



**National Registry of
Emergency Medical Technicians®**
THE NATION'S EMS CERTIFICATION™

National Continued Competency Program: EMT Education Guidelines

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NCCR Topic	VENTILATION <ul style="list-style-type: none"> • Minute ventilation • Effect on cardiac return • Assisted ventilation <ul style="list-style-type: none"> ○ Respiratory failure vs. distress ○ Assessment – when to ventilate • Adjuncts <ul style="list-style-type: none"> ○ Automatic Transport Ventilator (ATV) • Positioning
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technicians (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • Discuss the difference 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 • Discuss the effect of ventilation on venous return and cardiac output <ul style="list-style-type: none"> ○ Spontaneously breathing patient ○ Artificially ventilated patient • Decide when to oxygenate and when to ventilate a patient • Recognize the use of automated transport ventilators when managing patients • Discuss the use of padding during ventilation of the pediatric patient • Understand the AHA’s position on routine suctioning of the newborn
Curriculum Hours	3 hours
CONTENT	<p>Minute ventilation – The volume of air a person moves in and out of the respiratory system in one minute</p> <ul style="list-style-type: none"> • Minute ventilation (MV) consists of: Tidal volume 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) <p style="text-align: right;">→→</p>

- Explain adequate and inadequate breathing based on minute ventilation
 - 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 (V_a) – The amount of air that moves in and out of the alveoli per minute
- Alveolar ventilation consists of: (tidal volume (V_t) minus dead air (T_d) space) multiplied by respiratory rate in one minute.
 - $V_a = (V_t - V_d) \times F$
- Tidal volume – The volume of air a person moves in and out of the respiratory system in each breath
- Dead air space – The volume of air during breathing that does not reach the alveoli or is not involved in gas exchange
- Respiratory rate (Frequency (F)) – The number of times a person breathes per minute
- Alveolar ventilation = $(V_t - T_d) \times F$

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.

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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 ($[250\text{mL} - 150\text{mL}] \times 24 \text{ per minute} = 2400\text{mL/minute}$) is inadequate. This will lead to hypoxemia and will result in a decrease in her SpO₂ reading. She requires positive pressure ventilation.

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 inhalation, a large volume of venous blood is returned to the heart because of the extreme negative pressure generated during 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.

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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.]

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 an EMS provider 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.

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Review signs of distress and failure

- Respiratory distress
- Respiratory failure

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

Many other signs or symptoms can accompany this deterioration in mental status including decrease in SpO₂, cyanosis, 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.

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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 see 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.

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 times 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

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.

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NCCR Topic	OXYGENATION
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • Review physiology related to oxygen transport and metabolism • Recite the AHA's guidelines on oxygen therapy in the acute coronary syndrome and stroke patient • Discuss the role of free radicals related to oxygen therapy
Curriculum Hours	1 hour
CONTENT	<p>In 1994, the EMT National Standard Curriculum recommended that patients with chest pain receive oxygen by non-rebreather mask at 15 L/min.</p> <p>In 2000, the American Heart Association Guidelines recommended that patients with chest pain receive oxygen by nasal cannula at 2-4 L/min.</p> <p>In 2010, the American Heart Association Guidelines now recommend that patients with suspected acute coronary syndrome (ACS) not receive oxygen unless they have an SpO₂ of less than 94% (on room air) or complain of dyspnea, have signs and symptoms of shock or heart failure. If the pulse oximeter is unreliable or not available, oxygen should be administered.</p> <p>Oxygenation of chest pain and stroke patients has changed.</p> <ul style="list-style-type: none"> • Patients that complain of dyspnea, experience signs and symptoms of shock, heart failure, or have an SpO₂ of less than 94% should receive oxygen at 2 L/minute via nasal cannula • Oxygen administration should be titrated to maintain an SpO₂ of at least 94%

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Delivery of high concentrations of oxygen to ACS and stroke patients who are not hypoxic may increase tissue damage.

The reason that oxygen is no longer recommended is because of the release of “free radicals.”

- Free radicals are byproducts of metabolism that when released in large numbers are toxic to neighboring cells, destroying their membranes and causing increased local tissue damage
- Reintroduction of a high concentration of oxygen to cells that have been functioning anaerobically increases the production of free radicals causing cell membrane damage and tissue death
- When EMS providers deliver high concentrations of oxygen to patients with suspected ACS or stroke, delivering high concentrations of oxygen may be more harmful than keeping the patient on room air

NCCR Topic	POST-RESUSCITATION CARE <ul style="list-style-type: none"> • Recognition of Return of Spontaneous Circulation (ROSC) • Oxygenation • Induced hypothermia (only limited depth and breadth)
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • Identify the signs of ROSC • Describe the principles of optimization of ventilation and oxygenation • Appreciate the benefits of induced hypothermia in post cardiac arrest management • Describe systems of care necessary for improving post cardiac arrest outcomes
Curriculum Hours	0.5 hour
CONTENT	<p>Recognition of ROSC</p> <ul style="list-style-type: none"> • In the cardiac arrest patient, CPR must be continued until signs of life are observed <ul style="list-style-type: none"> ○ Patient breathing ○ Patient movement <p>Optimizing ventilation and oxygenation in the post cardiac arrest patient</p> <p>The goal for oxygenation in the post cardiac arrest patient is to maintain an SpO₂ of greater than or equal to 94%.</p> <ul style="list-style-type: none"> • Once your patient's SpO₂ is 94%, more oxygen is not necessarily better • Avoid excessive ventilation (over-bagging) <ul style="list-style-type: none"> ○ Reduces cardiac output ○ Decreases cerebral blood flow <p>Consider elevating the head of the stretcher approximately 30° if the patient will tolerate it</p> <ul style="list-style-type: none"> • Reduces cerebral edema • Reduces aspiration and pneumonia <p style="text-align: right;">→→</p>

Induced hypothermia in post-cardiac arrest patient

- Intentional reduction of core body temperature which can be accomplished by a variety of methods
 - Cold packs
 - Administration of chilled IV fluids
 - Target temperature 32-34° C
 - Can be held at that temperature up to 24 hours
- 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

- Most deaths following ROSC occur within the first 24 hours
- Transport 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

NCCR Topic	STROKE <ul style="list-style-type: none"> • Assessment (stroke scale) • Oxygen administration • Time of onset (duration) • Transport destination
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to</i></p> <ul style="list-style-type: none"> • 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
Curriculum Hours	1 hour
CONTENT	Out-of-hospital stroke assessment tool <ul style="list-style-type: none"> • Specific tool used will be determined by local protocol • Examples include <ul style="list-style-type: none"> ○ Cincinnati Prehospital Stroke Scale ○ Los Angeles Prehospital Stroke Screen ○ Miami Emergency Neurologic Deficit Checklist • Signs and Symptoms assessed by these tools <ul style="list-style-type: none"> ○ Symmetry of the face ○ Weakness of extremities ○ Speech difficulties ○ Coordination <p style="text-align: right;">→→</p>

The goal for oxygenation in the stroke patient is to maintain an SpO₂ of 94% to avoid oxygen toxicity

- High flow oxygen decreases cerebral blood flow

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

- Some stroke treatments are time sensitive

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.

NCCR Topic	CARDIAC ARREST (VENTRICULAR ASSIST DEVICES (VADs))
Patient Group	Adult and pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • Discuss the function of ventricular assist devices (VAD) assessment and care of patients who have VADs • Discuss the criteria to terminate resuscitation efforts versus the need for continued resuscitation
Curriculum Hours	0.5 hour
CONTENT	<p>Ventricular Assist Devices (VADs) A mechanical device that is placed inside a person's chest, that assists the heart pump oxygen-rich blood throughout the body.</p> <ul style="list-style-type: none"> • 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 <p>Assessment</p> <ul style="list-style-type: none"> • Initial assessment remains the same • <i>Most VADs produce continuous flow, therefore these patients will not have a palpable pulse, or measurable blood pressure</i> • SpO₂ 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 • The patient and their 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 <p style="text-align: right;">→→</p> <p>Management</p>

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| | <ul style="list-style-type: none">• Verify the patient's DNR status• Allow the patient and caregiver to guide your interaction with the device• <i>Keep batteries and controller within reach and secured to the patient</i>• Use caution when cutting and removing clothes, to avoid damaging the device• Verify if chest compressions are indicated with the patient's specific device<ul style="list-style-type: none">○ Consult family○ View VAD identification card○ Consult with VAD coordinator• Use the AED as you would with any other patient. Avoid placing the pads directly over the device (consider anterior-posterior pad placement) |
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NCCR Topic	CARDIAC RATE DISTURBANCE (PEDIATRIC) <ul style="list-style-type: none"> • Tachycardia • Bradycardia • Irregular pulse
Patient Group	Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • Recognize abnormally fast and abnormally slow pulse rates in the pediatric patient • Discuss the cause of abnormally fast or slow pulse rates in the pediatric patient • Discuss the causes of an irregular pulse in the pediatric patient • Describe the BLS management of abnormally fast or slow pulse rates in the pediatric patient
Curriculum Hours	1 hour
CONTENT	Recognize abnormally fast pulse rate in the pediatric patient <ul style="list-style-type: none"> • Pulse rates in infants (less than 1 year) greater than 220 and greater than 180 in children (1 year to onset of puberty) <ul style="list-style-type: none"> ○ Can be caused by: <ul style="list-style-type: none"> ▪ Dehydration ▪ Sepsis ▪ Failure to thrive ▪ Medication/Drug ingestion ▪ Toxins ▪ Hemorrhage ○ Management <ul style="list-style-type: none"> ▪ Recognize the need for rapid transport and ALS level care ▪ Transportation to pediatric emergency department when possible

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- Pulse rates less than 60 in pediatric patients associated with hypotension, altered mental status and or signs of shock
 - Can be caused by:
 - Respiratory compromise
 - Toxins
 - Congenital defects
 - Management
 - Ensure properly size equipment for correct management
 - Assisted ventilation with enough tidal volume to just achieve visible chest rise
 - Oxygenation
 - CPR if bradycardia persists despite BVM ventilation
 - Recognize the need for rapid transport and ALS level care
 - Transportation to pediatric emergency department when possible
- Irregular pulse in pediatric patients
 - Can be caused by congenital defects
 - Management
 - Appreciate that some irregular pulses in the asymptomatic patient may not require treatment
 - Recognize the need for rapid transport and ALS level care
 - Transportation to pediatric emergency department when possible

NCCR Topic	PEDIATRIC CARDIAC ARREST <ul style="list-style-type: none"> • Optimal chest compressions <ul style="list-style-type: none"> ○ Techniques • Ventilation/Compression ratio <ul style="list-style-type: none"> ○ Single and 2-Rescuer CPR ○ AED use
Patient Group	Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • Describe the current techniques of single and 2-Rescuer CPR and AED use in pediatric patients • Demonstrate the current techniques of single and 2-Rescuer CPR and AED use in pediatric patients <p><i>Note: No student should be granted credit for completing this lesson without completion of a scenario-based pediatric cardiac arrest skills station. When teaching large numbers of students, this scenario may be completed, evaluated and validated at the local level.</i></p>
Curriculum Hours	1 hour – lecture 1 hour – scenario-based skills station
CONTENT	Techniques of Single Rescuer CPR <ul style="list-style-type: none"> • Infant (less than 1 year of age) <ul style="list-style-type: none"> ○ Chest compressions <ul style="list-style-type: none"> ▪ 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 <ul style="list-style-type: none"> ▪ Resuscitation outcomes in infants and children are best if compressions are combined with ventilations ▪ 2 breaths after every 30 compressions ▪ Each breath should take about 1 second ▪ Ventilate with enough volume to observe chest rise

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- Child (1 year of age until onset of puberty)
 - Chest compressions
 - Push hard, push fast
 - Minimum of 100 per minute
 - Use 1 or 2 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 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 2 minutes
- Infant (less than 1 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
 - 2 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 observe chest rise

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- Child (1 year of age until onset of puberty)
 - Chest compressions
 - Push hard, push fast
 - Minimum of 100 per minute
 - Use 1 or 2 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 observe chest rise

AED Use

Children with sudden witnessed cardiac arrest require the rapid application of an AED to assess for the presence of a shockable rhythm.

Use an AED with pediatric pads in children under 8 years old

- If pediatric pads are not available – adult pads should be used

AEDs that deliver relatively high energy doses have been used successfully in cardiac arrests in infants and children, with minimal myocardial damage and good neurological outcomes.

Application of the AED should not interrupt chest compressions.

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

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NCCR Topic	CHEST PAIN FROM CARDIOVASCULAR CAUSE <ul style="list-style-type: none"> • Medication administration <ul style="list-style-type: none"> ○ Nitroglycerin ○ Aspirin (ASA) ○ Oxygen • Transportation destination
Patient Group	Adult
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • Review the pathophysiology of cardiac-related chest pain • Identify a patient with non-traumatic chest pain and determine the likelihood of cardiovascular cause • Recite the indications and contraindications for the administration of nitroglycerin, aspirin, and oxygen • Explain the need for reassessment after performing an intervention • Explain the importance of choosing the most appropriate transport destination for the patient with chest pain of cardiac origin
Curriculum hours	1 hour
CONTENT	Pathophysiology of cardiac-related chest pain <ul style="list-style-type: none"> • Review the path of blood flow through the heart and lungs • Emphasize coronary perfusion <ul style="list-style-type: none"> ○ Acute Coronary Syndrome (ACS) <ul style="list-style-type: none"> ▪ Insufficient oxygen supply to meet the heart's needs ▪ Heart muscle becomes ischemic ▪ Most common type of ischemia is related to coronary artery disease ○ Coronary Artery Disease (CAD)

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- Build-up of plaque in the coronary arteries is the most common cause
 - Reduces coronary blood flow
 - Results in ischemia
 - Cardiac muscle has more mitochondria than any other muscle
 - More sensitive to oxygen deprivation
 - Typical presentation involves chest pain
 - Beware of atypical presentations
 - CAD can cause
 - Angina
 - Myocardial Infarction
 - Arrhythmias

Identify a patient with non-traumatic chest pain and determine likelihood of cardiovascular cause

- Patient Assessment
 - Signs and symptoms - Emphasize
 - Role of fluid in the lungs
 - Significance of positive JVD
 - Significance of skin color and presence of diaphoresis
 - Atypical presentation in women, elderly and diabetic
 - Significance of an irregular pulse
 - Significance of hypotension
 - When authorized by local medical direction, the capture and transmission of 12-lead EKGs by EMTs may prove beneficial in a comprehensive STEMI system of care
 - Allergies
 - Aspirin
 - Medications
 - Effects of antihypertensives, antianginal and anticoagulant medications
 - Effects of erectile dysfunction drugs
 - Compliance of prescribed medications
 - Previous illness/history
 - Diabetes
 - Previous cardiac events
 - Hypertension
 - Asthma
 - Other chronic diseases
 - Last intake
 - Events leading up to the incident

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- Pain assessment
 - Onset of pain
 - What makes it better/what makes it worse
 - Severity of pain on a scale of 0-10
 - Describe the pain
 - Radiation of pain

Recite the indications and contraindications for the administration of Nitroglycerin, Aspirin, and Oxygen

- Nitroglycerin
 - Indications
 - Contraindications
 - Systolic BP less than 90mm/Hg
 - Diastolic BP less than 30mm/Hg below baseline
 - HR less than 50 or greater than 100 in patients without heart failure (clear lung sounds)
- Aspirin
 - Should be given to all patients with suspected MI
 - Should be given to patients even if they are already on a daily dose
 - Mechanism of action
 - Platelet aggregation inhibitor
 - Slows further clotting
 - Contraindications
 - True allergy
 - Active GI hemorrhage
- Oxygen administration
 - Indications in the presence of chest pain
 - Difficulty breathing
 - Signs of heart failure or shock
 - SpO₂ less than 94%
 - Titrate to an SpO₂ ≥ 94%
 - Use of low-flow oxygen in most cases will achieve desired SpO₂
 - Contraindications
 - Routine administration of oxygen to a non-complicated chest pain patient is not indicated

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Explain the need for reassessment after performing an intervention

- Chest pain related to cardiac disease is a dynamic process
- EMTs must reassess patients to determine the effectiveness of their interventions
 - Adjust care accordingly

Explain the importance of choosing the most appropriate transport destination for the patient with chest pain of cardiac origin

- Patients experiencing ACS should be transported to chest pain receiving centers or in accordance with local protocol
- At times, the patient's choice of hospital can be detrimental to their outcome

NCCR Topic	CENTRAL NERVOUS SYSTEM (CNS) INJURY <ul style="list-style-type: none"> • Sports injuries <ul style="list-style-type: none"> ○ Concussion
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • 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
Curriculum Hours	0.5 hour
CONTENT	<p>Signs And Symptoms of a Concussion</p> <p>Observed Signs</p> <ul style="list-style-type: none"> • 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 <p>Physical Symptoms</p> <ul style="list-style-type: none"> • 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” <p style="text-align: right;">→→</p>

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)

NCCR Topic	TOURNIQUETS
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • 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	<p>The instructor should demonstrate the application of both an improvised and a commercially available tourniquet commonly used in your area.</p> <p>Risks And Benefits Of Early Tourniquet Application (PHTLS p.211 cite 13, 14)</p> <ul style="list-style-type: none"> • 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 2 hours) • 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 <p>Early application</p> <ul style="list-style-type: none"> • If direct pressure doesn't immediately control the hemorrhage, a tourniquet should be applied. <p>Psychomotor</p> <p><i>No student should receive credit for this lecture unless he or she has properly applied a tourniquet on a simulated patient.</i></p>

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NCCR Topic	FIELD TRIAGE <ul style="list-style-type: none"> • MUCC (Model Uniform Core Criteria) • CDC Field Triage Decision Scheme • SALT (Sort, Assess, Lifesaving Interventions, Treatment/Transport)
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review CDC Trauma Triage Decision Scheme
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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	SPECIAL HEALTHCARE NEEDS <ul style="list-style-type: none"> • Tracheostomy care • Dialysis shunts • How to deal with patients and equipment <ul style="list-style-type: none"> ○ Feeding tubes, CSF shunts, etc. • Common cognitive issues
Patient Group	Adult and Pediatric (as appropriate)
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • 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	1 hour
CONTENT	General considerations when managing a special needs patient <ul style="list-style-type: none"> • Maintain traditional EMS priorities of airway, breathing and circulatory support • Involve parents/caregivers in the assessment and management of care <ul style="list-style-type: none"> ○ Medical history ○ Is the patient acting appropriately? ○ Normal baseline vital signs ○ Medications ○ Caregiver's "go bag" for the patient <ul style="list-style-type: none"> ▪ 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

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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

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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 a 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 an assessment, 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 2 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

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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 2 years of life while the brain is developing
- Characterized by
 - Abnormal muscle tone and posture
 - Muscular spasms
 - Hearing and vision problems
 - Seizures
- Cause is difficult to determine
 - May be caused by
 - Low levels of oxygen
 - Infection
 - Head injury
 - RH incompatibility
 - Infections in the mother (e.g. Rubella, Herpes Simplex)

NCCR Topic	OB EMERGENCIES <ul style="list-style-type: none"> • Abnormal presentations <ul style="list-style-type: none"> ○ Nuchal cord • Neonatal resuscitation <ul style="list-style-type: none"> ○ Routine suctioning of the neonate
Patient Group	Adult and Pediatric as applicable
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review current AHA Guidelines
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Breech <ul style="list-style-type: none"> ○ Descriptions <ul style="list-style-type: none"> ▪ 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 ○ 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 1 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

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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 heart rate below 100, gasping or apnea, initiate positive pressure ventilation with room air and monitor. If labored breathing or persistent cyanosis, clear the airway, monitor, SpO₂ and consider CPAP

After 1 minute post-partum

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

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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.

NCCR Topic	PSYCHIATRIC EMERGENCIES <ul style="list-style-type: none"> • Mental health • Patient restraint <ul style="list-style-type: none"> ○ Agitated delirium (only limited depth and breadth) • Suicide/Depression
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • Describe the components of a mental status examination • Perform effective patient restraint • Understand the risk factors for suicide • Identify common synthetic stimulants and natural or synthetic THC <ul style="list-style-type: none"> ○ Recognize the effects of ○ Synthetic stimulants ○ Natural and synthetic THC
Curriculum Hours	1.5 hours
CONTENT	Mental status examination <ul style="list-style-type: none"> • Mental health history • General appearance <ul style="list-style-type: none"> ○ Dress ○ Grooming ○ Posture <ul style="list-style-type: none"> ▪ Wringing of hands ▪ Facial grimaces ○ Mannerisms ○ Actions ○ Violence

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- Speech
 - Spontaneous or pressured
 - Slow or fast
 - Soft or loud
 - Understandable or not
 - Appropriate or inappropriate
 - Word salad
 - Full words, inappropriately put together
 - Delusional
- Mood
 - Depressed
 - Euphoric
 - Manic
 - Anxious
 - Angry
 - Agitated
 - Fearful
 - Guilty
- Area of thought
 - Racing thoughts
 - Hallucinations
 - Auditory
 - Visual
 - Somatic (strange body sensations)
 - Obsessive thoughts
 - Delusions (false beliefs)
 - Suicidal thoughts
 - Unconnected thoughts
 - Disturbed or distorted thoughts
- In situations in which you have completed a mental status examination, you should report
 - General appearance
 - Speech
 - Mood
 - Area of thought

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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

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- 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
 - 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

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

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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.

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Toxicological Emergencies

- Synthetic stimulants
- Tetrahydrocannabinol (THC - natural/synthetic)

Synthetic Stimulants

- “Bath Salts”
 - Bliss, Blue Silk, Ivory Wave, White Dove, White Knight, White Lightening (etc.)
 - Usually sold as a powder
 - White to off-white in color
 - Can also be sold in capsule
 - Usually inhaled nasally
 - Can also be taken orally, intravenously, or smoked
- Methamphetamine
 - Crank, Crystal Meth, Glass, Ice, Tweak, Yaba (etc.)
 - Usually sold as crystals
 - White to off-white in color
 - Yellow/red crystalline powder
 - Usually smoked, snorted or injected IV
- MDMA (methylenedioxymethamphetamine)
 - Ecstasy, E, X, XTC, Smarties, Scooby-Snacks, Skittles
 - Usually sold in tablets or capsules
 - Can also be sold in liquid drops, snorted, or smoked
 - Can be any color
- Effects of synthetic stimulants
 - Psychological
 - Agitation, insomnia, irritability, dizziness, depression, paranoia, delusions, suicidal thoughts, seizures, and panic attacks
 - Somatic (effects on the body)
 - Hyperthermia (significant with MDMA)
 - Rapid heart rate
 - Can lead to heart attacks and strokes
 - Chest pains, nosebleeds, sweating, nausea, and vomiting

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Tetrahydrocannabinol (THC)

- Natural
 - Weed, bud, doobie, Mary Jane, pot, blunt, herb, hemp, grass, etc.
 - A green, brown or gray mixture of dried, shredded leaves, stems, seeds, and flowers of the hemp plant
 - Usually smoked in a cigarette or pipe

- Synthetic
 - Characterized by mimicking natural THC
 - Can cause psychosis
 - K2, spice, black mamba, Bombay blue, genie, zohai
 - Similar appearance to natural THC

- Effects of THC
 - Impaired short term memory
 - Decreased concentration and attention
 - Impaired balance and coordination
 - Increased heart rate and blood pressure
 - Increased appetite

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NCCR Topic	ENDOCRINE <ul style="list-style-type: none"> • Diabetes • Metabolic syndrome (only limited depth and breadth) <ul style="list-style-type: none"> ○ Insulin resistance, DKA/HHNS • Medication pumps (only limited depth and breadth) <ul style="list-style-type: none"> ○ Insulin • Glucometer (only limited depth and breadth)
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • Distinguish between insulin dependent vs. non-insulin dependent diabetes • Identify commonly prescribed medications used to treat diabetes • Discuss metabolic syndrome and its comorbidities • Understand the management of hypo/hyperglycemia • Discuss patient use of insulin pumps and other glycemic control options • Demonstrate appropriate use of a glucometer
Curriculum Hours	1 hour
CONTENT	<p>Diabetes</p> <ul style="list-style-type: none"> • Insulin dependent diabetes (IDDM, Type 1) <ul style="list-style-type: none"> ○ Earlier age of onset ○ Lack of insulin production <ul style="list-style-type: none"> ▪ Usually requires injection of insulin to replace insulin that is normally produced by the pancreas ▪ Insulin is required for most cells to utilize glucose ○ Initial presentation before diagnosis is usually the 3 P's <ul style="list-style-type: none"> ▪ Polydipsia – Increased thirst ▪ Polyuria – Increased urine output ▪ Polyphagia – Increased hunger ○ After diagnosis, frequently presents to EMS with hypoglycemia <ul style="list-style-type: none"> ▪ Some patients may use medications at home to raise glucose levels <ul style="list-style-type: none"> • Self-injected glucagon • Glucose tabs/paste

→→

- Assessment
 - History of type 1 diabetes
 - Altered mental status
 - Consider alternative causes (e.g. ETOH, trauma etc.)
 - Blood glucose reading
 - Hypoglycemia – less than 80mg/dL
 - Hyperglycemia – greater than 140mg/dL
 - Very low blood glucose levels can cause seizures and stroke like symptoms
 - Management of hypoglycemia
 - Ensure an open airway, adequate breathing, circulation and ability to swallow
 - Determine the blood glucose level (if available)
 - Administer oral glucose as appropriate
 - Management of hyperglycemia
 - Ensure an open airway, adequate breathing and circulation
 - Determine the blood glucose level (if available)
 - Supportive care
 - Transport
- **Non-insulin dependent diabetes (NIDDM, Type 2)**
 - Usually later age of onset
 - Associated with obesity
 - Some cases of type 2 diabetes are resolved with weight loss
 - Cells less receptive to insulin
 - Usually requires medication to improve insulin sensitivity
 - These patients are typically aware that they are type 2 diabetic prior to EMS contact
 - After diagnosis, frequently presents to EMS with hyperglycemia and vague complaints (e.g. fatigue, malaise, thirst etc.)
 - Some patients may use medications at home to decrease blood glucose levels
 - Oral medications
 - Commonly prescribed
 - Metformin (Glucophage®, Glumetza®)
 - Glyburide (DiaBeta®)
 - Chlorpropamide (Diabinese®)
 - Some may use insulin

→→

- Assessment
 - History of type 2 diabetes
 - Altered mental status (severe hyperglycemia)
 - Rapid, deep breathing
 - Dry skin due to dehydration
 - Elevated blood glucose
- Management of hyperglycemia
 - Ensure an open airway, adequate breathing and circulation
 - Determine the blood glucose level (if available)
 - Supportive care
 - Transport

Metabolic syndrome

- Named for a group of risk factors that increase the risk for coronary artery disease, stroke and type 2 diabetes
 - Extra weight around the middle and upper parts of the body (central obesity). The body may be described as "apple-shaped"
 - Insulin resistance. The body uses insulin less effectively than normal. Insulin is needed to help control the amount of sugar in the body. As a result, blood sugar and fat levels rise
 - People with metabolic syndrome have an increased long-term risk for developing heart disease, type 2 diabetes, stroke, kidney disease, and poor blood supply to the legs

Medication pumps (insulin)

- Device that is designed to pump insulin into the body at a controlled rate through a subcutaneous catheter (usually placed in the abdominal area)
- Typically has a pager-type device that controls insulin delivery
- May need to be deactivated during a hypoglycemic emergency

Glucometer

If time permits and the equipment is available, demonstrate appropriate use of the glucometer and have each student practice obtaining a blood glucose level.

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NCCR Topic	IMMUNOLOGICAL DISEASES <ul style="list-style-type: none"> • Allergic reaction • Anaphylaxis
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • Discuss the physiology related to allergies and anaphylaxis • Differentiate between a mild/localized allergic reaction and anaphylaxis • Explain the actions of medications used to treat anaphylaxis <ul style="list-style-type: none"> ○ Epinephrine ○ Benadryl® • Demonstrate the administration of epinephrine for anaphylaxis according to local protocol
Curriculum Hours	1 hour
CONTENT	<p>Allergic reaction</p> <ul style="list-style-type: none"> • Hyperactive, localized immune response to an allergen <ul style="list-style-type: none"> ○ Some histamine released <ul style="list-style-type: none"> ▪ Local redness, swelling, hives, itching, nausea, vomiting, diarrhea ○ Typically requires minimal supportive therapies ○ Reactions are generally self-limited ○ Repeat exposures may or may not lead to anaphylaxis (e.g. bee stings, food allergies, etc.) <p>Anaphylaxis</p> <ul style="list-style-type: none"> • Life threatening reaction of the immune system to an allergen • Massive histamine and other compounds are released throughout the body <ul style="list-style-type: none"> ○ Vasodilation and increased capillary permeability <ul style="list-style-type: none"> ▪ Can lead to shock ○ Bronchoconstriction and mucous production <ul style="list-style-type: none"> ▪ Can lead to extremely difficulty breathing ○ Soft tissue swelling of the upper airway <ul style="list-style-type: none"> ▪ Can lead to airway obstruction <p style="text-align: right;">→→</p>

Treatment for Anaphylaxis

- Assure adequate airway, ventilation and oxygenation
- Administer oxygen if SpO₂ is less than 94%, titrated to a maximum of 94%
- Epinephrine
 - Reverses many of the effects of histamine via
 - Bronchodilation
 - Vasoconstriction
 - Continuous reassessment is required
 - May require additional dosing due to short half-life
- Diphenhydramine (Benadryl)
 - Blocks histamine receptors, blunting further histamine response
- Transport to an appropriate facility for evaluation

Each student should demonstrate the administration of epinephrine for anaphylaxis using the appropriate device/medication route according to local protocol.

NCCR Topic	COMMUNICABLE DISEASES <ul style="list-style-type: none"> • Hygiene (hand washing, etc.) • Vaccines • Antibiotic resistant infections • Influenza • Public health – epidemics, pandemics, reporting, etc. • Systemic inflammatory response syndrome (SIRS) vs. Sepsis vs. Septic shock <ul style="list-style-type: none"> ○ Fluid resuscitation
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review CDC recommendations
Learning Objectives	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • 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	0.5 hour
CONTENT	Hand washing using soap and water When to wash your hands <ul style="list-style-type: none"> • Before and after patient contact • Before eating • After cleaning the ambulance or equipment • After using the toilet • After blowing your nose, coughing or sneezing <div style="text-align: right;">→→</div>

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

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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.

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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/minute
- Respiratory rate greater than 20/minute

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	AT-RISK POPULATIONS <ul style="list-style-type: none"> • Pediatric • Geriatric • Economically disadvantaged • Domestic violence • Human trafficking
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
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	<i>By the end of this lesson, the student will be able to:</i> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ○ Domestic abuse ○ Human trafficking ○ Non-accidental trauma • Recall appropriate actions of EMTs in the presence of abused patients
Curriculum Hours	0.5 hour
CONTENT	Recognize the unique characteristics of at-risk populations <ul style="list-style-type: none"> • Pediatric <ul style="list-style-type: none"> ○ Wide range in development <ul style="list-style-type: none"> ▪ Neonatal to young adult ○ Non-verbal to highly communicative ○ Response to shock changes with organ development ○ Injury and illness patterns change with development ○ Depend on adults for protection and prevention • Geriatric <ul style="list-style-type: none"> ○ Fragility is a better indicator of risk than age in years ○ Polypharmacy is common ○ Age-related cognitive impairment <ul style="list-style-type: none"> ▪ Dementia ▪ Delirium ○ Loss of independence

→→

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

<i>Color</i>	<i>Age of Bruise</i>
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

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NCCR Topic	PEDIATRIC TRANSPORT • NHTSA
Patient Group	Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review National Highway Traffic Safety Administration (NHTSA) recommendations
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • 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 <p>Reference: http://www.nasemso.org/Councils/PEDS/documents/EMS_Child_Transport_Working_Group_July_Final_Draft_7-2-20102.pdf</p>
Curriculum Hours	0.5 hour
CONTENT	<p><i>The instructor should demonstrate the appropriate method to secure a car seat to a wheeled ambulance stretcher.</i></p> <p>Children need to be properly restrained in an approved child restraint device during transport</p> <ul style="list-style-type: none"> • Proper pediatric transportation devices reduce morbidity and mortality in accidents <p>For a Child who is uninjured / not ill</p> <ul style="list-style-type: none"> • Transport using a size-appropriate child restraint system that complies with FMVSS 213 in a vehicle other than a ground ambulance <p>For a child who is ill and/or injured and whose condition may or may not require continuous monitoring and/or interventions</p> <ul style="list-style-type: none"> • Transport child in a size-appropriate child restraint system that complies with the injury criteria of FMVSS 213—secured appropriately on cot <p style="text-align: right;">→→</p>

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	AFFECTIVE CHARACTERISTICS <ul style="list-style-type: none"> • Professionalism • Cultural competency <ul style="list-style-type: none"> ○ Changing demographics
Patient Group	Adult and Pediatric
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards
Learning Objectives	<p><i>By the end of this lesson, the student will be able to:</i></p> <ul style="list-style-type: none"> • 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 characteristic identified in the National EMS Education Standards
Curriculum Hours	0.5 hour
CONTENT	<p>Professionalism The examples of professional behaviors that are provided below are not all-inclusive and may be modified to meet local standards.</p> <p>Integrity</p> <ul style="list-style-type: none"> • Consistently honest • Able to be trusted with the property of others • Can be trusted with confidential information • Complete and accurate documentation of patient care <p>Empathy</p> <ul style="list-style-type: none"> • 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 <p style="text-align: right;">→→</p>

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 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

- Health care disparities

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

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

- Low income
- Minority
- Women
- Children
- Elderly
- Individuals with special health care needs, including individuals with disabilities and individuals who need chronic care or end-of-life care

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NCCR Topic	ROLE OF RESEARCH
Patient Group	n/a
Provider Level	Emergency Medical Technician (EMT)
Instructor Preparation	Review National EMS Education Standards Review National EMS Information Systems (NEMSIS) Goals & Objectives
Learning Objectives	<p data-bbox="488 457 1101 489"><i>By the end of this lesson, the student will be able to:</i></p> <ul data-bbox="537 527 1398 632" style="list-style-type: none"> • Define evidenced-based medicine and practice • Explain the reasons EMS professionals should participate in research • Discuss how research affects best practice
Course planning time	0.5 hour
CONTENT	<p data-bbox="488 743 914 774">Define Evidenced-Based Practice</p> <ul data-bbox="537 812 1360 947" style="list-style-type: none"> • 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 <p data-bbox="488 1016 1382 1047">Explain the Reasons EMS Professionals Should Participate in Research</p> <ul data-bbox="537 1085 1390 1560" style="list-style-type: none"> • 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 <ul data-bbox="634 1226 1390 1560" style="list-style-type: none"> ○ May include <ul data-bbox="732 1257 1390 1560" style="list-style-type: none"> ▪ Completing data collection forms <ul data-bbox="829 1289 1390 1352" style="list-style-type: none"> • Including accurate documentation in patient care records ▪ Alerting researchers when certain cases are encountered ▪ Completing questionnaires ▪ Volunteering to participate in research studies <ul data-bbox="829 1499 1390 1560" style="list-style-type: none"> • 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
 - Physiological impairment
 - Disability
 - Pain/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