

- MRSA
- VRE
- VRSA

Influenza

According to the CDC

- Influenza viruses
- Spread from person to person
    - Primarily through large-particle respiratory droplet transmission
        - Requires close contact between source and recipient persons
    - Contact with respiratory-droplet contaminated surfaces is another possible source of transmission
    - Airborne transmission via small-particle residue of evaporated droplets that might remain suspended in the air for long periods of time is thought to be possible
- Typical incubation period for influenza is 1-4 days (average: 2 days)
- Adults are contagious from the day before symptoms begin through 5-10 days after onset
- Young children also might be contagious several days before illness onset, and can be infectious for 10 or more days after onset of symptoms
- Severely immunocompromised persons can shed virus for weeks or months

It is estimated that the influenza vaccine is approximately 60% effective. There are many strains of influenza that occur seasonally. The influenza viruses in the seasonal flu vaccine are selected each year based on surveillance-based forecasts about what viruses are most likely to cause illness in the coming season. The seasonal flu vaccine is a trivalent vaccine (a three component vaccine) with each component selected to protect against one of the three main groups of influenza viruses circulating in humans.

→→

Public Health

Epidemic – The occurrence in a community of cases of an illness, specific health related behavior, or other health related events clearly in excess of normal expectancy

Pandemic – A worldwide epidemic

Disease and Injury Surveillance (EMS providers are in a unique position)

- First contact
- Notice trends
- Common symptomatic presentations
- Geographical area

Reporting

- Know who to contact in your system
- Policy/Parameters for what/when to report
- Centralized reporting
    - Help identify local/state/national trends in disease and injury
    - Data needs to be aggregated

SIRS, Sepsis and Septic Shock

Systemic Inflammatory Response Syndrome (SIRS) - Presence of two or more of the following

- Temperature less than 97°F or greater than 100.4°F
- Heart rate greater than 90/minutes
- Respiratory rate greater than 20/minutes

Sepsis – SIRS with a suspected or proven infection

Septic Shock – Sepsis with refractory hypotension or signs of hypoperfusion despite adequate fluid resuscitation

- End organ dysfunction
- Oliguria
- Altered mental status

Patients are considered to have septic shock if they have sepsis plus hypotension after aggressive fluid resuscitation (up to 40ml/kg).

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NCCR Topic	**MEDICATION DELIVERY** • IM vs. SQ (e.g. epinephrine) • Intranasal (nasal atomizer)
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review Local Protocols
Curriculum Hours	1 hour
Learning Objectives	*By the end of this lesson, the student will be able to:* • Discuss why intramuscular (IM) administration is superior to the subcutaneous (SQ) route • Compare and contrast the delivery of medication with a nasal atomizer vs. other routes of administration

CONTENT	**Benefits of IM drug administration over the SQ route**
	
	• With certain drugs (e.g. epinephrine) IM drug administration is more consistent than SQ in the prehospital setting
	  o Obese patients
	  o Pediatrics
	  o Movement of the ambulance
	• Prehospital medications that have previously been given via the SQ route are transitioning to the intramuscular route due to more predictable absorption in critical patients
	  o Peripheral vasoconstriction or poor perfusion (e.g. shock)
	• Larger volumes of medication can be given via the IM route vs. the SQ route
	
	J Allergy Clin/Immunol, 2011 NOV 108(5):871-3 Simons (Epinephrine IM over SQ) Recommend injection into thigh for anaphylaxis
	
	→→

	Intranasal Delivery of Medications
	
	• This delivery technique combines a method of measuring a unit dose of medication
	  o Delivered with a syringe or unit dose pump with a spray tip
	  o Medication is aerosolized into fine particles as it is being sprayed into the nose
	  o Results in a broader distribution of the medication across the nasal mucosa and an increased bioavailability
	
	• Not all medications can be delivered intranasally
	  o Must have the correct pharmacokinetics
	
	• Medications that can be delivered via intranasal route include but are not limited to
	  o Fentanyl
	  o Midazolam
	  o Naloxone
	  o Ketamine
	  o Glucagon
	
	• Split dosage between nares
	  o Max volume in each naris is 1.0mL

NCCR Topic	**PAIN MANAGEMENT** • NAEMSP recommendations • AAP pediatric pain management
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review NAEMSP position paper (link provided below)
Curriculum Hours	1 hour
Learning Objectives	*By the end of this lesson, the student will be able to:* • Summarize the position paper published by the National Association of EMS Physicians regarding Prehospital Pain Management o (http://www.naemsp.org/Documents/POSITION%20PrehospitalPainMgmt.pdf)
CONTENT	**Pain Assessment** • Adequate pain control is not routinely provided for a number of reasons o Most commonly underestimation of patient's needs o EMS personnel may base their judgment on past similar patients o Prehospital protocols should require assessment of pain severity and reassessment and document of the level of pain after every intervention • Tools for pain assessment o Use the same scale to assess and reassess o Interpretation of the signal includes physiologic, psychological, emotional, and behavioral dimensions o Assessment instrument – document ▪ Presence of pain ▪ Intensity of pain ▪ Change in pain severity with time and treatment →→

- Types of scales
  - Numeric Rating Scale
    - "Rate your pain on a scale of 0-10"
    - Proven more reliable in trauma
  - Graphic Scale
    - Commonly used in pediatric patients (see supplement)

Indications and Contraindications of Pain Management

Oligoanalgesia – Under use of analgesics in the face of valid indications for treatment. Typically used to represent the under-use of pain management medications or techniques.

Clinical protocols for prehospital pain management

- Must list clear indications and contraindications for each form of analgesic intervention
- Should be in accordance with protocols from local and regional trauma centers
- Consensus of opinion and acceptance by receiving physicians

Non-pharmacologic interventions for pain management

- Careful use of appropriate wording
- Distraction away from painful stimuli
- In infants and young children, the presence of their parents has shown to reduce the level of distress in both the child and the parents
- Traditional interventions should be provided whether or not pharmacological interventions are used
  - Immobilization of fractures
  - Elevation
  - Ice
  - Padding of spinal immobilization
  - etc.

→→

Pharmacological interventions for pain management – Review of most commonly used agents

- Narcotics (morphine, fentanyl, hydromorphone (Dilaudid®) etc.)
- Ketamine
- Nitrous oxide
- Non-narcotics
    - Nalbuphine (Nubain®)
    - NSAIDS - Ketorolac (Toradol®)

Patient Monitoring and Documentation Before and after analgesic administration

- Documentation of the patient's clinical status before and after analgesic administration is required
- Vital signs – Baseline, and following each intervention
    - Level of consciousness
    - HR, BP, Pulse
- Document any significant change in clinical status, then any corrective action taken
- Follow all local controlled substances policies for documentation, wastage, storage, etc.

Quality improvement and medical oversight

- Systems with established QI programs have better compliance to pain management protocols
    - Establish benchmarks
    - Tracking plan
    - Feedback and discussion with ED staff, medical director, patients

Acute vs. chronic pain management

- Dependence, abuse, and addiction of prescribed medications is well documented
- Perform a thorough pain assessment prior to providing treatment
- Pain management should depend upon objective clinical decision making
- Pain is individualized with each patient. When they report where their pain is on the scale, it should not be influenced by the individual provider's bias →→

Pediatric specific topics

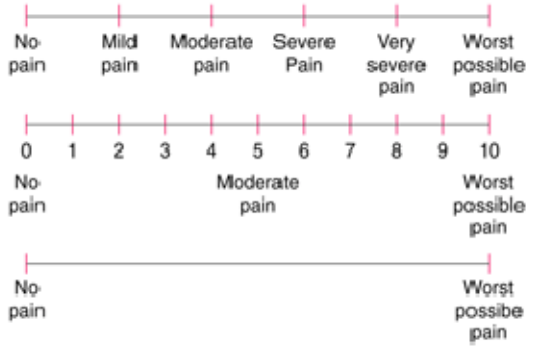
- EMS providers sometimes struggle with assessment and management of pain in the pediatric patient

Research

- Conduct a local research program evaluating pain management in your area

SUPPLEMENT:

Visual Analog Scale



Word Descriptor Scale

0 = No pain
1 = Mild pain
2 = Distressing pain
3 = Severe pain
4 = Horrible pain
5 = Excruciating pain

Graphic Scale

Verbal Scale

"On a scale of 0 to 10, with 0 meaning no pain and 10 meaning the worst pain you can imagine, how much pain are you having now?"

Functional Pain Scale

0 = No pain
1 = Tolerable and pain does not prevent any activities
2 = Tolerable and pain prevents some activities
3 = Intolerable and pain does not prevent use of telephone, TV viewing, or reading.
4 = Intolerable and pain prevents use of telephone, TV viewing, or reading.
5 = Intolerable and pain prevents verbal communication

NCCR Topic	**PSYCHIATRIC EMERGENCIES** • Mental health • Patient restraint o Agitated delirium (only limited depth and breadth) • Suicide/Depression
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	*By the end of this lesson, the student will be able to:* • Describe the components of a mental status examination • Perform effective patient restraint • Understand the risk factors for suicide
Curriculum Hours	1 hour

CONTENT	**Mental status examination**
	
	• Mental health history
	
	• General appearance
	  o Dress
	  o Grooming
	  o Posture
	  ▪ Wringing of hands
	  ▪ Facial grimaces
	  o Mannerisms
	  o Actions
	  o Violence
	
	• Speech
	  o Spontaneous or pressured
	  o Slow or fast
	  o Soft or loud
	  o Understandable or not
	  o Appropriate or inappropriate
	  ▪ Word salad
	  ▪ Full words, inappropriately put together
	  ▪ Delusional
	
	→→

	• Mood
	  o Depressed
	  o Euphoric
	  o Manic
	  o Anxious
	  o Angry
	  o Agitated
	  o Fearful
	  o Guilty
	
	• Area of thought
	  o Racing thoughts
	  o Hallucinations
	  ▪ Auditory
	  ▪ Visual
	  ▪ Somatic (strange body sensations)
	  o Obsessive thoughts
	  o Delusions (false beliefs)
	  o Suicidal thoughts
	  o Unconnected thoughts
	  o Disturbed or distorted thoughts
	
	• In situations in which you have completed a mental status examination, you should report
	  o General appearance
	  o Speech
	  o Mood
	  o Area of thought
	
	→→

Patient Restraint

- Restraint considerations
  - Provider safety
    - Assure that the scene is safe
    - Remove yourself from the scene if weapons are present
  - Determine the need for ALS pharmacological restraint
  - Violent presentation
  - Restrain only those you are capable of overpowering with the physical forces available to you
    - Use only the force necessary to maintain control and prevent injury to you, your partner and your patient
  - The presence of Altered Mental Status (AMS)
    - Multiple drugs producing erratic or bizarre behavior
    - Consider medical conditions that can cause AMS
      - Hypoglycemia
      - Hypoxia
      - Stroke
  - Positioning
    - Position the patient appropriately to prevent suffocation, aspiration, or circulatory compromise
    - Continuous monitoring of breathing and circulation
    -
- Legal considerations (e.g.: age, in custody)

- Local protocol
  - Medical advice
  - Interfacing with law enforcement

- Equipment
  - Regardless of which types of restraints are used, they should be secure enough to restrain the patient, but not limiting to circulatory or respiratory status

- Transportation
  - Assure continued ability to restrain
    - Adequate
      - Personnel
      - Equipment
    - Consideration of continued ALS support

→→

- Physiology of restraining motion
  - Understand normal range of motion
  - Restraining range of motion
  - Understand muscle groups

- Special Patient Considerations
  - Pregnant
  - Pediatric
  - Geriatric

- Restraint techniques
  - Pre-plan each provider's role during restraint
    - Know your communication signals or verbal cues
    - Assign a provider to restrain each limb
  - If multiple providers move toward a patient, it is difficult for the patient to focus on all
  - Swift, coordinated action is most effective
    - Team leader continues to talk to the patient while acting
  - Once a patient is restrained, the restraints should not be removed in the out-of-hospital setting

- Environmental restraint
  - Stabilize the environment (calm patient via therapeutic communication techniques)
  - Separate stimulus from environment (e.g. separate two screaming, fighting people; remove law enforcement from direct view.)

→→

- Chemical restraint
  - Indications
    - Patient poses a threat to himself or others
    - Patients requiring physical restraint that continue to struggle or fight should immediately be chemically restrained
      - *Restrained patients require continuous monitoring, assessment, and management*
  - Medication types
    - Ketamine
    - Benzodiazepines (e.g. midazolam, lorazepam etc.)
    - Antipsychotics (haloperidol, risperidone etc.)
  - Dosage
    - Titrate dosage to level of agitation
    - Combination therapy may be necessary
      - Consult with local medical direction when establishing protocols/designing education
  - Medication routes
    - IM
    - IV/IO
    - Nasal
    - P.O./buccal

Agitated Delirium/Excited Delirium

- Characterized by a sudden onset of extreme agitation and extremely combative behavior
  - Bizarreness, aggressiveness, agitation, ranting, hyperactivity, paranoia, panic
  - Reported to result from substance intoxication, psychiatric illness, alcohol withdrawal, head trauma, or a combination of these
  - Hyperthermia typically present
  - Involves behavioral and physical symptoms that are also observed in medical and psychiatric patients
    - Rhabdomyolysis, neuroleptic malignant syndrome, and catatonia
  - Leads to cardiac respiratory and cardiac arrest

→→

	Suicide/Depression Risk factors for suicide: • History of depression and other mental disorders • Previous suicidal gestures/attempts • Confront the patient • History of family/child abuse (non-accidental trauma) • Feelings of hopelessness • Unwillingness to seek mental health care (stigma attached) • Feeling of being isolated from others • History of impulsive or aggressive behavior • Inability to access mental health • Recent diagnosis of a serious illness, especially an illness that signals a loss of independence • Recent loss of a loved one, job, money or social loss • Aged between 15-24, over 40 • Alcohol or drug abuse • Divorce or widowed (5x) • Gives away personal belongings/cherished possessions • Physical or mental stress • Major physical stress such as surgery and long periods of sleep deprivation • Expression of a clear plan for committing suicide • Ability of the mechanisms to carry out suicide *Psychomotor Lab: If time permits, practice effective restraint.*

NCCR Topic	**AT-RISK POPULATIONS** • Pediatric • Geriatric • Economically disadvantaged • Domestic violence • Human trafficking
Patient Group	Adult and Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review Department of Homeland Security Human Trafficking Resources http://www.dhs.gov/human-trafficking-awareness-training
Learning Objectives	*By the end of this lesson, the student will be able to:* • Recognize the unique characteristics of at-risk populations • Recall the appropriate actions of EMTs in the presence of at-risk patients • Recognition of circumstances that may indicate abuse o Domestic abuse o Human trafficking o Non-accidental trauma • Recall appropriate actions of EMTs in the presence of abused patients
Curriculum Hours	1 hour
CONTENT	**Recognize the unique characteristics of at-risk populations:** • Pediatric o Wide range in development ▪ Neonatal to young adult o Non-verbal to highly communicative o Response to shock changes with organ development o Injury and illness patterns change with development o Depend on adults for protection and prevention →→

- Geriatric
  - Fragility is a better indicator of risk than age in years
  - Polypharmacy is common
    - May have certain drug interactions
  - Be aware of potential medication overdoses
  - Age-related cognitive impairment
    - Dementia
    - Delirium
  - Loss of independence
  - May have reduced uptake of certain medications

Recall the appropriate actions of EMTs in the presence of at-risk patients

- Assessment challenges
  - Unreliable historians
    - Difficulty in relaying previous medical history, medications and other current therapies
  - Reliance on caregivers
  - Requires proper interpretation of the patient's verbal and non-verbal communication
  - EMT's interpretation of physical examination findings often drive care
  - Assess the environment in which patient was found and the need for additional follow-up

- Knowledge of community resources (i.e., child protective services, elder care, meals on wheels, etc.)

→→

Recognition of circumstances that may indicate abuse

- Domestic abuse [Boehme D (2001) EMS Response to Domestic Violence Curriculum and Resource Manual]
    - Documented studies of domestic violence generally report the following physical sites and percentages of injuries
        - 14.5% Head
        - 33% Face and neck
        - 12% Back and buttocks
        - 10% Breasts
        - 16% Arms
        - 5.5% Abdomen (Increases during pregnancy)
        - 4% Genitals
    - Another important aspect of injuries from domestic violence refers to victims who are repeatedly abused. Keeping this in mind, you may encounter injuries in different stages of healing. It may help to review how to estimate the age of a bruise

Color	***Age of Bruise***
Red it Reddish Blue	Less than 24 hours
Dark purple/Dark Blue	1-4 days
Greenish/Yellow Green	5-7 days
Normal tint/disappearing	1-3 weeks

- Classical presentations found in trafficking victims
    - Bruises in various stages of healing caused by physical abuse
    - Scars, mutilations, or infections due to improper medical care
    - Urinary difficulties, pelvic pain, pregnancy, or rectal trauma caused from working in the sex industry
    - Chronic back, hearing, cardiovascular, or respiratory problems as a result of forced manual labor in unsafe conditions
    - Poor eyesight and/or eye problems due to dimly lit work sites
    - Malnourishment and/or serious dental problems
    - Disorientation, confusion, phobias, or panic attacks caused by daily mental abuse, torture, and culture shock

→→

	Recall appropriate actions of EMTs in the presence of abused patients • Follow your local laws and protocols regarding reporting potential abuse cases, regardless of age

NCCR Topic	**PEDIATRIC TRANSPORT** • NHTSA
Patient Group	Pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review National Highway Traffic Safety Administration (NHTSA) recommendations
Learning Objectives	*By the end of this lesson, the student will be able to:* • Explain how to appropriately secure a child safety restraint to a wheeled ambulance stretcher • Understand that children need to be properly restrained in an approved child restraint device during transport • Explain to another provider the characteristics of an approved child restraint system Reference: http://www.nasemso.org/Councils/PEDS/documents/EMS_Child_Transport_Working_Group_July_Final_Draft_7-2-20102.pdf
Curriculum Hours	0.5 hour
CONTENT	*The instructor should demonstrate the appropriate method to secure a car seat to a wheeled ambulance stretcher.* **Children need to be properly restrained in an approved child restraint device during transport** • Proper pediatric transportation devices reduce morbidity and mortality in accidents **For a Child who is uninjured / not ill** • Transport using a size-appropriate child restraint system that complies with FMVSS 213 in a vehicle other than a ground ambulance **For a child who is ill and/or injured and whose condition may or may not require continuous monitoring and/or interventions** • Transport child in a size-appropriate child restraint system that complies with the injury criteria of FMVSS 213—secured appropriately on cot →→

	A child whose condition requires spinal immobilization and/or lying flat: • Secure the child to a size-appropriate backboard using standard spinal immobilization techniques **A child or children requiring transport as part of a multiple patient transport (newborn with mother, multiple children, etc.)** • If possible, for multiple patients, transport each as a single patient according to the guidance shown above • For mother and newborn, transport the newborn in an approved size-appropriate child restraint system in the rear facing EMS provider seat with a forward-facing belt path that prevents both lateral and forward movement, leaving the cot for the mother

NCCR Topic	**CULTURE OF SAFETY** • Adverse event reporting • Medication safety
Patient Group	n/a
Provider Level	Paramedic
Instructor Preparation	Review National EMS Culture of Safety documents http://www.emscultureofsafety.org/
Learning Objectives	*By the end of this lesson, the student will be able to:* • Define culture of safety • Review the six key elements for advancing a culture of safety in EMS • Identify the role of the EMS provider in establishing a culture of safety within their EMS organization
Curriculum Hours	0.5 hour
CONTENT	**Define Culture of Safety** "The enduring value and priority placed on worker and public safety by everyone in every group at every level of an organization. It refers to the extent to which individuals and groups will commit to personal responsibility for safety; act to preserve, enhance and communicate safety concerns; strive to actively learn, adapt and modify (both individual and organizational) behavior based on lessons learned from mistakes; and be rewarded in a manner consistent with these values." (http://www.emscultureofsafety.org/) **Review the six key elements for advancing a culture of safety in EMS** • Advancement of values similar to those in a school of thought known as Just Culture • Coordinated support and resources for provider agencies and other stakeholders • A national data system for responder safety and patient safety in EMS • Evolution of the EMS education system; • Promulgation of safety standards and related information • Reporting/investigation of applicable incidents →→

	Identify the role of the EMS provider in establishing a culture of safety within their EMS organization **EMS providers should** • Collaborate with EMS management in the development, promotion, and implementation of a comprehensive system-wide safety program for their EMS system such as Just Culture or other similar programs to facilitate an honest and prompt reporting of mishaps and errors • Support the need for coordination of all EMS safety related programs at the local, regional, state, and federal levels to share items such as best practices and improved safety standards • Participate in current local and/or national EMS responder and patient data collection systems (e.g. E.V.E.N.T.) • Support increased EMS educational initiatives to address EMS system safety and a new culture of safety for EMS and seek opportunities to expand their knowledge base on culture, patient safety, and research on clinical safety, responder safety, personal protective equipment, etc. • Corporate in the development of new and improved safety standards that affect all aspects of the EMS system such as participating with studies in safety related research • Support the creation of a national EMS safety data system that collects both patient and EMS personnel data **Medication Safety** Review the "5 rights" of medication administration • Right patient • Right medication • Right dose • Right route • Right time →→

	Understand that usage of the "5 rights" of medication administration alone does not ensure patient medication safety
	
	• Medication administration is a systematic process involving:
	  o Packaging
	  o Storage
	  o Separating drugs that look or sound alike
	  o Eliminate or reduce the availability of multiple medication strengths
	  o Ability to read medication
	  o Ability to calculate correct dose
	  ▪ Provide aids (checklists, flip-books, etc.)
	  o Ability to administer correct dose
	  o Ability to focus attention to detail on medication administration during an emergency situation
	  o Conduct independent double-checks of medication administration
	  ▪ Use principles of Crew Resource Management
	• Local protocol should supplement the "5 rights"

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NCCR Topic	**AFFECTIVE CHARACTERISTICS** • Professionalism • Cultural competency o Changing demographics
Patient Group	Adult and pediatric
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	*By the end of this lesson, the student will be able to:* • Appreciate the current issues with disparities in health care in specific populations • Advocate for improved care in different cultural contexts • Recognize and exhibit professional behaviors in the 11 characteristics identified in the National EMS Education Standards
Curriculum Hours	1 hour
CONTENT	**Professionalism** The examples of professional behaviors that are provided below are not all-inclusive and may be modified to meet local standards. **Integrity** • Consistently honest • Able to be trusted with the property of others • Can be trusted with confidential information • Complete and accurate documentation of patient care **Empathy** • Showing compassion for others • Responding appropriately to the emotional response of patients and family members • Demonstrating respect for others • Demonstrating a calm, compassionate, and helpful demeanor toward those in need • Being supportive and reassuring to others →→

Self-Motivation

- Taking initiative to complete assignments
- Taking initiative to improve and/or correct behavior
- Taking on and following through on tasks without constant supervision
- Showing enthusiasm for learning and improvement
- consistently striving for excellence in all aspects of patient care and professional activities
- Accepting constructive feedback in a positive manner
- Taking advantage of learning opportunities

Appearance and Personal Hygiene

- Clothing and uniform is appropriate, neat, clean and well maintained
- Good personal hygiene and grooming

Self-Confidence

- Demonstrating the ability to trust personal judgment
- Demonstrating an awareness of strengths and limitations
- Exercises good personal judgment

Communications

- Speaking clearly
- Writing legibly
- Listening actively
- Adjusting communication strategies to various situations

Time Management

- Consistent punctuality
- Completing tasks and assignments on time

Teamwork and Diplomacy

- Placing the success of the team above self-interest
- Not undermining the team
- Helping and supporting other team members
- Showing respect for all team members
- Remaining flexible and open to change
- Communicating with others to resolve problems

→→

	Respect • Being polite to others; not using derogatory or demeaning terms • Behaving in a manner that brings credit to the profession **Patient Advocacy** • Not allowing personal bias to or feelings to interfere with patient care • Placing the needs of patients above self-interest • Protecting and respecting patient confidentiality and dignity **Careful Delivery of Service** • Mastering and refreshing skills • Performing complete equipment checks • Demonstrating careful and safe ambulance operations • Following policies, procedures, and protocols →→

Cultural Competency

Have each student complete the Development Model of Intercultural Sensitivity worksheet (APPENDIX 1) before beginning this topic.

Culture is "the integrated pattern of human behavior that includes thoughts, communications, actions, customs, beliefs, values, and institutions of a racial, ethnic, religious, or social group."[1]

It is important for EMS providers to be aware of and competent with the culturally diverse patients they may encounter in their local area.

The Institute of Medicine has identified the following groups as priority patients:

- Low income groups
- Minority groups—i.e., racial (Federally recognized racial categories are: American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or other Pacific Islander; and White) and ethnic (Federally recognized ethnic categories are: Hispanic or Latino, or not Hispanic or Latino)
- Women
- Children
- Elderly
- Individuals with special health care needs, including individuals with disabilities and individuals who need chronic care or end-of-life care

http://www.iom.edu/~/media/Files/Report%20Files/2001/Crossing-the-Quality-Chasm/Quality%20Chasm%202001%20%20report%20brief.pdf

1. Cross, T., Bazron, B., Dennis, K., & Isaacs, M., as cited in U.S. Department of Human Services, Office of Minority Health. (2001). *National standards for culturally and linguistically appropriate services in health care*. Final report. Retrieved 2/8/13

See Appendix for Lab Skills Activities
Bennett's Developmental Model of Intercultural Sensitivity

NCCR Topic	**CREW RESOURCE MANAGEMENT (CRM)**
Patient Group	n/a
Provider Level	Paramedic
Instructor Preparation	Review IAFC CRM Manual (link below)
Learning Objectives	*By the end of this lesson, the student will be able to:* • Describe crew resource management (CRM) and its benefits to EMS • Describe the responsibilities of team leaders and team members • Understand the roles of the team member and team leader • List the benefits of CRM • Explain how CRM fits into your local organizational structure • List the difficulties associated with implementation of CRM in your organization's culture
Curriculum Hours	1 hour

CONTENT

Crew Resource Management (CRM) is the effective use of **all** resources to minimize errors, improve safety and improve performance.

IAFC CRM Manual http://www.iafc.org/files/pubs_CRMmanual.pdf

Benefits to EMS

- Minimize errors
  - Utilizes collective wisdom via appreciative inquiry
  - Verbalizes errors and reports them promptly
    - "Leave your ego at the door"
- Improved safety
- Improved performance
  - Conflict resolution
  - Improved communication
  - Increased feedback
  - Better workload management
  - Improved clinical decision making
- Better teamwork
- Improved situational awareness

→→

Crew Resource Management

Crew Resource Management (CRM) is a tool created to optimize human performance by reducing the effect of human error through the use of all resources.

Resources include

- People
- Hardware
- Information

Principles of CRM

a. Error management through improved training/skills development in six areas

i. Communication Skills
ii. Teamwork
iii. Task Allocation
iv. Critical Decision Making
v. Situational Awareness
vi. Debrief

b. Six steps in detail

i. Communication Skills

Suggestion: Use communication skills exercises from IAFF CRM Manual pp. 29-31

ii. Teamwork

1. Leadership
   a. Authority
   b. Mentoring
   c. Conflict Resolution
   d. Mission Analysis
   e. Teamwork

2. Followership
   a. Self-Assessment
   b. Physical Condition
   c. Mental Condition
   d. Attitude
   e. Understanding human behaviors
      - Slip, trip, lapse – Culture of Safety reference

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f. Followership Skills
   1) Respect authority
   2) Personal safety
   3) Crew Safety
   4) Accept authority
   5) Know authority limits
   6) Leader success
   7) Good communication skills
   8) Learning attitude
   9) Ego in check
   10) Balance assertiveness/authority
   11) Accept orders
   12) Demand clear tasks
   13) Admit errors
   14) Provide feedback
   15) Adapt

iii. Task Allocation

1. Know your limits
2. Know your crew's limits
3. Capitalize on strengths
4. Eat the elephant one bite at a time

iv. Critical Decision Making

1. Recognize problems
2. Continue to "fly the plane" (treat the patient)
3. Maintain Situational Awareness
4. Assess Hazards
5. Assess Resources
6. Solicit Solutions
7. Make a Decision!
8. Rapid Primed Decision Making
9. Ways to increase decision making skills

a. Experience
b. Training
c. Communication
d. Preplanning

v. Situational Awareness

1. Take care of the patient *(edited for EMS application)*
2. Assess problems in the time available
3. Gather information from all sources
4. Choose the best option
5. Monitor results—alter as necessary
6. Beware of situational awareness loss factors

→→

vi. Debrief

1. Check your feelings at the door
2. Facilitate
3. Prebrief
4. Topics
5. Decorum
6. Analyze
7. Operations
8. Human behaviors

c. A high degree of technical proficiency is essential for safe and efficient operations.

d. CRM alone cannot overcome a lack of proficiency.

e. Technical proficiency alone cannot guarantee safe operations in the absence of effective crew coordination.

f. CRM must be taught to all members of the organization.

g. Team leader retains authority, recognizes benefits of using all available resources.

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	Team Member/Team Leader **Team Member** • Communicates accurately and concisely while listening and accepts feedback • Demonstrates followership – is receptive to leadership • Demonstrates confidence, compassion, maturity • Maintains situational awareness • Utilizes appreciative inquiry • Uses closed-loop communication • Reports progress on tasks • Performs tasks accurately and in a timely manner • Advocates safety concerns and is safety conscious at all times • Leaves ego/rank at the door • Performs a dangerous or inappropriate intervention • Exhibits unacceptable affect with patient or other personnel • Immediately suggests corrective action if a harmful intervention is ordered/performed by others • Followership skills **Team Leader** • Creates, implements and revises an action plan • Communicates accurately and concisely while listening and encouraging feedback • Receives, processes, verifies and prioritizes information • Reconciles incongruent information • Demonstrates confidence, compassion, maturity and command presence • Takes charge • Maintains accountability for team's actions/outcomes • Assesses situation and resources and modifies accordingly • Maintains situational awareness • Utilizes appreciative inquiry • Uses closed-loop communication • Reports progress on tasks • Performs tasks accurately and in a timely manner • Addresses safety concerns and is safety conscious at all times • Leaves ego/rank at the door • Performed or ordered a dangerous or inappropriate intervention • Exhibited unacceptable affect with patient or other personnel

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NCCR Topic	**CREW RESOURCE MANAGEMENT (Application)**
Patient Group	n/a
Provider Level	Paramedic
Instructor Preparation	Review IAFC CRM Manual (http://www.iafc.org/files/pubs_CRMmanual.pdf)
Learning Objectives	*By the end of this lesson, the student will be able to:* • Practice CRM in simulated scenarios (2-3) • Apply CRM principles to EMS activities and tasks • Defend the benefits of CRM
Curriculum Hours	1 hour (continued from above)
CONTENT	**Team leaders receive feedback after demonstrating the following tasks** • Creates, implements and revises an action plan • Communicates accurately and concisely while listening and encouraging feedback • Receives, processes, verifies and prioritizes information • Reconciles incongruent information • Demonstrates confidence, compassion, maturity and command presence • Takes charge • Maintains accountability for team's actions/outcomes • Assesses situation and resources and modifies accordingly • Maintains situational awareness • Utilizes appreciative inquiry • Uses closed-loop communication →→

	Team members receive feedback after demonstrating the following tasks: • Communicates accurately and concisely while listening and accepts feedback Demonstrates followership – is receptive to leadership • Demonstrates confidence, compassion, maturity • Maintains situational awareness • Utilizes appreciative inquiry • Uses closed-loop communication • Reports progress on tasks • Performs tasks accurately and in a timely manner • Advocates safety concerns and is safety conscious at all times • Leaves ego/rank at the door • Performs a dangerous or inappropriate intervention • Exhibits unacceptable affect with patient or other personnel • Immediately suggests corrective action if a harmful intervention is ordered/performed by others • Followership skills ***See Appendix for Lab Skills Activities*** ***Team Evaluations*** ***Sample Scenarios***

NCCR Topic	**ROLE OF RESEARCH**
Patient Group	n/a
Provider Level	Paramedic
Instructor Preparation	Review National EMS Education Standards Review National EMS Information Systems (NEMSIS) Goals & Objectives
Learning Objectives	*By the end of this lesson, the student will be able to:* • Define evidenced based medicine and practice • Explain the reasons EMS professionals should participate in research • Describe the scientific method • Contrast different types of research methods • Know the principles of how to conduct a literature review
Curriculum Hours	1 Hour
CONTENT	**Define Evidenced Based Practice** • Evidence-based medicine asks questions, finds and appraises the relevant data, and harnesses that information for everyday clinical practice • Evidenced based medicine drives your protocols **Explain The Reasons EMS Professionals Should Participate In Research** • Refines care in the prehospital setting • Ensures the safest and most effective care and treatment for patients • Participation in research projects are a professional responsibility in order to grow the evidence base o May include: ▪ Completing data collection forms • Including accurate documentation in patient care records ▪ Alerting researchers when certain cases are encountered ▪ Completing questionnaires ▪ Volunteering to participate in research studies • Enrolling patients in research projects and obtaining consent →→

- Job security
    - Outcomes research is becoming increasingly important in funding and support of patient care in medicine
        - EMS is the practice of medicine
        - In EMS, specific outcomes include
            - Survival
            - Impaired physiology
            - Limit disability
            - Alleviate discomfort
            - Satisfaction
            - Cost-effectiveness
    - EMS outcomes research is key to the future of EMS system development and maintenance
    - Workforce support and training is influenced by research
        - If EMS fails to demonstrate, by research, that EMS makes a difference in patient outcomes, EMS will cease to receive support

- Improves working conditions
    - Understanding the occupational environment, and developing best practices to mitigate risk improves working conditions

Description of the scientific method

1. Ask a question
2. Conduct a literature review
3. Determine a hypothesis
4. Test your hypothesis
5. Analyze the data to come to a conclusion
6. Report your findings
7. Repeat in different populations

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Contrast different types of research methods

- Experimental
  - The investigator controls events then record an outcome
  - May be randomized
    - E.g. Intravenous vs intramuscular therapy for prehospital status epilepticus (Silbergleit R, Durkalski V,Lowenstein D, Conwit R, Pancioli A, Palesch Y, Barsan W. Intramuscular versus Intravenous Therapy for Prehospital Status Epilepticus. N Eng J Med 2012; 366:591-600
  - Or non-randomized
    - E.g. Clinical consequences of the introduction of mechanical chest compressions in the EMS system for treatment of out-of-hospital cardiac arrest (Axelsson C, Nestin J, Svensson L, Axelsson AB, Herlitz J. Clinical Consequences of the Introduction of Mechanical Chest Compression in the EMS System for Treatment of Out-Of-Hospital Cardiac Arrest-A Pilot Study. Resuscitation 2006; 71:47-55
  - Difficult to perform and very costly
  - When performed appropriately, provides a high level of scientific evidence

- Observational
  - Investigators do not control events, rather they observe the occurrence of events and record the outcome
  - Retrospective study
    - When the outcome of interest has occurred in the past
    - E.g. The association between prehospital endotracheal intubation attempts and survival to hospital discharge among cardiac arrest patients (cite: Studnek, J. AEM 2010)

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- Prospective Study
  - Exposure/intervention occurs in the past, but the outcome of interest has yet to occur
  - E.g. Early Cardiac Cath-Lab activation by paramedics for patients with STEMI on prehospital 12-lead ECG (Lee CH, Van Gelder MC, Cone DC. Early Cardiac Catheterization laboratory Activation by Paramedics for Patients with ST-segment Elevation Myocardial Infarction on Prehospital 12-Lead Electrocardiograms. PEC 2010; 14(2) 153-158)
  - When performed appropriately, a prospective observational study adds significantly to evidence base
- Descriptive Study
  - A study to identify patterns or characteristics in a population, but not the causal linkages among its different elements.
  - Often described as hypothesis generating
  - E.g. Assessment of depression, anxiety and stress among Nationally Certified EMS professionals (Bentley MA, Crawford JM, Wilkins FR, Fernandez AR, Studnek JR. An Assessment of Depression, Anxiety, and Stress Among Nationally Certified EMS Professionals. PEC 2013; Epub ahead of print.

Know the principles of how to conduct a literature review

- Understand what you are asking
- Identify key words
- Utilize specific search engines such as PubMed.gov, sponsored by the National Library of Medicine
- Know the difference between peer reviewed research and trade magazines
  - Peer-reviewed journal – Prehospital Emergency Care, Annals of Emergency Medicine, Journal of Trauma, Circulation, etc.
    - Contains articles which utilize the scientific method
    - Reviewed by subject matter experts
  - Trade magazines – JEMS, EMS World, etc.
    - Articles are not scientifically rigorous
  - Should not be used as primary sources