Table 5.1. Arizona Scope of Practice Skills

Note: This undated, 231-page document was used pre-2017. Please refer to the updated Scope of Practice in the Bureau's Statues and Rules book, link in bullhorn section, azdhs.gov/bems. The Education Committee is working on producing STR PowerPoint trainings for each STR. As they get produced, they can be found in the tile for EMS Education at azdhs.gov/bems. sb 10/27/22

KEY:

✓ = Arizona Scope of Practice skill

STR = STR skill

* = Already intubated

Select the STR you would like to view and click the subject you would like to review

AIRWAY/VENTILATION/OXYGENATION		EMT	AEMT	EMT-I(99)	PARAMEDIC
	Airway - esophageal	STR	✓	✓	✓
	Airway - supraglottic	STR	✓	✓	✓
	Automated transport ventilator	STR	STR	✓	✓
	Chest tube placement assist only				STR
	Chest tube monitoring and management				STR
	Cricothyrotomy- needle			STR	✓
	Cricothyrotomy- percutaneous			STR	✓
	Cricothyrotomy- surgical			STR	STR
	Intubation - nasotracheal			STR	✓
	Intubation - orotracheal	STR	STR	✓	✓
	Medication Assisted Intubation (paralytics)				STR
CARDIOVASCULAR/CIRCULATION		**EMT**	**AEMT**	**EMT-I (99)**	**PARAMEDIC**
	Cardiac - multiple lead acquisition (non-interpretive)	STR	STR	✓	✓
	Carotid massage – (≤17 years)			STR	STR
	Mechanical CPR device	STR	STR	STR	STR
MEDICATION ADMINISTRATION - ROUTES		**EMT**	**AEMT**	**EMT-I (99)**	**PARAMEDIC**
	Aerosolized/nebulized (beta agonist)	STR	✓	✓	✓
	Auto-injector	STR	✓	✓	✓
	Buccal	STR	✓	✓	✓
	Intradermal			STR	STR
	Intranasal	STR	✓	✓	✓
	Intraosseous		STR	✓	✓
	Rectal		STR	✓	✓
	Small volume nebulizer	STR	✓	✓	✓
IV INITIATION/MAINTENANCE FLUIDS		**EMT**	**AEMT**	**EMT-I (99)**	**PARAMEDIC**
	Intravenous initiation - peripheral	STR	✓	✓	✓
	Umbilical initiation				STR
MISCELLANEOUS		**EMT**	**AEMT**	**EMT-I (99)**	**PARAMEDIC**
	Eye irrigation (Morgan lens)				STR
	Thrombolytic therapy- initiation				STR
	Urinary catheterization				STR
	Blood chemistry analysis				STR
	Use/monitoring of agents specified in Table 5.4 during interfacility transports			STR	STR
	Use/monitoring of infusion pump for agent administration during interfacility transports			STR	STR

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT

Airway Esophageal – Airway Supraglottic

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum
http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMT can only use this skill under "on-line" medical direction.

Course Description:
Review of the respiratory system focused anatomy, physiology, and pathophysiology. Identification and description of the respiratory anatomy in a neonate, infant, pediatric, and adult patient. Understanding the pathophysiology of airway compromise, including the selection, insertion and use of an appropriate airway adjunct and oxygen therapy. Understanding the complications of advanced airway techniques.

Prerequisites:
Certified EMT, under Medical Direction

Course Competencies:
This course is designed to develop the following course competencies:
Identify and describe the airway anatomy and use of airway adjuncts for the neonate, infant, pediatric and adult patients (I)
Identify the need for advanced airway techniques in neonate, infant, pediatric and adult patients (II)
Identify and differentiate esophageal airways, supraglottic airways and endotracheal airways (III)
Select appropriate airway; set up and manage equipment (IV)
Identify and demonstrate proper preparation of the patient and safety techniques (V)
Identify and describe indications and contraindications for invasive airways site selection (VI)
Perform all airway adjunct techniques (VII)
Perform advanced airway application techniques (VIII)

Monitor advanced airway (IX)
Demonstrate 100% accuracy in performance or insertion of advanced airway techniques in selected scenarios (X)
Demonstrate 85% proficiency on a written examination (XI)

Focused Anatomy and Physiology

1. **Upper airway anatomy**
    - A. Pharynx
        - i. Nasal cavity and mouth meet
        - ii. Nasopharynx
        - III. Respiration functions
    - b. Oropharynx
        - I. Respiration, digestion functions
    - c. Laryngopharynx
        - I. Respiration, digestion functions
    - D. Epiglottis
        - I. Prevents food from entering the lower airway
    - E. Vellecula
    - F. Larynx
        - i. Thyroid cartilage
        - II. Adam's apple
        - iii. Cricoid cartilage
            1. First to begin trachea
            2. Complete cartilage ring
            3. Posterior compression occludes the esophagus, reduced aspiration risk
        - iv. Glottis
            1. True vocal cords, space between
        - v. Arytenoid cartilage
            1. Attachment point for vocal cords
        - vi. Cricothyroid membrane
            1. Between the cricoid and thyroid cartilage
            2. Surgical cricothyroidotomy
            3. Thyroid gland, blood vessels, jugular veins nearby
2. **Lower airway anatomy**
    - A. Trachea
        - i. Left, right mainstem bronchi
    - B. Bronchi
        - i. Carina
        - ii. Hilum
        - iii. Alveoli
        - iv. Surfactant
        - v. Atelectasis
    - c. Lungs
        - i. Inferior, middle, lower lobes
        - ii. Visceral, parietal pleura
3. **Differences in the pediatric airway**
    - a. Airway flexes when supine

b. Padding placed under torso
c. Tongue uses more space in oral cavity, obstructs airway
d. Epiglottis large, long, U-shaped, extends vertically beyond the opening of cords
e. Straight blade used for intubation
f. Larynx
g. Newborn, C1–C4
h. Epiglottis can pass behind soft palate, lock into nasopharynx
i. 7 years, C3–C5

4. **Trachea**
    a. Endotracheal tube may move with head position changes
5. **Diaphragm**
    a. Infants, decreased contraction efficiency
    b. Respiration jeopardized with movement, restraint
6. **Chest wall**
    a. Offers less protection to underlying organs
    b. Injury without external signs
7. **Respiratory system physiology**
    a. Ventilation
    b. Inspiration
    c. Expiration
    d. Hering–Breuer reflex
    e. Respiration
    f. Gas exchange between living organism and its environment
        i. External
            1. Gas exchange between alveoli of lungs and red blood cells traveling through pulmonary capillaries
        ii. Internal
            1. Once in the bloodstream, gases exchanged between blood cells and tissues
            2. Hemoglobin
            3. Oxyhemoglobin
            4. Percentage of hemoglobin bound to oxygen
            5. Partial pressure
            6. Pressure exerted by each individual gas in mixture
            7. Normal oxygen pressure in arterial blood = 80–100 torr
            8. Normal CO_2 in arterial blood = 35–45 torr
            9. Blood gas concentrations
            10. Decreased oxygen concentrations in blood causes
                A. Decreased hemoglobin concentration
                B. Lower oxygen partial pressure in atmosphere
                C. Pneumothorax, hemothorax
                D. Decreased respiration mechanics
                E. Low inspired oxygen concentrations
                F. Impaired diffusion across the pulmonary membrane
                G. Impaired pulmonary blood flow
                h. Hypoxemia

I. Decreased amount of oxygen-saturated hemoglobin in blood stream
J. Treatment includes ventilation, supplemental oxygen
k. Hypoxia
L. Decreased oxygen amount in tissues
M. Treatment includes ventilation, supplemental oxygen
n. Hypoventilation
O. Hypercarbia, CO_2 excess
    I. Causes
p. Hypoventilation
q. Decreased CO_2 elimination
r. Increased CO_2 production
s. Hyperventilation
T. Hypocarbia
    I. Causes
u. Hyperventilation
v. Increased CO_2 elimination
w. Decreased cardiac output
x. Perfusion, lung function interference
y. Decreased CO_2 production

III. Lung and respiratory volumes
1. Total lung volume
2. Tidal volume
    A. Volume of gas inhaled, exhaled during single respiratory cycle
3. Dead air space
    a. Air does not participate in gas exchange
4. Alveolar
    a. Amount of air that reaches alveoli for gas exchange
    b. Difference between tidal volume, dead space volume
5. Minute, residual volume
    a. Amount of gas moved in and out of the respiratory tract/minute
6. Functional reserve capacity
    a. Volume of air remaining in lungs at end of normal expiration
7. Residual volume
    a. After maximal forced exhalation, amount of air remaining in lungs, airway passages not able to expel
8. Inspiratory reserve volume
    a. Amount of gas forcefully inspired + normal breath's tidal volume
9. Expiratory reserve volume
    a. Amount of gas forcefully expired at end of normal expiration
10. FiO_2
    a. Percentage of oxygen in inspired air
11. Peak expiratory flow

a. Greatest rate of air flow achieved during forced expiration beginning with lungs fully inflated

iv. Control of respiration
1. Brainstem
a. Medulla oblongata
b. Pons
2. Apneustic center
a. Pneumotaxic center
3. Chemoreceptors
a. Increased PCO_2
b. Decreased PCO_2
c. Decreased PO_2

ADVANCED AIRWAYS

1. Dual lumen airway devices
a. Esophageal-tracheal Combitube®
2. Combitube®
a. Indications
i. Difficult face mask fit or difficult bag-mask ventilation
ii. Intubation unsuccessful
iii. Airway management necessary but untrained for visualized orotracheal intubation
b. Contraindications
i. Intact gag reflex
ii. Esophageal disease (varices or cancers)
iii. Caustic substance ingestion
iv. Upper airway obstruction
v. Less than 4 ft tall
c. Advantages
i. Minimal training
ii. Visualization/special equipment not required
iii. Suspected neck injury
iv. Face mask not needed
v. Esophageal or tracheal placement
vi. Allows suctioning of gastric contents
vii. Reduces risk of aspiration
d. Disadvantages
i. Proximal port may be occluded with secretions
ii. Identification of tube location difficult
iii. Soft tissue trauma
iv. Suctioning depends on tube placement
v. Esophageal or tracheal trauma
vi. Cuff damage (teeth)
vii. Limited mouth opening may prohibit insertion
3. PTL airway
a. Dual lumen similar to Combitube®
b. Do not test cuffs prior to inflation
i. Indications
1. Unconscious over 14 years old

2. Height between 5 and 7 feet tall
3. Absent gag reflex
4. Unable to intubate
5. Failure of less invasive measures

ii. Contraindications
1. Less than 14 years old
2. Gag reflex intact
3. Esophageal disease (varices or cancers)
4. Chronic alcohol abuse
5. Suspected caustic ingestion

4. Supraglottic airway devices
   a. Indications
      i. Difficult face mask fit
      ii. Intubation unsuccessful or ventilation difficult
      iii. Airway management necessary but untrained for visualized orotracheal intubation
   b. Contraindications
      i. Provider untrained
      ii. Risk of aspiration exists
   c. Advantages
      i. Quick insertion
      ii. Greater tidal volume
      iii. Ventilation equivalent to tracheal tube
      iv. Training simpler than tracheal tube
      v. Unaffected by anatomic factors
      vi. No risk of esophageal/bronchial intubation
      vii. Less potential for trauma
      viii. Less coughing, laryngeal spasm, sore throat, voice changes
   d. Disadvantages
      i. No protection from aspiration
      ii. Mouth opening may not be enough to accommodate
      iii. Ineffective with abnormal respiratory anatomy
      iv. Not adequate if high airway pressure is needed
5. Endotracheal intubation
   a. Indications
      i. Patient's inability to protect airway
      ii. Inability to ventilate
      iii. Airway obstruction
      iv. Prolonged ventilatory support required
   b. Contraindications
      i. Untrained
   c. Advantages
      i. Isolates airway keeping it open
      ii. Reduces risk of aspiration
      iii. High concentration of oxygen
      iv. Permits suctioning of trachea
      v. Route for administration of some medications
      vi. Ensures delivery of adequate tidal volume

d. Disadvantages
    i. Training/experience/special equipment required
    ii. Bypasses physiologic function of upper airway
    iii. Requires direct visualization of vocal cords
e. Equipment
    i. Laryngoscope handle, blades, extra batteries
    ii. Endotracheal tubes of various sizes
    iii. 10-mL syringe, stylet, bag-mask device
    iv. Suction equipment, commercial tube holder/tape
    v. Water-soluble lubricant, bite block/oral airway
    vi. Exhaled CO_2 detector
f. Complications
    i. Bleeding, mucosal necrosis, barotrauma
    ii. Laryngospasm, laryngeal/tracheal edema
    iii. Vocal cord damage
    iv. Aspiration, cuff leak
    v. Esophageal intubation, right bronchus intubation
    vi. Tube occlusion, hypoxia, dysrhythmias
    vii. Trauma to lips, teeth, tongue, soft tissues
    viii. Increased intracranial pressure

8. Documentation
9. Practical's
    a. Mannequin
    b. Human subjects
10. Final Written Examinations

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT –AEMT –I-99 – Paramedic

EMCT Use of an Esophageal Tracheal Double Lumen Airway Device (ETDLAD)

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform a STR [Special Training Required] skill, the Medical Director shall ensure that the EMCT has completed training specific to the skill consistent with the knowledge and competencies established according to A.R.S. 36-2204. Periodically thereafter the Medical Director shall reassess an EMCT's competency in the STR [Special Training Required] skill according to policies and procedures required in R9-25-201 (C) (3) (b) (viii).

PREREQUISITES

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

INTRODUCTION

The esophageal tracheal double lumen airway device (ETDLAD) is designed for use in emergency situations, can be inserted blindly, and can be used to ventilate a patient whether inserted into the esophagus or the trachea.

The Arizona Department of Health Services (ADHS) views the ETDLAD as a useful tool for prehospital airway management and has added use of an ETDLAD to the EMCT scope of practice as an optional skill acquired through prescribed training. This document provides information about the ETDLAD design and function and ADHS's recommendations for EMCT use of an ETDLAD in the prehospital EMS environment. ADHS intends for this document to be a guideline for the prescribed training under A.A.C. R9-25-511(C).

ETDLAD DESIGN AND FUNCTION

The ETDLAD is a device that combines an esophageal obturator lumen (longer tube) with a tracheal lumen (shorter tube) and features a large esophageal balloon approximately at midpoint and a smaller distal cuff at the distal end of the device (each with a connecting tube for inflation). The esophageal obturator lumen is blocked at the distal end and has perforations at the pharyngeal level. The tracheal lumen is open at both ends. When inflated, the oropharyngeal balloon seals the mouth and nose, and the distal cuff seals either the esophagus or trachea (depending on ETDLAD placement). When the ETDLAD is placed in the esophagus, ventilation is accomplished through the esophageal obturator lumen when air blown in escapes the esophageal lumen through the perforations, enters the pharynx, is blocked by the oropharyngeal balloon and distal cuff, and is thus forced into the trachea. When the ETDLAD is placed in the trachea, ventilation is accomplished through the tracheal lumen by blowing air directly into the trachea.

Indications:

Cardiac arrest or apnea

Contraindications:

Intact gag reflex
Height less than 4 feet
Known esophageal pathology
Recent ingestion of a caustic substance
Central airway obstruction

Advantages:

Non invasive
Helpful under difficult circumstances of space and light
Blind insertion possible
Simultaneous fixation after inflation of oropharyngeal balloon
Effective in tracheal or esophageal position
Minimized risk of aspiration
No need for electrical power supply

Potential Complications:

Increased incidence of sore throat, dysphagia, and upper airway hematoma (compared to endotracheal intubation and laryngeal mask airway) Esophageal rupture (rare)
Barotrauma possible

Available Sizes:

Small ETDLAD (37 F) recommended for use with patients 4 - 5.5 feet tall Large ETDLAD (41 F) recommended for use with patients 5 feet tall and taller

Insertion Procedure:

1. **Select appropriate size ETDLAD based on patient height.**
2. **Test the oropharyngeal balloon and distal cuff by attaching the appropriate syringe to the connecting tube for each and:**
   a. If using the smaller ETDLAD, inflating 85 cc of air into the oropharyngeal balloon and 12 cc of air into the distal cuff;
   b. If using the larger ETDLAD, inflating 100 cc of air into the oropharyngeal balloon and 15 cc of air into the distal cuff; and
   c. Ensuring that the oropharyngeal balloon and distal cuff remain inflated.
3. **Deflate the oropharyngeal balloon and distal cuff.**
4. **Lubricate the ETDLAD with water-soluble gel.**
5. **Hold the distal end of the ETDLAD bent for a few seconds to alleviate insertion by curving the ETDLAD.**
6. **Insert the ETDLAD (distal end first) gently in a curved downward motion by grasping the back of the tongue and jaw between thumb and forefinger and lifting the jaw, inserting until the printed ringmarks are positioned between the teeth or alveolar ridges. DO NOT USE FORCE.**
7. **Do one of the following:**
   a. If no resistance is encountered, go to step #8; or
      i. If resistance is encountered, stop insertion, remove the ETDLAD, and do one of the following:
      ii. if this is the first attempt to insert the ETDLAD, go back to step #5 to attempt another insertion; or
      iii. If this is the second attempt to insert the ETDLAD, maintain the patient's airway and ventilate using basic airway techniques; do NOT proceed to step #8.
8. **Once the ETDLAD is inserted:**

a. Use the larger syringe to inflate the oropharyngeal balloon with:
   i. If using the smaller ETDLAD, 85 cc of air; or
   ii. If using the larger ETDLAD, 100 cc of air;
b. Confirm that the oropharyngeal balloon remains inflated and observe the
   placement of the oropharyngeal balloon (should be in the posterior pharynx behind the hard palate);
c. Use the smaller syringe to inflate the distal cuff with:
   i. If using the smaller ETDLAD, 5-12 cc of air; or
   ii. If using the larger ETDLAD, 5-15 cc of air; and
d. Confirm that the oropharyngeal balloon remains inflated.

9. **Attach the ventilation bag to the esophageal obturator lumen (the longer tube marked #1) and begin ventilations.**
10. **Listen for breath sounds in the lungs and gurgling sounds in the epgastrium and do one of the following:**
    a. If there are breath sounds in the lungs, continue to ventilate through the esophageal obturator lumen and go to step #12;
    b. If there are no breath sounds in the lungs, and there are gurgling sounds in the epigastrium, move the ventilation bag to the tracheal lumen (the shorter tube marked #2) and begin ventilations; and
    c. If there are no breath sounds in the lungs and no gurgling sounds in the epigastrium, deflate the oropharyngeal balloon with the larger syringe, deflate the distal cuff with the smaller syringe, and:
       i. If this is the first time adjusting the ETDLAD, pull the ETDLAD out 2-3 cm, and go to step #8; or
       ii. If this is the second time adjusting the ETDLAD, remove the ETDLAD, ventilate using basic airway techniques, and do not go to step #11.
11. **Listen for breath sounds in the lungs and do one of the following:**
    a. If there are breath sounds in the lungs, continue to ventilate through the tracheal lumen and go to step #12; and
    b. If there are no breath sounds in the lungs, deflate the oropharyngeal balloon with the larger syringe, deflate the distal cuff with the smaller syringe, remove the ETDLAD, and ventilate using basic airway techniques.
12. **Continue patient ventilation and verify proper delivery of ventilations at least every 5 minutes by:**
    a. Listening for breath sounds on both sides of the chest,
    b. Using a CO2 detector and pulse oximeter and recording readings as part of patient vitals, and
    c. Verifying chest rise with each ventilation.
13. **Continually reassess patient for spontaneous respirations and pulse and remove the ETDLAD if:**
    a. The patient develops a gag reflex,
    b. The patient becomes conscious, or
    c. Ventilation is inadequate due to ETDLAD placement (then ventilate using basic airway techniques).

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT - AEMT

Automatic Transport Ventilator (ATV) – Inter-facility Transport

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing An EMT - AEMT to perform a STR [Special Training Required] skill, the Medical Director shall ensure that the EMCT has completed training specific to the skill consistent with the knowledge and competencies established according to A.R.S. 36-2204. Periodically thereafter the Medical Director shall reassess an EMCT's competency in the STR [Special Training Required] skill according to policies and procedures required in R9-25-201 (C) (3) (b) (viii).

PREREQUISITES

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Course Description

This course is designed to provide instruction for the use of an Automatic Transport Ventilator (ATV) by an EMT or an AEMT as approved by the EMT or AEMT administrative medical director. The course meets the requirements in A.A.C. R9-25-502(A)(3)(a) for an EMT or AEMT, who may then be approved by an administrative medical director for the use of the device as a STR skill.

Methodology

This guidance document suggests the following didactic, psychomotor, written and practical evaluation, and remediation process to ensure proficiency.

The following is a breakdown of the following recommended minimum hours for training:

- 1 hour – Didactic/lecture
- 1 hour – Psychomotor/hand-on practice
- $^1/_2$ hour – Written and skills evaluation
- $^1/_2$ hour – Remediation

Instructor/Faculty

The instructor must be approved by the administrative medical director and meet the following requirements:

1. Would qualify, under A.A.C. R9-25-304(A), to serve as a preceptor for a course at the classification level of EMT-I(99) or Paramedic; and
2. Is authorized by the applicable licensing Board under Arizona Revised Statutes Title 32 or, for an EMCT, the instructor's administrative medical director to use the device.

Equipment

The following minimum equipment should be available for the course:

- Body Substance Isolation equipment
- Automatic Transport Ventilator (ATV)
- Airway manikin
- Airway adjuncts
- Oxygen supply
- Bag-Valve-Mask
- Suction device

***Note**: Content material may vary slightly depending on the type of Automatic Transport Ventilator (ATV) being used. The instructor will need to make necessary adjustments based on the type of equipment.*

Course Competencies:

1. Discuss the common pathological events that affect the pulmonary system.
2. List the indications, contraindications, advantages, and disadvantages of an Automatic Transport Ventilator (ATV).
3. List and describe the features of the Automatic Transport Ventilator (ATV).
4. Discuss the respiratory volumes and capacities.
5. Describe and demonstrate the proper use of Body Substance Isolation (BSI).
6. Describe and demonstrate the assembly and application technique of the Automatic Transport Ventilator (ATV), rate, and high pressure alarm settings.
7. Discuss and demonstrate the tidal volume settings, by ml/kg for the Automatic Transport Ventilator (ATV).
8. Discuss and demonstrate assessment of the patient to determine efficacy of the Automatic Transport Ventilator (ATV).
9. Demonstrate how to decontaminate and reassemble the Automatic Transport Ventilator (ATV).
10. Discuss the maintenance and quality control of the Automatic Transport Ventilator (ATV).
11. Discuss the role of the administrative medical direction and oversight in the use of the Automatic Transport Ventilator (ATV).
12. Complete a written and practical skills evaluation with 80% competency; no failure of critical criteria.
13. (Optional) Discuss the epidemiology, anatomy, physiology, pathophysiology, assessment findings, and management for the following respiratory diseases and conditions:
    a. Adult respiratory distress syndrome (ARDS)
    b. Bronchial asthma
    c. Chronic bronchitis
    d. Emphysema
    e. Pneumonia
    f. Pulmonary edema
    g. Pulmonary thromboembolism
    h. Neoplasms of the lung
    i. Upper respiratory infections
    j. Spontaneous pneumothorax
    k. Hyperventilation syndrome

COURSE OUTLINE

Introduction

The Automatic Transport Ventilator is essentially a flow-restricted, oxygen-powered ventilation device (FROPVD) attached to a control box that allows the variables of ventilations to be set. They have been shown to be excellent at providing and maintaining a constant rate and tidal volume during ventilation and maintaining adequate oxygenation of arterial blood. In addition, most ATVs use oxygen as their power source, thereby providing 100% oxygen during ventilation.

I. Indications

A. Extended ventilation of intubated patients or alternative airway
B. In situations in which a BVM is used
C. Can be used during CPR
D. Inter-facility transport with intubated patients
E. To control rate and tidal volume of ventilation in order to prevent complications of hyperventilation

II. Contraindications

A. Absolute
   1. Children less than 5 years of age
   2. Obstructed airway
   3. Pneumothorax (after needle decompression)
B. Relative
   1. Awake patients
   2. Increased airway resistance or poor lung compliance
   3. Asthma
   4. Pulmonary edema

III. Advantages

A. To control rate and tidal volume of ventilation in order to prevent complications of hyperventilation.
B. Oxygen can be delivered at lower inspiratory flow rates and for longer inspiratory times, thereby lessening the likelihood of gastric distention
C. Frees your hands to perform other tasks, such as maintaining a mask seal or ensuring patency of the airway
D. The device can be set to deliver tidal volume, respiratory rate, and minute volume
E. Some devices have alarms to indicate high airway resistance, low pressure in the oxygen tank as well as accidental disconnection from the ventilator
F. Lightweight, portable, and durable
G. Mechanically simple
H. Adapts to portable oxygen tanks

IV. Disadvantages

A. Because most ATVs are oxygen powered, constant oxygen supply is needed to power the device. Bag-valve-mask device should always be readily available when using the Automatic Transport Ventilator (ATV).
B. The Automatic Transport Ventilator (ATV) cannot be used in children less than 5 years of age.

C. When using the Automatic Transport Ventilator, it is not possible to feel an increase in airway resistance or decrease in lung compliance.
D. Tube displacement cannot be detected.
E. The ATV is difficult to secure.

V. Features

***Note**: Content material may vary slightly depending on the type of Automatic Transport Ventilator (ATV) being used. The instructor will need to make necessary adjustments based on the type of equipment. The content of this section will be specific to the device being used. It is important that all components are discussed.*

The minimum desirable features of the ATV are as follows:

A. Time or volume cycled device
B. A standard 15/22 mm adapter to fit a tracheal tube, mask, or other airway adjunct
C. A rugged design that is also lightweight (2-5 kg)
D. Capable of operating under temperature extremes and under all environmental conditions
E. A peak-inspiratory-pressure-limiting valve that is set at 60 cmH_2O but can be increased to 80 cm H O or lowered to 20 cm H O22
F. An audible alarm that indicates high airway pressure or poor lung compliance when peak inspiratory limiting pressure is generated
G. Minimal gas consumption so that the device can operate for a minimum of 45 minutes on an E cylinder
H. Ability to deliver 100% oxygen with each ventilation
I. Ability to deliver each ventilation over a 2-second period at a maximum flow rate of approximately 30L/minute in the adult and 1 second duration in children with a maximum flow rate of 15 L/minute
J. If it has a demand-valve feature, the ability to deliver an inspiratory flow rate of at least 100 L/minute and triggered at -2 cm H_2O inspiratory pressure to reduce the work of breathing
K. Will deliver a ventilation rate of 10 ventilations per minute in the adult and 20 ventilations per minute in the child with the ability to adjust the rate

VI: Respiratory volumes and capacities

***Note**: Content material may vary slightly depending on the type of Automatic Transport Ventilator (ATV) being used. The instructor will need to make necessary adjustments based on the type of equipment.*

A. In most cases respiratory rate is set at the midpoint or average for the patient's age.
B. Tidal volume is usually estimated using the formula of 4 to 6 mL/kg because ATVs are oxygen powered and provide oxygen enriched breathing gas.
C. The tidal volume can be adjusted based on the patient's chest rise and physiologic response.

VII: Proper Body Substance Isolation (BSI)

To reduce the risk of exposure, important pieces of protective gear include the following:

A. Gloves
B. Mask
C. Eyewear
D. Gowns or aprons (if indicated)

VIII: Assembly, application technique, efficacy of the Automatic Transport Ventilator (ATV), and troubleshooting

***Note**: Content material may vary slightly depending on the type of Automatic Transport Ventilator (ATV) being used. The instructor will need to make necessary adjustments based on the type of equipment.*

A. Appropriate Body Substance Isolation (BSI) must be used when performing this Procedure

B. Assembly of the Automatic Transport Ventilator
   1. Hand tight all fittings.
   2. Attach regulator to oxygen cylinder, check for adequate pressure (>1000 psi).
   3. Attach the oxygen line to the high pressure outlet on the regulator (quick-release oxygen line connector device is highly recommended).
   4. Connect patient valve supply tubing.

C. Application

***Note**: Use of the Automatic Transport Ventilators (ATV) should not impede the management of the patient's airway. Opening the airway with basic maneuver and providing proper ventilation is the first priority in performing the vital basic skills in perfusion.*

1. Determine the indication for the use of the Automatic Transport Ventilator (ATV).
2. Assure that all tubing is free from kinks.
3. Determine the proper tidal volume setting (patient's weight in kilograms times 4 – 6 ml/kg).
4. Set breaths per minute (BPM) control to desired rate per minute.
5. Occlude the patient valve assembly outlet by a gloved hand. The audible pressure limit alarm should sound as the ventilator cycles through the delivery phase.
6. Assess lung compliance and chest rise with a bag-valve device. Tidal volume can be adjusted based on the patient's chest rise and physiologic response.
7. Attach the patient valve assembly to the ETT or mask on the patient.
8. Assess the ventilation.
9. Listen for bilateral lung sounds.
10. Observe for proper chest rise and fall.
11. If lung sounds are absent or only on one side only; rule out possible causes (i.e. airway obstruction, improper ETT placement, pneumothorax/tension pneumothorax).
12. Reassess the tidal volume and breaths per minute (BPM). Tidal volume can be adjusted based on the patient's chest rise and physiologic response.
13. Attach CO_2 monitoring device or colorimetric chemical detection (if available).
14. Look for patient's improvement (i.e. skin color, pulse oximetry, mental status). 15. Count the number of complete ventilator cycles for a full minute.
15. Assess and manage the airway for patency.
16. If spontaneous breathing begins, it may be desirable to turn off the breaths per minute. This would allow the patient to draw oxygen up to the tidal volume limit set on the control device. If the patient is intubated and spontaneous breathing begins, contact on line medical direction for pharmacological intervention if indicated.

17. Reassess the oxygen cylinder pressure level frequently

D. Troubleshooting

Warning: Transport of patients with the ATV requires the EMT-I(99) or Paramedic to have a good working knowledge of the ventilator's use and problem solution. Proper emergency backup equipment or other means of positive-pressure ventilation device must be immediately available during transport.

Troubleshooting guidelines for ATV:

Indication	**Probable Cause**	**Solution**
Low pressure alarm sounds; continuous high-pitched hum	Low supply of oxygen	Always make sure an adequate supply of oxygen is available for patient use and transport
High pressure limit alarm sounds during the following indications: Decreased tidal volume or Decreased chest	Leak around mask or Patient Valve tubing	Check all connections for leaks
	Inappropriate volume setting	Check Control Module setting and adjust as required
	Inappropriate Inspiratory Time setting	Check Control Module setting and adjust as required
	Decreased lung compliance and/or increased airway resistance	Evaluate patient and correct as required by adjusting Control Module settings; attempt to ventilate via other means if adjustments do not result in satisfactory ventilation of the patient
	Airway secretions	Clear airway of secretions; suction
Indication	**Probable Cause**	**Solution**
Inadequate inspiratory phase and chest movement	Blocked airway and/or a stiff lung is indicated	Increase the volume delivered to the patient, until adequate chest movement occurs, by rotating the Tidal Volume control knob in a clockwise direction. Disconnect the patient from the ventilator and attempt to ventilate via other means if adjustment do not result in adequate ventilation

IX. Decontamination and Quality Control

The Automatic Transport Ventilator (ATV) must be cleaned after every use

***Note**: Content material may vary slightly depending on the type of Automatic Transport Ventilator (ATV) being used. The instructor will need to make necessary adjustments based on the type of equipment.*

1. Control Module
   a. Leave hoses connected when decontaminating the unit.
   b. Do not submerge the control unit in liquid.
   c. Remove gross contamination by wiping with approved disinfectant solution, wipe off with clean disposable towel.
   d. Dry surface with a clean disposable towel.
   e. Discard contaminated towels into a biohazard bag.
2. Patient Valve Assembly
   a. Remove the outlet adapter and exhalation valve from the patient valve assembly.
   b. Remove gross contamination by wiping adapter and exhalation valve with an approved disinfectant solution.
   c. Dry with a clean disposable towel.
   d. Inspect each component for signs of wear (discard and replace any worn parts).
   e. Reassemble the unit.

X. Medical Direction

Automatic Transport Ventilator can be performed by:

A. An EMT-I(99) or a Paramedic, according to A.A.C. R9-25-502(A)(2), only if authorized by the EMT-I(99)'s or Paramedic's administrative medical director and if the EMT-I(99) or Paramedic is able to receive on-line medical direction.

B. An AEMT or EMT as a STR skill, according to A.A.C. R9-25-502(A)(3), only after the AEMT or EMT has successfully completed training that meets the requirements in A.A.C. R9-25-502(A)(3)(a), if authorized by the AEMT's or EMT's administrative medical director, and if the EMT-I(99) or Paramedic is able to receive on-line medical direction.

Instructor Training Resource
(OPTIONAL)

Section 1: General pathophysiology of the pulmonary system

I. Introduction

A. Epidemiology

1. Incidence

   Respiratory complaints are a major aspect of EMS, resulting in 28% of all EMS chief complaints according to a US study of over 2.5 million EMS calls.

2. Mortality/ morbidity

   Over 200,000 persons die from respiratory emergencies each year.

3. Risk factors

   a. Intrinsic factors that increase the risk of developing respiratory disease

      i. Genetic predisposition influences development of:

         (1) Asthma
         (2) COPD
         (3) Carcinomas

      ii. Associated cardiac or circulatory pathologies influences development of:

         (1) Pulmonary edema
         (2) Pulmonary emboli

      iii. Stress

         (1) Increases the severity of respiratory complaints
         (2) May be associated with the frequency of exacerbations of asthma and COPD

   b. Extrinsic factors that increase the risk of developing respiratory disease

      i. Smoking

         (1) Increases the prevalence of COPD and carcinomas
         (2) Increases the severity of virtually all respiratory disorders

      ii. Environmental pollutants

         (1) Increases the prevalence of COPD
         (2) Increases the severity of all obstructive disorders

B. Anatomy and physiology review

1. Global physiology of the pulmonary system

   a. Function

      i. The respiratory system functions as a gas exchange system.
      ii. 10,000 liters of air are filtered, warmed, humidified, and exchanged daily in adults.
      iii. Oxygen is diffused into the bloodstream for use in cellular metabolism by the body's 100 trillion cells.
      iv. Wastes, including carbon dioxide, are excreted from the body via the respiratory system.

   b. Physiology

      i. Ventilation

         (1) Ventilation refers to the process of air movement in and out of the lungs.

         (2) In order for ventilation to occur, the following functions **must** be intact:

(a) Neurologic control (brainstem) needs to initiate inspiration
(b) Nerves between the brainstem and the muscles of respiration (diaphragm and intercostals) need to be intact and undamaged
(c) Diaphragm and intercostal muscles must be functional and non-traumatized
(d) Upper airways must be intact and patent
(e) Lower airways must be intact and patent
(f) The alveoli must be intact and non-collapsed

(3) Emergent intervention for ventilation problems includes:
(a) Opening the upper and lower airways
(b) Providing assisted ventilation

ii. Diffusion

(1) Diffusion refers to the process of gas exchange between the air-filled alveoli and the pulmonary capillary bed.

(2) Gas exchange is driven by simple diffusion - gases from areas of high concentration to areas of low concentration (gas exchange continues until the concentrations are equal).

(3) In order for diffusion to occur, the following functions **must** be intact:
(a) The alveolar walls must be intact and not thickened.
(b) The interstitial space (between the alveoli and capillary wall) must not be enlarged or filled with fluid.
(c) The capillary walls must be intact and not thickened.

(4) Emergent intervention for diffusion problems includes:
(a) Provision of high flow oxygen
(b) Taking measures to reduce inflammation in the interstitial space

iii. Perfusion

(1) Perfusion refers to the process of circulating blood through the pulmonary capillary bed.

(2) In order for perfusion to occur, the following functions **must** be intact:
(a) There must be adequate blood volume (and adequate hemoglobin within the blood).
(b) The pulmonary capillaries must be intact and not occluded.
(c) The left heart must be functioning properly to assure a smooth flow of blood through the pulmonary capillary bed.

(3) Emergent intervention for perfusion problems includes:
(a) Ensuring adequate circulating volume and hemoglobin levels
(b) Optimizing left heart function as necessary

c. Rationale behind learning physiology

i. There are many, many different pulmonary diseases.

ii. Many diseases act in a variety of different ways on a number of body systems.

iii. Learning the pathophysiology of every respiratory disease is impossible at the EMCT level, and is not a useful exercise because of the dynamic nature of newly developing or identified pulmonary pathologies.

iv. However, all respiratory problems, old or new, can be categorized as impacting ventilation, diffusion, or perfusion.

v. Treatment can be initiated rapidly and effectively once the problem has been identified as ventilation, diffusion, perfusion or a combination.

2. Anatomy of the pulmonary system

a. The upper airway

i. Functions

(1) Conduit for air
(2) Filtration
(3) Warming
(4) Humidification
(5) Protection of lower airway

ii. Structures

(1) Nose
(2) Pharynx
(3) Larynx

b. The lower airway

i. Functions

(1) Conduit for air
(2) Filtration
(3) Warming
(4) Humidification
(5) Removal of foreign particles

ii. Structures

(1) Trachea
(2) Bronchi
(3) Bronchioles
(4) Cilia

c. The gas exchange interface

i. Functions

(1) Facilitate gas exchange
(2) Transfer gases
(3) Mechanism and normals
(4) Diffusion
(5) Venous partial pressures of gases
(6) Arterial partial pressures of gases
(7) Oxygen saturation
(8) Oxyhemoglobin dissociation curve

ii. Structures

(1) Alveoli
(2) Interstitial space
(3) Pulmonary capillary bed

d. The chest wall

i. Functions

(1) Ventilation

(2) Protection of lungs and airways
(3) Mechanism and normals
(4) The process of inspiration and expiration
(5) Normal respiratory volumes (total lung capacity, tidal volume)

ii. Structures
(1) Diaphragm is the major muscle of respiration
(2) Intercostal muscles
(3) Accessory muscles
(4) Pleural space

e. The neurologic control of breathing

i. Functions
(1) To control ventilation in coordination with physiologic needs
(2) Mechanism and normal values
(3) Driven primarily by the pH of the cerebrospinal fluid - which is influenced by the partial pressure of CO_2 ($PaCO_2$)
(4) Secondary drive is the $PaCO_2$
(5) Tertiary drive (typically only utilized in a small number of individuals with severe pulmonary disease) is the partial pressure of oxygen (PaO_2) as measured by peripheral baroreceptors located in the aortic arch and carotid artery

ii. Structures
(1) Medulla
(2) Phrenic nerve, which innervates the diaphragm
(3) Spinal nerves (thoracic levels), which innervate the intercostal muscles
(4) Hering-Breuer reflex, which prevents over inflation

II. General system pathophysiology, assessment and management

A. Pathophysiology

1. A variety of problems can impact the pulmonary system's ability to achieve its goal of gas exchange to provide for cellular needs and excretion of wastes.
2. Understanding these problems globally can enable the EMCT to quickly and effectively pinpoint probable causes and necessary interventions.
3. Specific pathophysiologies

a. Ventilation

i. Upper airway obstruction
(1) Trauma
(2) Epiglottis
(3) Foreign body obstruction
(4) Inflammation of the tonsils

ii. Lower airway obstruction
(1) Trauma
(2) Obstructive lung disease
(3) Mucous accumulation
(4) Smooth muscle spasm
(5) Airway edema

iii. Chest wall impairment
(1) Trauma
(2) Hemothorax
(3) Pneumothorax
(4) Emphysema
(5) Pleural inflammation
(6) Neuromuscular diseases (such as multiple sclerosis or muscular dystrophy)
iv. Problems in neurologic control
(1) Brainstem malfunction
(a) CNS depressant drugs
(b) CVA or other medical neurologic condition
(c) Trauma
(2) Phrenic/spinal nerve dysfunction
(a) Trauma
(b) Neuromuscular diseases

b. Diffusion
i. Inadequate oxygen concentration in ambient air
ii. Alveolar pathology
(1) Asbestosis, other environmental lung diseases
(2) Blebs/bullaes associated with chronic obstructive pulmonary disease (COPD)
(3) Inhalation injuries
iii. Interstitial space pathology
(1) Pulmonary edema
(a) High pressure (also known as cardiogenic)
(i) Left heart failure
(ii) Idiopathic pulmonary hypertension
(b) High permeability (also known as non-cardiogenic)
(i) ARDS
(ii) Asbestosis, environmental lung diseases
(iii) Near-drowning
(iv) Post-hypoxia
(v) Inhalation injuries
v. Capillary bed athology Severe atherosclerosis

c. Perfusion
i. Inadequate blood volume/hemoglobin levels
(1) Hypovolemia
(2) Anemia
ii. Impaired circulatory blood flow Pulmonary embolus
iii. Capillary wall pathology Trauma

B. Assessment findings
1. Scene size-up
a. Pulmonary complaints may be associated with exposure to a wide variety of toxins, including carbon monoxide, toxic products of combustion, or environments that have deficient ambient oxygen (such as silos, enclosed storage spaces etc.).

b. It is critical to assure a safe environment for all EMS personnel before initiating patient contact.
c. If necessary, individuals with specialized training and equipment should be utilized to remove the patient from a hazardous environment.

2. Initial assessment
   a. A major focus of the initial assessment is the recognition of life-threat; there are a variety of pulmonary conditions that may offer a very real risk for patient death.
   b. Recognition of life threat and the initiation of resuscitation takes priority over detailed assessment.
   c. Signs of life-threatening respiratory distress in adults, listed from most ominous to least severe:
      i. Alterations in mental status
      ii. Severe cyanosis
      iii. Absent breath sounds
      iv. Audible stridor
      v. 1-2 word dyspnea
      vi. Tachycardia > 130 beats/minute
      vii. Pallor and diaphoresis
      viii. The presence of retractions/use of the accessory muscles

3. Focused history and physical examination
   a. Chief complaint
      i. Dyspnea
      ii. Chest pain
      iii. Cough
         (1) Productive
         (2) Non-productive
         (3) Hemoptysis
      iv. Wheezing
      v. Signs of infection
         (1) Fever/chills
         (2) Increased sputum production
   b. History
      i. Previous experiences with similar/identical symptoms
         (1) The patient's subjective description of acuity is an accurate indicator of the acuity of this episode if the pathology is chronic.
         (2) Asking the patient "what happened the last time you had an attack this bad" is an extremely useful predictor of this episode's course.
      ii. Known pulmonary diagnosis
         If the diagnosis is not known to the paramedic, an effort should be made to learn whether it is primarily related to ventilation, diffusion, perfusion, or a combination.
      iii. History of previous intubation is an accurate indicator of severe pulmonary disease, and suggests that intubation may be required again.
      iv. Medication history
         (1) Current medications

(2) Medication allergies
(3) Pulmonary medications
(a) Sympathomimetic
(i) Inhaled
(ii) Oral
(iii) Parenteral
(b) Corticosteroid
(i) Inhaled
(ii) Oral (daily versus during exacerbations only)
(c) Chromolyn sodium
(d) Methylxanthines (theophyllin preparations)
(e) Antibiotics
(4) Cardiac-related drugs
v. History of the present episode
vi. Exposure/smoking history
c. Physical exam
i. General impression
(1) Position
(a) Sitting
(b) "Tripod" position
(c) Feet dangling
(2) Mentation
(a) Confusion is a sign of hypoxemia or hypercarbia.
(b) Restlessness and irritability may be signs of fear and hypoxemia.
(c) Severe lethargy or coma is a sign of hypercarbia.
(3) Ability to speak
(a) 1-2 word dyspnea versus ability to speak freely
(b) Rapid, rambling speech as a sign of anxiety and fear
(4) Respiratory effort
(a) Hard work indicates obstruction
(b) Retractions
(c) Use of accessory muscles
(5) Color
(a) Pallor
(b) Diaphoresis
(c) Cyanosis
(i) Central
(ii) Peripheral
ii. Vital signs
(1) Pulse
(a) Tachycardia is a sign of hypoxemia and the use of sympathomimetic medications.
(b) In the face of a pulmonary etiology, bradycardia is an ominous sign of severe hypoxemia and imminent cardiac arrest.

(2) Blood pressure

Hypertension may be associated with sympathomimetic medication use.

(3) Respiratory rate

(a) The respiratory rate is not a very accurate indicator of respiratory status unless it is very slow.

(b) Trends are essential in evaluating the chronic patient. Slowing rate in the face of an unimproved condition suggests exhaustion and impending respiratory insufficiency.

(4) Respiratory patterns

(a) Eupnea
(b) Tachypnea
(c) Cheyne-Stokes
(d) Central neurogenic hyperventilation
(e) Kussmaul
(f) Ataxic (Biot's)
(g) Apneustic
(h) Apnea

iii. Head/neck

(1) Pursed lip breathing
(2) Use of accessory muscles
(3) Sputum

(a) Increasing amounts suggests infection.

(b) Thick, green or brown sputum suggests infection and/or pneumonia.

(c) Yellow or pale gray sputum may be related to allergic or inflammatory etiologies.

(d) Frank hemoptysis often accompanies severe tuberculosis or carcinomas.

(e) Pink, frothy sputum is associated with severe, late stages of pulmonary edema.

(4) Jugular venous distention may accompany right-sided heart failure, which may be caused by severe pulmonary obstruction.

iv. Chest

(1) Signs of trauma
(2) Barrel chest demonstrates the presence of long-standing chronic obstructive lung disease.
(3) Retractions
(4) Symmetry
(5) Breath sounds

(a) Normal

(i) Bronchial
(ii) Bronchovesicular
(iii) Vesicular

(b) Abnormals

(i) Stridor
(ii) Wheezing
(iii) Ronchi (low wheezes)

(iv) Rales (crackles)
(v) Pleural friction rub

v. Extremities
(1) Peripheral cyanosis
(2) Clubbing is indicative of long-standing chronic hypoxemia.
(3) Carpopedal spasm may be associated with hypocapnia resulting from periods of rapid, deep respiration.

d. Diagnostic testing
i. Pulse oximetry
(1) Used to evaluate or confirm the adequacy of oxygen saturation
(2) May be inaccurate in the presence of conditions that abnormally bind hemoglobin, including carbon monoxide poisoning or methemoglobinemia

ii. Peak flow
Provides a baseline assessment of airflow for patients with obstructive lung disease

iii. Capnometry
(1) Provides ongoing assessment of endotracheal tube position End-tidal CO_2 drops immediately when the tube is displaced from the trachea
(2) Quantitative versus qualitative

C. Management
1. Airway and ventilation
a. Head-tilt/chin-lift
b. Jaw thrust without head-tilt
c. Head-tilt/jaw thrust
d. Oropharyngeal airway
e. Nasopharyngeal airway
f. Nasal cannula
g. Simple oxygen mask
h. Nonrebreather mask
i. Pharyngeal tracheal double-lumen airway
j. Pharyngeal tracheal lumen airway
k. Bag-valve-mask
l. Bag-valve-mask with PEEP, for EMT-I(99)s and Paramedics only
m. CPAP
n. Orotracheal intubation
o. Nasotracheal intubation
p. Suctioning
q. Endotracheal tube
r. Oxygen powered manually triggered ventilators
s. Automatic Transport Ventilator
t. Needle cricothyroidotomy
u. Surgical cricothyroidotomy

2. Circulation
3. Pharmacological
    a. Oxygen
    b. Sympathomimetic
    c. Albuterol
    d. Epinephrine
    e. Isoetharine
    f. Metaproterenol sulfate
    g. Racemic epinephrine
    h. Terbutaline sulfate
    i. Corticosteroid
    j. Methylxanthines
    k. Theophylline ethylenediamine - aminophylline
    l. Antibiotics
    m. Mucokinetic drugs
    n. Mucolytic drugs
    o. Bronchomucotropic drugs
    p. Prophylactic asthma drugs
    q. Cough suppressants - antitussive agents
    r. "Street" drugs

4. Non-pharmacological
    a Positioning - sitting up
    b. Back blows
5. Monitoring and devices used in pulmonary care
    a. Pulse oximetry
    b. Peak flow
    c. Capnometry
6. Transport considerations
    a. Appropriate mode
    b. Appropriate facility

Section 2: <u>Respiratory diseases and condition</u>

I. Specific illness

A. Acute/adult respiratory distress syndrome (ARDS)

1. Respiratory syndrome characterized by respiratory insufficiency and hypoxia
   a. Triggers
      i. Aspiration
      ii. Cardio-pulmonary bypass surgery
      iii. Gram-negative sepsis
      iv. Multiple blood transfusions
      v. Oxygen toxicity
      vi. Trauma
      vii. Pneumonia
      viii. Respiratory Infection
2. Findings
   a. Shortness of breath
   b. Rapid breathing
   c. Inadequate oxygenation
   d. Decreased lung compliance
3. Interventions
   a. Airway management
   b. Oxygen administration
      i. Mechanical ventilation
      ii. PEEP, for EMT-I(99)s and Paramedics only
   c. Improving underlying condition
   d. Removing the cause
   e. Suction prn

B. Obstructive airway diseases

1. A spectrum of diseases that affect a substantial number of individuals worldwide
2. Diseases include asthma and COPD (which includes emphysema and chronic bronchitis)
3. Epidemiology
   a. Morbidity/mortality
      i. Overall
      ii. Asthma - 4-5% of US population
      iii. 20% of adult males have chronic bronchitis
   b. Causative factors
      i. Cigarette smoking
      ii. Exposure to environmental toxins
      iii. Genetic predisposition
   c. Factors that may exacerbate underlying conditions
      i. Intrinsic

      Stress is a significant exacerbating factor, particularly in adults.
         (1) Upper respiratory infection
         (2) Exercise

      ii. Extrinsic
         (1) Tobacco smoke
         (2) Allergens (including foods, animal dander, dusts, molds, pollens)

(3) Drugs
(4) Occupational hazards

d. Prevention strategies
i. Smoking prevention, particularly for youth
ii. Stop smoking for existing smokers
iii. Control of air pollution
iv. Provision of smoke-free workplaces and public locations

4. Anatomy and physiology review
a. Ventilation disorders
b. Obstruction occurs in the bronchioles, and may be the result of:
i. Smooth muscle
spasm
Beta receptors
ii. Mucous
(1) Goblet cells
(2) Cilia
iii. Inflammation

c. Obstruction may be reversible or irreversible.

d. Obstruction causes air trapping through the following mechanism:
i. Bronchioles dilate naturally on inspiration.
ii. Dilation enables air to enter the alveoli despite the presence of obstruction.
iii. Bronchioles naturally constrict on expiration.
iv. Air becomes trapped distal to obstruction on exhalation.

5. Pathophysiology varies slightly by disease.
a. Asthma
i. Reversible obstruction
ii. Obstruction caused by a combination of smooth muscle spasm, mucous, and edema.
iii. Exacerbating factors tend to be extrinsic in children, intrinsic in adults.
iv. Status asthmaticus - prolonged exacerbation that doesn't respond to therapy

C. Chronic bronchitis
i. Reversible and irreversible obstruction
ii. Characterized by hyperplasia and hypertrophy of mucous-producing glands
iii. Clinical definition - productive cough for at least 3 months per year for 2 or more consecutive years
iv. Typically associated with cigarette smoking, but may also occur in non-smokers

c. Emphysema
i. Irreversible airway obstruction
ii. Diffusion defect also exists because of the presence of blebs.
iii. Because blebs have extremely thin walls, they are prone to collapse.
iv. To prevent collapse, the patient often exhales through

pursed lips, effectively maintaining a positive airway pressure.

v. Almost always associated with cigarette smoking or significant exposure to environmental toxins.

6. Assessment findings
   a. Signs of severe respiratory impairment
      i. Altered mentation
      ii. 1-2 word dyspnea
      iii. Absent breath sounds
   b. Chief complaint
      i. Dyspnea
      ii. Cough
      iii. Nocturnal awakening with dyspnea and wheezing
   c. History
      i. Personal or family history of asthma and/or allergies
      ii. History of acute exposure to pulmonary irritant
      iii. History of prior similar episodes
   d. Physical findings
      i. Wheezing may be present in ALL types of obstructive lung disease
      ii. Retractions and/or use of accessory muscles
   e. Diagnostic testing
      i. Pulse oximeter to document degree of hypoxemia and response to therapy
      ii. Peak flow to establish baseline airflow
7. Management
   a. Airway and Intubation as required
      i. Assisted ventilation may be necessary
      ii. High flow oxygen
   b. Circulation
      i. Intravenous therapy may be necessary to:
         (1) Improve hydration
         (2) Thin and loosen mucous
      ii. Pharmacologic
         (1) Adrenergic stimulants
         (2) Albuterol
         (3) Metaproterenol
         (4) Terbutaline
         (5) Atropine sulfate
         (6) Magnesium
         (7) Methylxanthines
         (8) Corticosteroid
   c. Supportive care
   d. Transport considerations
      i. Appropriate mode
      ii. Appropriate facility
      iii. Continue monitoring
      iv. Contact medical direction

e. Psychological support/communication strategies

D. Pneumonia

1. Epidemiology
   a. Incidence
      i. Fifth leading cause of death in the US
      ii. Not a single disease, but a group of specific infections
   b. Risk factors
      i. Cigarette smoking
      ii. Alcoholism
      iii. Exposure to cold
      iv. Extremes of age (old or young)
   c. Anatomy and physiology review
      i. Cilia
      ii. Causes and process of mucous production
2. Pathophysiology
   a. Ventilation disorder
   b. Infection of lung parenchyma
      i. Most commonly bacterial
      ii. May also be viral or fungal
   c. May cause alveolar collapse (atelectasis)
   d. Localized inflammation/infection may become systemic, leading to sepsis and septic shock
   e. Community acquired versus hospital acquired
3. Assessment findings
   a. Typical pneumonia
      i. Acute onset of fever and chills
      ii. Cough productive of purulent sputum
      iii. Pleuritic chest pain (in some cases)
      iv. Pulmonary consolidation on auscultation
      v. Location of bronchial breath sounds
      vi. Rales
      vii. Egophony
   b. Atypical pneumonia
      i. Non-productive cough
      ii. Extra-pulmonary symptoms
      iii. Headache
      iv. Myalagias
      v. Fatigue
      vi. Sore throat
      vii. Nausea, vomiting, diarrhea
      viii. Fever and chills
4. Management
   a. Airway and ventilation
      i. Intubation may be required
      ii. Assisted ventilation as necessary
      iii. High flow oxygen

b. Circulation
    i. Intravenous access
    ii. Administration of IV fluids
    iii. Improve hydration
    iv. Thin and mobilize mucous
c. Pharmacological
    i. Bronchodilators may be required if airway obstruction is severe or if the patient has accompanying obstructive lung disease.
    ii. Antibiotic therapy by prescription
    iii. Antipyretics
d. Non-pharmacological
    i. Cool if high fever
e. Transport considerations for the elderly (over 65 years of age)
    i. Significant co-morbidity
    ii. Inability to take oral medications
    iii. Support complications
    iv. Appropriate facility
f. Psychological support/ communication strategies

E. Pulmonary edema
1. Not a disease but a pathophysiological condition
    a. High pressure (cardiogenic)
    b. High permeability (non-cardiogenic)
2. Epidemiology
    a. Risk factors vary based on type
        i. High pressure (cardiogenic)
            (1) Acute myocardial infarction
            (2) Chronic hypertension
            (3) Myocarditis
        ii. High permeability (non-cardiogenic)
            (1) Acute hypoxemia
            (2) Near-drowning
            (3) Post-cardiac arrest
            (4) Post shock
            (5) High altitude exposure
            (6) Inhalation of pulmonary irritants
            (7) Adult respiratory distress syndrome (ARDS)
3. Anatomy and physiology review
    a. Alveoli
    b. Pulmonary capillaries
    c. Interstitial space and fluid
    d. Pulmonary circulation
    e. Role of surfactant
    f. Hydrostatic pressure
    g. Colloid osmotic pressure
    h. Capillary wall damage
    i. Left sided heart failure
    j. Lymphatic drainage

k. Pulmonary blood pressures
l. Starling's law of the heart
m. Hypoalbuminemic states (liver disease)

4. Pathophysiology
   a. Diffusion disorder
   b. High pressure (cardiogenic)
      i. Left sided heart failure
      ii. Increase in pulmonary venous pressure
      iii. Increase in hydrostatic pressure
      iv. Engorgement of pulmonary vasculature
      v. Failure of cough and lymphatics to drain fluids
      vi. Excessive accumulation of fluid in the interstitial space
      vii. Widening interstitial space impairs diffusion
      viii. In severe cases, fluid may accumulate in the alveoli
   c. High permeability (non-cardiogenic)
      i. Disruption of the alveolar-capillary membranes caused by:
         (1) Severe hypotension
         (2) Severe hypoxemia (post-drowning, post-cardiac arrest, severe seizure, prolonged hypoventilation)
         (3) High altitude
         (4) Environmental toxins
         (5) Septic shock
      ii. Disrupted membranes leak fluid into the interstitial space
      iii. Widened interstitial space impairs diffusion

5. Assessment findings
   a. High pressure (cardiogenic) Refer to cardiology unit
   b. High permeability (non-cardiogenic)
      i. History of associated factors
         (1) Hypoxic episode
         (2) Shock (hypovolemic, septic, or neurogenic)
         (3) Chest trauma
         (4) Recent acute inhalation of toxic gases or particles
         (5) Recent ascent to high altitude without climatizing
      ii. Dyspnea
      iii. Orthopnea
      iv. Fatigue
      v. Reduced exercise capacity
      vi. Pulmonary rales, particularly in severe cases
   c. Diagnostic testing
      Pulse oximetry

6. Management
   a. High pressure (cardiogenic)
      Refer to cardiology unit
   b. High permeability (non-cardiogenic)
      i. Airway and ventilation

      ii. Intubation as necessary

(1) Assisted ventilation may be required
(2) High flow oxygen

c. Circulation
   i. Avoid fluid excess
   ii. Monitor IV flow rates carefully

d. Pharmacological
   i. Diuretics may be considered in severe cases, but are not usually appropriate since the etiology is NOT high pressure in the pulmonary capillary bed.
   ii. Corticosteroid may be used to stabilize pulmonary capillary and alveolar walls.

e. Non-pharmacological
   i. Position the patient in an upright position with legs dangling
   ii. Rapid removal from any environmental toxins
   iii. Rapid descent in altitude if high altitude pulmonary edema (HAPE) is suspected

f. Transport decisions
   i. Appropriate mode
   ii. Appropriate facility

g. Psychological support/communication strategies

F. Pulmonary thromboembolism

1. Epidemiology
   a. Incidence
      i. Responsible for 50,000 deaths annually
      ii. 5% of sudden deaths
   b. Mortality/morbidity
      Less than 10% of pulmonary emboli result in death
   c. Risk factors
      i. Recent surgery
      ii. Pregnancy
      iii. Oral contraceptives
      iv. infection
      v. Cancer
      vi. Sickle cell anemia
      vii. Long bone fractures
      viii. Prolonged inactivity
      ix. Bedridden patients
   d. Prevention strategies

2. Anatomy and physiology review
   a. Deep veins in lower legs
   b. Venous system
   c. Coagulation of blood
   d. Role of venous stasis
   e. Venous wall injury
   f. Venous valves
   g. Pulmonary vasculature

   h. Ventilation-perfusion mismatch

3. Pathophysiology
    a. Perfusion disorder
    b. Deep vein stasis
    c. Injury to view wall
    d. Hypercoagulability
    e. Platelet aggregation
    f. Embolism size
    g. Embolism location in the legs
    h. Embolism location in the lungs
    i. Complete loss of perfusion in some area of lungs
    j. Other causes of pulmonary circulation obstruction:
        i. Air
        ii. Fat
        iii. Foreign objects
        iv. Venous catheters
        v. Amniotic fluid
4. Assessment findings - depend on size of the clot
    a. Evidence of significant life-threatening embolus in a proximal location
        i. Altered mentation
        ii. Severe cyanosis
        iii. Profound hypotension
        iv. Cardiac arrest
    b. Chief complaint
        i. Chest pain
        ii. Dyspnea
        iii. Cough (typically non-productive)
    c. History
        i. Sudden onset
        ii. Identification of risk factors
    d. Physical findings
        i. Normal breath sounds or, in severe cases, rales
        ii. Pleural friction rub
        iii. Tachycardia
        iv. Clinical evidence of thrombophlebitis (found in less than 50%)
        v. Tachypnea
        vi. Hemoptysis (fairly rare)
        vii. Petechiae on upper thorax and arms
5. Management - prevention has major role in management
    a. Depends on the size of the embolism
    b. Airway and ventilation
        i. Intubation if necessary
        ii. Positive pressure ventilation if required
        iii. High flow oxygen
    c. Circulation
        i. CPR if required
        ii. IV therapy; hydration based on clinical symptoms
    d. Pharmacological

Thrombolytic therapy may be appropriate if the diagnosis of pulmonary embolus is confirmed; however, this is rare - especially in the out-of-hospital setting.

e. Non-pharmacological therapy
   i. Support body systems
   ii. Most severe cases will be managed as a cardiac arrest of unknown origin

f. Transport considerations
   i. Rapid transport
   ii. Appropriate mode
   iii. Appropriate facility

g. Psychological support/communication strategies

G. Neoplasms of the lung

1. Epidemiology
   a. Incidence
      i. 150,000 have cancer
      ii. Typical age between 55 to 65
      iii. Morbidity/mortality
         (1) Most die within one year
         (2) 20% local lung involvement
         (3) 25% spread to lymph
         (4) 55% distant metastatic cancer
   b. Prevention
      i. Prevent starting smoking in youth
      ii. Smoking cessation in smokers
      iii. Avoidance of environmental hazards, particularly asbestos
      iv. Cancer screening programs
2. Anatomy and physiology review
3. Pathophysiology
   Significant variety in the cell types, and the growth rates associated with each type
4. Assessment findings
   a. Signs of severe distress
      i. Altered mentation
      ii. 1-2 word dyspnea
      iii. Severe or uncontrollable hemoptysis
   b. Chief complaints
      i. Cough
      ii. Hemoptysis
      iii. Dyspnea
      iv. Hoarseness or voice change
      v. Dysphagia
   c. History
      Diagnosed history of cancer
   d. Physical findings
      Signs and symptoms vary according to location of the tumor
5. Management
   a. Airway and ventilation
      i. Intubation if required
      ii. Assisted ventilation if necessary

iii. Oxygen - flow rate based on symptoms and pulse oximetry
iv. Supportive care

b. Circulation
i. Many patients with diagnosed lung cancer with have an indwelling catheter in place. Local protocols vary regarding whether this catheter may be used for IV infusion in the field.
ii. IV infusion may be required to improve hydration or thin/ mobilize sputum.

c. Pharmacological
Out-of-hospital therapy for lung cancer patients is symptomatic, and may include the following
i. Bronchodilators
ii. Corticosteroid
iii. Continuation of hospital-initiated antibiotics

d. Transport considerations
i. End stage patients may have advance directives or DNR
ii. Supportive care

e. Psychological support/communication strategies
If diagnosed end stage
i. Death and dying patient
ii. Family support

H. Upper respiratory infection

1. Epidemiology
a. Incidence 80 million cases in 1975

b. Morbidity/mortality
i. Rarely life threatening
ii. Often exacerbates underlying pulmonary conditions
iii. Often become significant infections in patients with suppressed immune function (such as HIV)

c. Risk factors
i. Avoidance of exposure is nearly impossible because of the prevalence of causative agents.
ii. Severity increases in patients with underlying pulmonary conditions.

d. Prevention strategies
Hand washing and covering the mouth during sneezing and coughing are essential in preventing spread.

2. Anatomy and physiology review
a. Nasopharynx
b. Oropharynx
c. Paranasal sinus
d. Inner ear
e. Middle ear
f. Outer ear
g. Eustachian tubes
h. Epiglottis
i. Respiratory epithelium
j. Lymphatic system
k. Secretory antibody IgA

3. Pathophysiology
    a. A variety of bacteria and virus cause URI
    b. 20-30% are Group A streptococci
    c. 50% of pharyngitis have no demonstrated bacterial or viral cause
    d. Most are self-limiting diseases
4. Assessment findings
    a. Chief complaints
        i. Sore throat
        ii. Fever
        iii. Chills
        iv. Headache
    b. Physical findings
        i. Cervical adenopathy
        ii. Erthyematous pharynx
        iii. Positive throat culture
5. Management
    a. Airway and ventilation
        i. Typically no intervention required
        ii. Oxygen administration may be appropriate in patients with underlying pulmonary conditions (administer based on symptoms and pulse oximetry)
    b. Pharmacological
        i. Out-of-hospital care is symptomatic, and based in part on the presence of underlying pulmonary conditions
        ii. Interventions that may be appropriate include:
            (1) Bronchodilators
            (2) Continuation of prescribed antibiotics
            (3) Corticosteroid
    c. Non-pharmacological
    d. Transport considerations
        i. Appropriate mode
        ii. Appropriate facility
    e. Psychological support/communication strategies

        Collected throat cultures require family notification of results and follow-up care

I. Spontaneous pneumothorax

1. Epidemiology
    a. Incidence 18 per 100,000
    b. Morbidity/mortality 15-20% partial pneumothorax may be well tolerated
    c. Risk factors
        i. Males
        ii. Younger age
        iii. Thin body mass
        iv. History of COPD (secondary spontaneous pneumothorax)
2. Assessment findings
    a. Chief complaint
        i. Shortness of breath

ii. Chest pain
iii. Sudden onset

b. Physical findings
i. Typically minor
(1) Pallor
(2) Diaphoresis
(3) Tachypnea

ii. Severe
(1) Altered mentation
(2) Cyanosis
(3) Tachycardia
(4) Decreased breath sounds
(5) Local hyperresonance to percussion
(6) Subcutaneous emphysema

3. Management

a. Airway and ventilation
i. Intubation as required
ii. Assisted ventilation if necessary
iii. Oxygen-administer levels based on symptoms and pulse oximetry

b. Circulation
IV initiation if severe symptoms present

c. Pharmacological
Not typically necessary; treat symptomatically

d. Non-pharmacological
Position of comfort/best ventilation

e. Transport considerations
i. Appropriate mode
ii. Appropriate facility

f. Psychological support/communication strategies

J. Hyperventilation syndrome

1. Multiple causes

a. Hypoxia
b. High altitude
c. Pulmonary disease
d. Pulmonary disorders
e. Pneumonia
f. Interstitial pneumonitits, fibrosis, edema
g. Pulmonary embolie, vascular disease
h. Bronchial asthma
i. Cardiovascular disorders
j. Congestive heart failure
k. Hypotension
l. Metabolic disorders
m. Acidosis
n. Hepatic failure
o. Neurologic disorders
p. Psychogenic or anxiety hypertension

q. Central nervous system infections, tumors
r. Drug-induces
s. Salicylate
t. Methylxanthine
u. Beta-adrenergic agonists
v. Progesterone
w. Fever, sepsis
x. Pain
y. Pregnancy

2. Assessment findings
   a. Chief complaint
      i. Dyspnea
      ii. Chest Pain
      iii. Other symptoms based on etiology
      iv. Carpopedal spasm
   b. Physical findings
      i. Rapid breathing with high minute volume
      ii. Varying depending on cause of syndrome
      iii. Carpopedal spasm
3. Pathophysiology
   Depends on cause of syndrome
4. Management
   a. Depends on cause of syndrome, discussed elsewhere
      i. Airway and ventilation Oxygen-rate of administration base on symptoms and pulse oximetry
      ii. If anxiety hyperventilation is confirmed (especially based on patient's prior history) coached ventilation/rebreathing techniques might be considered.
   b. Circulation
      Intervention rarely required
   c. Pharmacological
      Intervention rarely required
   d. Non-pharmacological
      i. Intervention rarely required
      ii. Patients with anxiety hyperventilation will require psychological approaches to calm them
      iii. Have them mimic your respiratory rate and volume
      iv. Do not place bag over mouth and nose
   e. Transport considerations
      i. Appropriate mode
      ii. Appropriate facility
   f. Psychological support/communication strategies Depends on cause of hyperventilation

I. Psychomotor Skills

A. Given the equipment to be used, the student will practice the proper technique for using an Automatic Transport Ventilator (ATV).

B. Given the equipment to be used, in a one-on-one situation, the instructor will guide the student to perform the skill to proficiency.

C. In a one-on-one situation, the instructor will create a minimum of three scenarios that meet one or more of the following criteria:

1. There is an indication for use of the ATV.
2. The device fails to operate properly.
3. How to troubleshoot the ATV.
4. The ATV is in use when the patient begins to breathe spontaneously.

***Note**: The student must identify each situation correctly and perform the indicated tasks appropriately.*

II. Written Evaluation

Administer a written evaluation completed with 80% competency.

III. Psychomotor Skills Evaluation

A. Using the attached practical skills sheet evaluation, the student will correctly use the Automatic Transport Ventilator (ATV) to ventilate a manikin with 80% competency; no failure of critical criteria.

B. When conducting the practical testing, the following conditions must be maintained:

1. The practical exam must be conducted in a testing environment. The students must understand that they are being evaluated. Corrective guidance during the evaluation is not permitted.
2. The evaluator must not reveal the specific criteria for failure.
3. The student will be allowed three (3) attempts to perform the practical skills evaluation with 80% competency; no failure of critical criteria.
4. Students who fail will go through another training session and or a remediation process.

Proposed Skills Evaluation
Automatic Transport Ventilator

Student's Name: _____

Date: _____ Attempt#

Evaluator:_____ Signature: _____

Criteria	Points Possible	Points Attained
Takes or verbalizes universal Body Substance Isolation	1	
Prepares the ATV and check oxygen source/supply	2	
Obstructs patient valve assembly with gloved hand to determine high pressure alarm functioning	2	
Sets the tidal volume, ventilatory rate, and alarms if available	2	
Rechecks the settings as appropriate for the patient's	2	
Connects the ATV to the 15/22 mm fitting on the	1	
Auscultates the patient's breath sounds to ensure adequate ventilation	2	
Verbalizes possible complications of ATV use	2	
Reassesses the oxygen supply pressure level	1	
Demonstrates trouble shooting technique	2	
Total	17	

Critical Criteria

(Failure to meet any of the critical criteria constitutes failure. The student must be remediated prior to retesting.) The student has three (3) opportunities to successfully complete the test. If a student fails to achieve a passing grade after three (3) opportunities, the student must repeat the entire course.

_____ Fails to take or verbalize Body Substance Isolation precautions.

_____ Fails to check oxygen supply, set the appropriate tidal volume and ventilatory rate.

_____ Fails to auscultate the patient's breath sound and adequate ventilation rate.

_____ Fails to not provide manual BVM ventilation if unable to immediately identify ventilation complications.

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for Paramedic

3/17/16

STR Training Chest Tube Placement (assist only) and Monitoring

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing a Paramedic to perform an STR [Special Training Required] skill, a Medical Director shall ensure that the Paramedic has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess the Paramedic's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, a Paramedic can only use this skill under direction and supervision of medical direction.

Course Description:

This course provides the Paramedic with an overview of STR [Special Training Required] Training Chest Tube Placement (assist only) and Monitoring. This course presents the possible indications, contraindications, advantages, disadvantages, complications, and documentation recommendations for use of Chest Tube Placement (assist only) and Monitoring. This course includes lecture, skills demonstration, skills practice, skills testing, and a summative written exam.

Prerequisites:

Certified Paramedic under Medical Direction

Course Competencies:

The purpose of Chest Tube Management is to understand the use of chest tubes and the conditions that require their use. This course is designed to provide healthcare professionals with information about chest tubes and the management of chest drainage systems.

After successful completion of this course, you will be able to:

1. Identify indications for the use of chest tubes and accompanying signs and symptoms.
2. Describe the risks/complications associated with chest tubes and chest drainage units (CDUs).
3. Describe the monitoring of chest tubes and chest drainage systems.
5. Describe considerations in caring for the patient who has a chest tube, including chest tube maintenance.
6. Identify factors that indicate when it is appropriate to discontinue the use of a chest tube.
7. Describe how to assist with discontinuation of a chest tube.

Definitions

Pneumothorax:
A collection of air in the pleural space
Note that pneumothorax is the most common serious pleural complication in the Intensive Care Unit & the most common reason for inserting a chest tube.

Tension pneumothorax:
Occurs when air accumulates in the pleura space to the point of causing a mediastinal shift pushing the heart, great vessels, trachea, and lungs toward the unaffected side of the thoracic cavity

Hemothorax: A collection of blood in the pleural cavity.
Hemopneumothorax: An accumulation of both air and blood in the pleural cavity.
Pleural effusion: Is excessive fluid in the pleura cavity?
Chylothorax: Is the accumulation of lymphatic fluid in the pleural space?
Empyema: Is a collection of purulent material from an infection like pneumonia?

I. **Signs and Symptoms of a Tension Pneumothorax include:**

- Severe respiratory distress
- Tracheal deviation toward the unaffected side
- Cyanosis
- Muffled heart sounds
- Cardiac arrest

a. Indications for Chest Tubes
   1. There are various reasons for excess air and/or fluid in the pleural space. Specific common indications for chest tubes include:
      a. Pneumothorax (open and closed).
      b. Tension pneumothorax.
      c. Hemothorax.
      d. Hemopneumothorax.
      e. Pleural effusions.
      f. Chylothorax (a type of pleural effusion that results from lymphatic fluid (chyle) accumulating in the pleural cavity).
      g. Penetrating chest trauma.
      h. Pleural empyema (collection of purulent material in the lungs).
   2. Other indications include:
   3. Excess air and/or fluid accumulation in the pleural space. For example, chest tubes are often placed after cardiac surgery to drain blood associated with the surgery.
   4. Need for pleurodesis: Pleurodesis is a procedure used to treat patients with recurrent pleural effusions or recurrent pneumothorax. This procedure involves administering a sclerosing agent into the pleural space which causes the visceral and parietal pleura to adhere to each other without the thin coating of fluid between them. Chemical pleurodesis is a painful procedure, and patients are often pre-medicated with a sedative and analgesics. A local anesthetic may be instilled into the pleural space, or an epidural catheter may be placed for anesthesia.

5. Chemotherapy administration: May be administered through a chest tube. See below for common causes for air or fluid in the pleural space.

b. Contraindications to Chest Tube Insertion
   1. There are no definite contraindications to a chest tube especially when a patient is experiencing respiratory distress. If multiple adhesions, giant blebs, or coagulopathies are present and the patient is relatively stable, the benefit of chest tube therapy can be carefully weighed against the higher risks of complications for these patients.
   2. In less clear-cut scenarios, it is often helpful to know the amount of lung collapse to better support a decision to insert a chest tube in higher risk patients. Also, a CT scan of the chest may be necessary to guide chest tube placement should the patient have a condition (e.g. lung transplant, multiple loculations from previous pleurodesis) where blind insertion could be an issue (Doelken, 2010).
      a. More Info: Sometimes a CT scan of the chest may be necessary to guide chest tube placement.

c. Risk Associated with Chest Tube Insertion
   1. Chest tube insertion can be performed with basic surgical skills. Risks can be minimized if attention is paid to careful technique and monitoring of the patient for complications. Any potential complications are often outweighed by life-threatening intrapleural collections.
      a. Risks associated with chest tubes include:
         1. Bleeding at the site is a potential complication; however it is often minor and will likely resolve without intervention.
         2. Risk of infection (e.g. empyema) and other associated complications increase the longer the chest tube remains inserted.
         3. Subcutaneous emphysema, a collection of air under the skin, after chest tube placement. Small amounts of air near the chest tube insertion site will likely be absorbed, however, if this air moves to areas of the neck, chest, and face, it requires further attention if painful, though it is mostly a cosmetic issue.
         4. Lung trauma and perforation of the diaphragm during insertion or removal is possible.
         5. Bronchopleural fistula, an abnormal connection between an air passage and the membrane that covers the lung, is also a reported complication. In the case of lung trauma or bronchopleural fistula, the chest tube must remain in place until the patient is fully healed.
         6. Malposition of the chest tube is the most common of all complications, resulting in persistent air and fluid in the pleural space until the malposition is identified and resolved.

d. Monitoring the Chest Drainage Unit
   1. Monitoring the chest drainage unit is important to make sure it is functioning correctly. When monitoring the unit, it is important to regularly check:
      a. Water levels in the chest drainage unit. The water may evaporate over time, and may need to be refilled periodically.
      b. The connection source to ensure that the chest drainage unit is suctioning properly. Adequate suction is confirmed by noting a gentle bubbling in the suction control chamber (Rushing, 2007).
      c. The suction control stopcock can be adjusted to increase or decrease suction control bubbling.

e. Monitoring Intrathoracic Pressure

1. If a chest drainage unit is not connected to suction, it is utilizing gravity to drain fluid from the chest cavity. To accurately read intrathoracic pressure when using gravity only (no suction), the clinician should read directly from the water seal. A rise in the water seal indicates that negative pressure is present in the pleural space (this confirms that the patient is healing). On the other hand, bubbling indicates positive pressure (air leak).When recording intrathoracic pressure in a unit on suction: Add the readings of suction control chamber plus the level of the water seal chamber.
For Example: -20cmH20 + -5cmH20 = -25cmH20 intrathoracic pressure.

f. Tidaling

1. With a chest tube in the pleural space, the water level should fluctuate in the water seal chamber. This is known as tidaling, and should correspond with respiration. When there is no air leak, the water level in the water seal chamber should rise and fall with the patient's respiration. During spontaneous respiration, the water level will rise during inhalation and fall during exhalation. If the patient is receiving positive pressure ventilation, the oscillation will be just the opposite. If the lung is re-expanded, tidaling may not be present.

g. Drainage

1. Depending on the hospital, the nursing unit, and the patient's condition, it is necessary to monitor and document chest drainage every four to eight hours minimally or as condition warrants:
    a. Closely monitoring the output will enable the nurse to notify the physician if there is excessive output.
    b. To assess drainage level, mark the drainage level on the outside of the drainage collection chamber in hourly or shift increments with the date and time. Record the output information on the flowsheet to provide a reference point for future measurements.
    c. In the nurse's note or flowsheet, a description of the drainage color will also help healthcare providers to guide their care. For example, with a hemothorax, the color should change from bloody to straw color (sanguinous to sero-sanguinous to serous). Accurate documentation will facilitate early identification of any changes in the patient's condition related to the chest tube.
    d. Significant changes should be reported to the physician. Examples of this are: the drainage color changed from serous to bloody or drainage output was greater than 100 ml in one hour when the output was normally 10 ml in 12 hours or there is increasing bloody drainage greater than 100 ml in one hour. If there is no drainage inform the physician and anticipate an order for a chest x-ray to see if the lung has re-expanded. If it has not re-expanded, the chest tube may be displaced or it may be clogged. The physician should be notified so that the patient can be reassessed. The physician may order a CT scan of the chest to check placement or may decide to place a new chest tube.

h. Air Leaks
    1. Assess the patient for an air leak. It is important to rectify any air leaks because an airtight system reestablishes negative pressure and permits the lungs to expand effectively.
    2. Assessing for an air leak: Clamp off suction for one minute. An air leak is present if there is constant bubbling in the water-seal chamber.
    3. An air leak alerts the nurse that he or she must assess for the location of the leak by checking the connections from the chest drainage unit to the insertion site.
    4. If there is excessive, continuous bubbling in the water-seal chamber, there is most likely a large air leak. Starting from away from the patient and going towards the patient, check all connections. Lastly, change the dressing and make sure there is good seal with the dressing around the insertion site.
    5. If it is the pleural space that is leaking, intermittent bubbling with respiration is normal. This will resolve as the lung re-expands. Therefore, when a pneumothorax is the indication for the chest tube, an air leak is to be expected; yet, should decrease with patient improvement.

i. Chest Tube Maintenance
    a. Keep all tubing patent and free of kinks or obstructions. Dependent loops with the chest tube tubing should be avoided since they obstruct chest drainage into the collection system and increase pressure within the lung. The tubing should also never dangle; coil it on the bed and anchor tubing when securing the chest tube. It is acceptable for the nurse to gently milk the tubing when a visible clot or obstructing drainage is in the tubing by squeezing hand over hand along the tubing and releasing the tubing between squeezes. However, excessive chest-tube manipulation should be avoiding, as this can create negative pressures in the tube and does little to maintain chest-tube patency. If you see visible clots, squeeze hand-over-hand along the tubing and release the tubing between squeezes to help move the clots into the CDU.

j. Discontinuation of the Chest Tube
    a. The need for analgesia prior to discontinuing the chest tube should be considered.
    b. Inform patient about the steps that will be taken.
    c. Sit patient in semi-Fowlers or on his or her unaffected side.
    d. In order to keep the linens clean, the nurse or physician should drape the bed linen with protective pads.
    e. The physician should use hand hygiene and put on gloves then clamp drainage tubing.
    f. With nonsterile gloves, the nurse or physician will remove the old dressing then don sterile gloves.
    g. An aseptic technique should be used when removing the chest tube.
    h. The physician will instruct the patient to slowly exhale while the chest tube is removed on end-exhalation. If the patient can perform the Valsalva maneuver, this would be an opportune time for the physician to remove the chest tube.

i. Often the physician will close the wound with purse string suture which is usually already present, but sometimes it is necessary to suture the site.

j. Place an occlusive dressing (vasoline gauze, 4X4, and tape) over site and time, date, and initial the dressing. The nurse will need to follow-up to make sure a chest x-ray is obtained after the procedure.

II. Documenting Chest Tube Placement:

i. The following items must be included in a comprehensive documentation post chest tube placement:

1. Vital signs before and after the procedure.
2. Chest tube size and insertion site.
3. Physician inserting the chest tube.
4. Drainage present (and if it was sent for culture).
5. Tolerance to procedure.
6. Medications given.
7. Results of the chest x-ray post chest tube insertion.

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STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for I-99

Needle Cricothyrotomy

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an I-99 to perform a STR [Special Training Required] skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR [Special Training Required] skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Course Description

This course provides the I-99 ability to integrate the complex knowledge of the indications, contraindications, procedure, and complications to perform a needle cricothyrotomy.

Prerequisites

Certified I-99 under Medical Direction

Course Competencies

The student shall:

1. Discuss the indications, contraindications, advantages, disadvantages, and complications of performing a needle cricothyrotomy.
2. List the contraindications for performing a needle cricothyrptomy.
3. List the equipment required to perform a needle cricothyrotomy.
4. Demonstrate the procedure for performing a needle cricothyrotomy.
5. Demonstrate translaryngeal catheter ventilation.

Lesson Outline

I. **Indications**
   a. Conditions where there is the inability to adequately ventilate the patient
   b. Conditions where a patent airway cannot be secured with conventional means
   c. Uncontrolled oropharyngeal bleeding
   d. Lack of resources or protocol to perform RSI
   e. Conditions where the airway is obstructed by severe foreign body obstruction of the upper airway, swelling caused by anaphylaxis, upper airway burns, epiglottitis, massive maxillofacial trauma, and the inability to open the mouth (trismus)

II. **Contraindications**
   a. Ventilation is not as effective with a small-bore IV catheter as with an ET tube
   b. Exhalation via the glottis opening is not possible because the airway is completely obstructed above the catheter insertion point
   c. Caution when using a high-pressure ventilator: an increase in intrathoracic pressure can cause barotrauma or a pneumothorax
   d. Barotrauma can be caused by over inflation of the lungs
   e. Hypoxia and hypercarbia can occur causing dysrhythmias, brain damage, or cardiac arrest
   f. A condition where there is the ability to secure a patent airway by less invasive means
   g. A condition where there is a severe airway obstruction above the site of IV catheter insertion
   h. Inability to identify the correct anatomic landmarks
   i. Crushing injuries to the larynx
   j. Tracheal transection
   k. Underlying anatomic abnormalities (trauma, tumors, or subglottic stenosis)

III. **Advantages**
   a. Can be performed quickly
   b. Technically easier to perform than a surgical cricothyrotomy
   c. Has a lower risk of damaging adjacent structures
   d. Allows for subsequent intubation attempts
   e. Does not require manipulation of the patient's cervical spine

IV. **Disadvantages**
   a. Use of a small-bore IV catheter to ventilate does not provide protection from aspiration
   b. The high-pressure jet ventilator to provide adequate tidal volume that expends a high volume of oxygen rapidly
   c. Patients with short, muscular, or fat necks

V. **Complications**
   a. Improper IV catheter placement can cause severe bleeding
   b. Damage to adjacent structures
   c. Air leakage around the insertion site of the IV catheter
   d. Subcutaneous emphysema
   e. Air infiltration into the subcutaneous space can cause compression of the trachea

f. Improper use of the high-pressure jet ventilator can cause hypoventilation resulting in inadequate oxygenation and ventilation

VI. **Equipment**

a. Body substance isolation/personal protective equipment
b. Oxygen source
c. Bag-mask device with oxygen delivery capability or high-pressure jet ventilator
d. Providone iodine swabs/alcohol swabs
e. Large-bore IV catheter (14-16 gauge)
f. Sterile water or normal saline
g. 10 mL syringe
h. Commercial tube-securing device or tape

VII. **Procedure**

a. Ensure body substance isolation
b. Determine the indication for performing a needle cricothyrotomy
c. Assemble, check, and prepare equipment
d. Draw up 3 mL of sterile water or normal saline into a 10 mL syringe and attach it to the IV catheter
e. Place the patient's head in a neutral position
f. Locate the cricothyroid membrane
g. Clean the insertion site with antiseptic preps
h. Stabilize the larynx
i. Insert the IV needle into the midline of the cricothyroid membrane at a 45° angle toward the feet (caudally)
j. After feeling the pop as the IV needle penetrates the cricothyroid membrane, insert the needle 1 cm farther
k. Aspirate with the syringe – if air is aspirated, bubbling of the fluid within the syringe will occur; if blood is aspirated or resistance is met, reevaluate IV catheter placement
l. Advance the catheter over the needle until the hub of the catheter is flush with the skin
m. Withdraw the IV needle
n. Dispose of the IV needle in a sharps container
o. Attach one end of the oxygen tubing to the catheter and the other to the high-pressure jet ventilator and ventilate according to protocol **or** attach a 7.0-7.5 ET tube adapter to the IV catheter and then attach the bag-mask device and ventilate
p. Confirm placement of the IV catheter with auscultation, chest rise and fall, capnography, or other monitoring devices
q. Maintain manual stabilization of the IV catheter until it has been secured
r. Apply a dressing around the IV catheter and tape it in place
s. Reassess adequate ventilation, breath sounds, and capnography

References

- 2009 National EMS Education Standards – Paramedic (NHTSA, 2009)
- McDonald, Jeff, ALS Skills Review (AAOS, 2009)
- Caroline, Nancy, Emergency Care in the Streets, 7th Edition (AAOS, 2013)

Appendix A

Needle Cricothyrotomy

Procedure	Satisfactory	Unsatisfactory
1. Ensures body substance isolation		
2. Determines the indication for performing a needle cricothyrotomy		
3. Assembles, checks, and prepares equipment		
4. Draws up 3 mL of sterile water or normal saline into a 10 mL syringe and attach it to the IV catheter		
5. Places the patient's head into a neutral position		
6. Locates the cricothyroid membrane		
7. Cleanses the insertion site with antiseptic preps		
8. Stabilizes the larynx		
9. Inserts the IV needle into the midline of the cricothyroid membrane at a 45° angle toward the feet (caudally)		
10. Feels a pop as the IV needle penetrates the cricothyroid membrane and then insert the needle 1 cm farther		
11. Aspirates with the syringe to determine correct catheter placement		
12. Advances the catheter over the needle until the hub of the catheter is flush with the skin		
13. Withdraws the IV needle		
14. Disposes of the IV needle in a sharps container		
15. Attaches one end of the oxygen tubing to the catheter and the other to the high-pressure jet ventilator and ventilate according to protocol **or** attach a 7.0-7.5 ET tube adapter to the IV catheter and then attach the bag-mask device and ventilate		
16. Confirms placement of the IV catheter with auscultation, chest rise and fall, capnography, or other monitoring devices		
17. Maintain manual stabilization of the IV catheter until it has been secured		
18. Applies a dressing around the IV catheter and tape it in place		
19. Reassesses adequate ventilation, breath sounds, and capnography		

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for I-99

Percutaneous Cricothyrotomy

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

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Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Course Description
This course provides an I-99 the ability to integrate the complex knowledge of the indications, contraindications, and complications of a Percutaneous Cricothyrotomy

Prerequisites
Certified I-99 under Medical Direction

Course Competencies
This course provides the EMCT an overview of Percutaneous Cricothyrotomy. This course presents the possible indications, contraindications, advantages, disadvantages, complications, and documentation recommendations for performing a Percutaneous Cricothyrotomy. The course includes lecture, skills demonstration, skills practice, skills testing, and a summative written exam.

Percutaneous Cricothyrotomy

Percutaneous Cricothyrotomy is an invasive procedure aimed at obtaining a patent airway in a specific patient population. It should only be performed in the situations outlined below. In these situations, speed is of the essence. However, do not allow the urgency of the situation to take precedence over reasonable judgment or action. The indications and technique must be clearly documented whenever it is utilized.

INDICATIONS

1) Acute upper airway obstruction which cannot be relieved by other BLS and ALS maneuvers.
2) Patient in respiratory arrest with neck injury or head injury who cannot be ventilated adequately with bag/valve/mask and in whom orotracheal and nasotracheal intubation cannot be accomplished. After intubation attempts have failed, or is clearly not possible, attempt to ventilate the patient with bag/valve/mask technique. If this also fails to result in adequate ventilation, then proceed with Percutaneous Cricothyrotomy.
3) Patient who is in respiratory arrest with facial injuries which preclude endotracheal and nasotracheal intubation.
4) Patient with neck injury in which tracheal intubation either cannot be accomplished or has failed to ventilate the patient due to damage to the airway.
5) Other patients who are apneic and in whom all other BLS and ALS airway techniques have failed and when the time to the closest receiving hospital is prolonged.

CONTRAINDICATIONS

Absolute

1) Needle cricothyroidotomy with percutaneous transtracheal ventilation (PTV) is absolutely contraindicated when the airway is maintainable through noninvasive means.
2) In addition, needle cricothyroidotomy with PTV should **not** be performed when damage to the larynx, cricoid cartilage, or trachea preclude successful oxygenation and ventilation via a transtracheal catheter, for example:
   a) Laryngeal injury with known damage to cricoid cartilage (laryngeal fracture)
   b) T racheal rupture
   c) Tracheal transection with distal tracheal retraction into the mediastinum

Relative

1) Several relative contraindications arise in situations where anatomic distortion increases the risk of airway complications or where excessive bleeding may be encountered during needle cricothyroidotomy and PTV as follows:
   a) Anterior neck swelling (eg, angioedema, hematoma) that obscures anatomical landmarks.
   b) Anatomic anomalies or distortion of the larynx and trachea (eg, repaired tracheal anomalies
   c) Bleeding disorder

However, in most instances, the benefit of securing an airway will outweigh the risk of performing needle cricothyroidotomy in these circumstances.

Complications

1) Prolonged Procedure time
2) Hemorrhage
3) Aspiration
4) Possible Misplacement
5) False Passage
6) Perforation of the Esophagus
7) Injury
    a) Vocal Cords
    b) Carotid
    c) Jugular
    d) Subcutaneous Emphysema

Relevant Anatomy

1) Identify the thyroid cartilage
2) Palpate the prominent cricothyroid notch
3) Space between the cricoid and thyroid cartilages is the cricothyroid space.
    a) This is the location of the cricothyroid membrane

EQUIPMENT

1) Assemble necessary equipment
    a) Proper PPE (mask, eye protection, sterile gloves)
    b) Iodine or alcohol prep for site cleansing
2) Three to 10 mL syringe filled with sterile saline
3) Catheter (large bore) — AVOID needleless safety catheters that cannot be connected to a syringe (eg, BD InSyte, Autogard). Ensure that such "non-safety" catheters are easily available and are a part of the cricothyroidotomy kit. Similar catheters are also used for needle aspiration of pneumothorax (needle thoracocentesis).
    a) Infants and young children - 16- to 18-gauge IV catheters
    b) Adults and adolescents - 12- (ID 2.8 mm) to 16-gauge (ID 1.5 mm) IV catheters (angiocath) or 6 French transtracheal catheter (2 mm ID).
4) Bag-valve-mask and connectors
    a) Connector options — If a bag-valve-mask will be used for patient ventilation, then it should connect to the catheter using one of the following improvised adapters:
        i) Three mL Luer lock syringe with plunger removed with 7.5 mm ID endotracheal tube connector (bag-valve-mask connector)
    b) 3.0 mm ID endotracheal tube connector attached directly to the catheter (bag-valve-mask connector)
    c) 2.5 mm ID endotracheal tube connector attached to cut off IV tubing with Luer lock end connected directly to the catheter.
5) Manufactured Kits are available
    a) Use manufactures suggested guidelines for appropriate use.

TECHNIQUE

1) Establish the presence of an indication for a percutaneous cricothyrotomy to maintain a patent airway. NOTE: Intubation attempts have failed or are impossible and the patient cannot be adequately ventilated with bag/valve/mask technique.
2) Assemble necessary equipment
3) Expose the neck
    a) Identify the thyroid cartilage
    b) Palpate the prominent cricothyroid notch
    c) Space between the cricoid and thyroid cartilages is the cricothyroid space.
        i) This is the location of the cricothyroid membrane
4) Prep area
    a) Cleanse using betadine swab
5) Hold the trachea in place and provide skin tension with the thumb and middle finger of the non-dominant hand placed on either side of the trachea. Use the index finger to palpate the cricothyroid membrane.
6) Hold a 3 to 10 mL syringe half-filled with saline attached to the over-the-needle IV catheter in the dominant hand.
7) Place the catheter in the midline of the neck at the inferior margin of the cricothyroid membrane (to avoid the cricothyroid blood vessels located superiorly and laterally). Direct it caudally (toward the feet) at an angle of 30 to 45 degrees.
8) Puncture the skin and subcutaneous tissue. Advance the catheter while continuously applying negative pressure on the syringe, until air bubbles are seen, confirming intratracheal placement.
9) Advance the catheter forward off the needle until its hub rests at the skin surface.
    a) Remove the syringe and the needle.
10) Reattach the syringe to the catheter and again aspirate for air to confirm that the catheter remains in the trachea.
11) Hold the catheter firmly in place at all times or delegate an assistant to do this to reduce the chance of kinking or dislodgement.
12) Performing transtracheal ventilation
13) Connect the catheter to high pressure tubing (connected to a valve and a source of 100 percent oxygen) or to a bag-valve-mask .
14) Give a few ventilations to reconfirm placement and ensure that the equipment is functioning properly.
15) Fix the catheter in place as possible.
16) Interpose a capnometer in the circuit to monitor end tidal CO_2, if possible.
17) Begin regular ventilation by intermittently opening and closing the in-line valve; by intermittently occluding the side port, y-connector, or stopcock and; or by ventilations with the BVM, depending on the system in use.
18) Respiratory Rate
    a) Adjust the ratios based on clinical monitoring, blood gas measurements, and chest rise and fall
19) Stand clear and observe universal precautions as oropharyngeal secretions may sometimes be expelled through the patient's mouth and nose with great force.

20) Monitor patient condition and reassess frequently.
   a) Barotrauma and catheter issues that prevent transtracheal ventilation are the two most commonly described complications of percutaneous transtracheal ventilation (PTV).
   b) Subcutaneous emphysema can develop during cricothyroidotomy, securing of the catheter, PTV, or after removing the catheter.
   c) Kinking or dislodgement of the transtracheal catheter may result in rapid accumulation of subcutaneous gas in the tissues. In addition, multiple attempts at catheter placement may allow gas to escape into the tissues from previous puncture sites.
   d) Techniques to prevent the development of subcutaneous emphysema include:
      i) Using kink-resistant Teflon™ catheters
      ii) Assigning an individual to hold the catheter hub
      iii) Utilizing a commercially available cricothyroidotomy catheter with attached flanges for securing the catheter (avoids kinking and misplacement)
      iv) Placing a fingertip firmly over the puncture site and applying pressure for a few minutes to prevent air leak after catheter removal
21) Control bleeding and dress wound
22) Document the indications and procedure on the patient care form

SUMMARY

Needle cricothyroidotomy involves passing an over-the-needle catheter through the cricothyroid membrane.

Percutaneous transtracheal ventilation (PTV) is the delivery of oxygen to the lungs through an over-the-needle catheter using a high pressure gas source and is considered a form of conventional ventilation.

The primary indication for needle cricothyroidotomy with PTV is inability to maintain the airway with noninvasive standard airway procedures (eg, bag-valve-mask ventilation, endotracheal intubation) or rescue procedures (eg, laryngeal mask airway).

Needle cricothyroidotomy with PTV is absolutely contraindicated when the airway is maintainable through noninvasive means
In addition, needle cricothyroidotomy with PTV should not be performed when damage to the larynx, cricoid cartilage, or trachea preclude successful oxygenation and ventilation via a transtracheal catheter.

The key anatomic landmarks are (from cephalad to caudad): hyoid cartilage, thyroid cartilage, cricothyroid membrane, cricoid cartilage, and the tracheal rings.

Needle cricothyroidotomy and percutaneous transtracheal ventilation (PTV) can be performed using standard materials readily available in any EMS Vehicle Commercial setups are also available.

To ensure maximum effectiveness in a highly stressful emergent setting, the equipment for PTV, including all the necessary components, should be organized and immediately available.

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for AEMT and Paramedic

Surgical Cricothyrotomy

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Prerequisites:
Upon successful completion of this training, an EMT-I 99 and Paramedic can only use this skill under "on-line" medical direction.

Course Description:
This course provides the EMCT an overview of Surgical Cricothyrotomy. This course presents the possible indications, contraindications, advantages, disadvantages, complications, and documentation recommendations for performing a Surgical Cricothyrotomy. The course includes lecture, skills demonstration, skills practice, skills testing, and a summative written exam.

Course Competencies:
Upon completion of this chapter, the paramedic student will be able to:

1. Discuss the assessment and management of medical or traumatic obstruction of the airway.
2. Outline essential parameters to evaluate the effectiveness of airway and breathing.
3. Describe the use of airway maneuvers and airway adjuncts based on knowledge of their indications, contraindications, potential complications, and techniques.
4. Given a patient scenario, be able to perform the techniques to secure a patent airway

Course Outline

Foreign Body Airway Obstruction

I. Foreign Body Airway Obstruction
   A. Overview
   B. Airway Obstruction in the Conscious Patient
   C. Airway Obstruction in the Unconscious Patient
   D. Laryngeal Spasm and Edema
   E. Fractured Larynx
   F. Tracheal Trauma

Airway Evaluation

I. Essential Parameters of Airway Evaluation
   A. Relevant upper airway anatomy review
   B. Relevant lower airway anatomy review

I. INTRODUCTION

Surgical Cricothyrotomy is an invasive surgical procedure aimed at obtaining a patent airway in a specific patient population. It should only be performed in the situations outlined below. In these situations, speed is of the essence. However, do not allow the urgency of the situation to take precedence over reasonable judgment or action. The indications and technique must be clearly documented whenever it is utilized.

II. INDICATIONS

A. Acute upper airway obstruction which cannot be relieved by other BLS and ALS maneuvers

B. Patient in respiratory arrest with neck injury or head injury who cannot be ventilated adequately with bag/valve/mask and in whom orotracheal and nasotracheal intubation cannot be accomplished. After intubation attempts have failed, or is clearly not possible, attempt to ventilate the patient with bag/valve/mask technique. If this also fails to result in adequate ventilation, then proceed with surgical cricothyrotomy.

C. Patient who is in respiratory arrest with facial injuries which preclude endotracheal and nasotracheal intubation

D. Patient with neck injury in which tracheal intubation either cannot be accomplished or has failed to ventilate the patient due to damage to the airway

E. Other patients who are apneic and in whom all other BLS and ALS airway techniques have failed and when the time to the closest receiving hospital is prolonged

III. PRECAUTIONS

A. If bleeding occurs, use suction and proceed. Insertion and inflation of endotracheal tube through cricothyrotomy will protect patient from the hazard of blood in the airway. Direct pressure can then be used on the area.

B. Advance an endotracheal tube only 1 to 1.5 inches to avoid a right main stem intubation

IV. PROCEDURE - SURGICAL CRICOTHYROTOMY

A. Establish the presence of an indication for a surgical cricothyrotomy to maintain a patent airway. NOTE: Intubation attempts have failed or are impossible and the patient cannot be adequately ventilated with bag/valve/mask technique.

B. Assemble necessary equipment
    a. betadine prep swabs
    b. scalpel (11 blade, preferred)
    c. large curved hemostat or extra scalpel handle
    d. endotracheal tube
    e. tape

C. Expose the neck
    a. Identify the thyroid cartilage
    b. Palpate the prominent cricothyroid notch
    c. Space between the cricoid and thyroid cartilages is the cricothyroid space.
        i. This is the location of the cricothyroid membrane

D. Prep area
    a. Cleanse using betadine swab

E. Stabilize the trachea by holding the thyroid cartilage between thumb and fingers

F. Locate the anatomical landmarks of the neck and identify the crycothyroid membrane

G. Make a 2 cm (3/4 inch) horizontal stab incision, with the scalpel at the level of the crycothyroid membrane.
    a. Note: Some physician may recommend a vertical skin incision instead of a horizontal)

H. Insert hemostat or scalpel handle to dilate incision or turn scalpel handle until opening sufficient to allow passage of small endotracheal tube. (6.0 - 7.0 mm)

I. Pass endotracheal tube about 1 to 1.5 inches into trachea

J. Inflate cuff, if cuffed tube, and ventilate patient with high flow O2

K. Confirm Tube placement (Primary and Secondary devices)

L. Monitor patient condition and reassess frequently

M. Control bleeding and dress wound

N. Document the indications and procedure on the first care form

V. Complications

A. Prolonged Procedure time

B. Hemorrhage

C. Aspiration

D. Possible Misplacement

E. False Passage

F. Perforation of the Esophagus

G. Injury
    a. Vocal Cords
    b. Carotid
    c. Jugular
    d. Subcutaneous Emphysema

SURGICAL
CRICOTHYROTOMY

Name: _____
Date: _____
Examiner: _____

Activity	Points possible	Points awarded
Verbalizes appropriate indications/contraindications for this skill	1	
Verbalizes/demonstrates appropriate infection control precautions based on scenario	1*	
Identifies/selects the appropriate equipment	1	
Places the patient in supine position (if spinal injury is suspected, maintains the head and neck in a neutral position)	1	
Identifies landmarks—thyroid cartilage, cricoid cartilage, cricothyroid membrane, suprasternal notch	1	
Cleanses anterior and lateral neck	1	
Stabilizes the thyroid cartilage using the thumb and middle finger of the non-dominant hand	1	
Makes the skin incision over the cricothyroid membrane	1	
Feels the cricothyroid membrane and carefully makes a horizontal incision over the lower part of the membrane	1	
Maintains the landmark and uses a gloved finger to enlarge the hole horizontally and open the airway	1	
Inserts an ET tube of the appropriate size into the opening	1	
Directs the ET tube caudally into the trachea until the top edge of the ET tube cuff disappears into the incision of the cricothyroid membrane	1	
Inflates the ET tube cuff and ventilates the patient with 100% oxygen	1	
Confirms proper placement by auscultation over the epigastrium and lateral aspects of chest at midaxillary line; demonstrates at least one additional method of verifying proper tube placement; notes the depth (cm marking) of the tube at the teeth	3*	
Secures the ET tube to prevent dislodgement	1	
Minimum points for acceptable performance = 14 **TOTAL**	**17**	

* Critical criteria.

Recommendations/comments:

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for I-99

Nasotracheal Intubation for the Adult Patient

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

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Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Prerequisites

Certified I-99 under Medical Direction

Course Description

This course provides the I-99 the ability to integrate the complex knowledge of the indications, advantages, disadvantages, contraindications, procedure, and complications to perform nasotracheal intubation for the adult patient.

Course Competencies

The student shall:

1. Discuss methods used to predict the difficult airway.
2. Describe the advantages, disadvantages, and complications of intubating the trachea.
3. List the equipment required to perform nasotracheal intubation for the adult patient.
4. Explain how to determine correct endotracheal (ET) tube size.
5. Discuss the indications, contraindications, advantages, disadvantages, contraindications, and complications of nasotracheal intubation for the adult patient.
6. Demonstrate the procedure for nasorotracheal intubation for the adult patient.
7. List the methods available for confirming placement of the endotracheal tube.
8. Describe how to secure the endotracheal tube.

Lesson Outline

I. **Establish and maintain a patent airway with basic techniques and maneuvers, then consider advanced airway management**

II. **Patients primarily require advanced airway management for 2 reasons:**
   a. Failure to maintain a patent airway and/or
   b. Failure to adequately oxygenate and ventilate

III. **Advanced airway management involves the insertion of a number of advanced airway devices, including nasotracheal intubation where the endotracheal tube (ET) is passed into the trachea through the nose**

IV. **Predicting the difficult airway**
   a. Anatomic findings suggestive of a difficult airway may include
   b. Congenital abnormalities (i.e., dysmorphic face)
   c. Recent surgery
   d. Trauma
   e. Infection
   f. Neoplastic diseases (such as cancer)

V. **LEMON: mnemonic to guide assessment of the difficult airway**
   a. The following can make intubation more difficult
      1. Short, thick necks
      2. Morbid obesity
      3. Dental conditions, such as an overbite or "buck" teeth
   b. Evaluate 3-3-2
      1. First "3" refers to mouth opening
      2. Second "3" refers to mandible length
      3. "2" refers to the distance from the hyoid bone to the thyroid notch; should be at least two fingers wide
   c. Obstruction: note anything that might interfere with visualization or ET tube placement.

VI. **Intubation of the trachea is the best means of achieving complete control of the airway.**
   a. Advantages
      1. Provision of a secure airway
      2. Protection against aspiration
      3. Provision of an alternative route to the IV or intraosseous (IO) route for certain medications
   b. Disadvantages
      1. Special equipment required
      2. Physiologic functions of the upper airway (warming, filtering, humidifying) are bypassed
   c. Complications
      1. Bleeding
      2. Hypoxia
      3. Laryngeal swelling
      4. Laryngospasm
      5. Vocal cord damage
      6. Mucosal necrosis
      7. Barotrauma

VII. **Equipment: Features of the ET tube**

a. Proximal end
   1. Tube
   2. Cuff and pilot balloon
   3. Distal tip

b. Proximal end
   1. Equipped with an adapter that allows it to be attached to any ventilation device
   2. Includes an inflation port with a pilot balloon
   3. Distal cuff is inflated with a syringe
   4. Pilot balloon indicates whether the distal cuff is inflated or deflated once the tube has been inserted into the mouth
   5. Centimeter markings along the length of the ET tube provide a measurement of its depth
   6. Distal end of the tube has beveled tip to facilitate insertion and an opening on the side called Murphy's eye which enables ventilation to occur even if the tip becomes occluded
   7. Tubes range in size
      i. 2.5 to 9.0 mm in inside diameter
      ii. 12 to 32 cm in length
      iii. A tube that is too small will lead to increased resistance to airflow and difficulty in ventilating
      iv. A tube that is too large can be difficult to insert and may cause trauma.
      v. Predictions of size are just estimates

c. Always have 3 tubes ready
   1. One you think will be appropriate
   2. One a size large
   3. One a size smaller

VIII. **Other equipment considerations**

1. Same equipment used for orotracheal intubation (minus laryngoscope and stylet)
2. Select a tube that is slightly smaller than the nostril
3. Some ET tubes have been designed specifically for blind nasotracheal intubation
   i. Endotrol tube is slightly more flexible than a standard ET tube and equipped with a "trigger" that moves the tip of the tube anteriorly and increases the tube's overall curvature
4. Movement of air through the ET tube helps determine proper tube placement
5. A number of devices allow a paramedic to confirm successful intubation without placing his or her face next to the tube

IX. **Procedure to perform nasotracheal intubation**

a. Involves inserting an ET through the nose and into the trachea; this is a blind approach
   1. Usually performed without directly visualizing the vocal cords in the prehospital setting
   2. Excellent technique for establishing control over the airway in situations when it is difficult or hazardous to perform direct laryngoscopy

b. Indications
   1. Indicated for patients who are breathing spontaneously but require

definitive airway management
2. Responsive patients
3. Patients with altered mental status and intact gag reflex who are in respiratory failure because of conditions such as
   i. COPD
   ii. Asthma
   iii. Pulmonary edema

c. Contraindications
1. Apneic patients (in respiratory or cardiac arrest)
   i. Should be orotracheally intubated
2. Patients with head trauma and possible midface fractures
3. Patients with anatomic abnormalities or frequent cocaine use

d. Avoid in patients with blood-clotting abnormalities and in patients who take anticoagulation medications

e. Advantages
1. Can be performed on patients who are responsive and breathing
2. No need for a laryngoscope; eliminates the risk of trauma to teeth or soft tissues of the mouth
3. Mouth does not need to be opened—better suited to patients with limited temporomandibular joint mobility
4. Does not require sniffing position; ideal with a possible spinal injury
5. Tube is inserted through the nose, so patient cannot bite the tube.
6. Can be secured more easily than an orally inserted tube.

f. Disadvantages
1. Blind technique, so major tube confirmation methods cannot be used
2. Confirming proper tube position requires even more diligence

g. Complications
1. Bleeding is the most common.
2. Especially with rough technique
3. Poses an additional threat to an already compromised airway
4. Incidence of bleeding can be reduced by gentle insertion of the tube and lubrication of the tip with a water-soluble gel
   i. Anesthetic lubricant containing a vasoconstrictive agent will reduce patient discomfort and the likelihood and severity of nasal bleeding

X. Procedure to perform nasotracheal intubation

a. Standard precautions
1. Intubation may expose you to blood or other body fluids, so take proper precautions that include gloves and a mask that covers your entire face

b. Preoxygenation
1. Adequate preoxygenation with a bag-mask device and 100% oxygen is critical before intubation
2. Preoxygenate an apneic or hypoventilating patient for 2 to 3 minutes.
3. During the intubation attempt, the patient will undergo a period of "forced apnea"
4. Goal of preoxygenation is to prevent hypoxia from occurring during this time
5. Monitor Spo_2 and achieve as close to 100% saturation as possible during the 2- to 3-minute period
6. During the intubation attempt, continually monitor Spo_2 and maintain it at greater than 95%

7. Consequences of even brief periods of hypoxia can be disastrous; do not rely solely on pulse oximetry to quantify oxygenation status
8. Insert the tube into the nostril with the bevel facing toward the nasal septum.
    i. Right nostril is typically used
    ii. If the right nostril is obstructed, insert the tube into the left nostril, but rotate the tube 180° as its tip enters the nasopharynx
9. Aim the tip of the tube straight back toward the ear
10. Do not insert the tube with the tip aimed upward toward the eye.
11. Position the tube just above the glottic opening so that the patient will draw the tube into the trachea when he or she inhales deeply
12. Manipulate the patient's head to control the position of the tip of the tube.
    i. Cup your left hand (if tube is in the right nostril) under the patient's occiput.
    ii. Move the head to achieve maximum air flow through the tube.
13. If possible, instruct the patient to take a deep breath, and gently advance the tube with the inhalation
14. Placement in the trachea will be evidenced by an increase in air movement through the tube
15. If you see a soft-tissue bulge on either side of the airway, the tube may be inserted into the piriform fossa; hold the patient's head still and slightly withdraw the tube; once maximum airflow is detected, advance the tube on inhalation
16. If you do not see a soft-tissue bulge, the tube has entered the esophagus; Withdraw the tube until you detect airflow, and then extend the head
17. Once the tube has been properly positioned inflate the distal cuff with the minimum amount of air necessary, attach a bag-mask device to the tube, and ventilate
18. Note depth of insertion at the nostril; **confirmation and monitoring are extremely important**
    i. Unequal or absent breath sounds suggest esophageal placement, right mainstem bronchus placement, pneumothorax, bronchial obstruction
    ii. Bilaterally absent breath sounds or gurgling over the epigastrium
    iii. indicates that you have intubated the esophagus not the trachea; you should immediately remove the ET tube, be prepared to vigorously suction the airway, ventilate with a bag-mask device and 100% oxygen for 30 seconds to 1 minute before you reattempt nasotracheal intubation.
    iv. If breath sounds are heard only on the right side of the chest, the tube has likely been advanced too far, loosen or remove the tube-securing device, deflate the distal cuff, while ventilation continues, slowly retract the tube while simultaneously listening for breath sounds over the left side of the chest, stop as soon as bilaterally equal breath sounds are heard, note the depth of the tube (in cm) at the nostril, reinflate the distal cuff, secure the tube, and resume ventilations
    v. If the ET tube has been properly positioned in the trachea, the bag-mask device should be easy to compress and you should see corresponding chest expansion
    vi. Increased resistance during ventilations may indicate gastric distention,

esophageal intubation or tension pneumothorax
Continuous waveform capnography or other commercial devices, in addition to a clinical assessment, is the most reliable method of confirming and monitoring correct placement

vii. The ideal time to attach the capnography T-piece is when the bag-mask device is attached to the ET tube.
viii. After confirming proper tube placement, note and mark the ET tube at the nostril; this enables health care personnel to determine whether the tube has slipped in or out

19. Securing the tube
    i. Never leave the ET tube unattended before it has been secured with an appropriate device.
    ii. Support the secured tube manually while you ventilate the patient to avoid a sudden jolt from the bag-mask device
    iii. Clean up any secretions or excess lubricant, and secure the tube with tape

References

- 2009 National EMS Education Standards – Paramedic (NHTSA, 2009)
- McDonald, Jeff, ALS Skills Review (AAOS, 2009)
- Caroline, Nancy, Emergency Care in the Streets, 7th Edition (AAOS, 2013)

Appendix A
Nasotracheal Intubation for the Adult Patient

Name: _____
Date: _____
Examiner: _____

Procedure	Satisfactory	Unsatisfactory
1. Ensures body substance isolation		
2. Preoxygenates the patient with a bag-mask device and 100% oxygen		
3. Assembles, checks, and prepares equipment		
4. Places the patient's head in a neutral position		
5. Preforms the ET tube by bending it in a circle		
6. Administers a topical vasoconstrictor nasal spray		
7. Lubricates the tip of the tube with a water-soluble gel		
8. Gently inserts the ET tube into the more compliant nostril with the bevel facing toward the nasal septum (may attach the BAAM® device for assistance)		
9. Advances the ET tube along the nasal floor		
10. Advances the ET tube through the vocal cords as the patient inhales		
11. Inflates the distal cuff with 5 to 10 mL of air and detaches the syringe		
12. Attaches an $ETCO_2$ detector (waveform capnography preferred) to the ET tube		
13. Attaches the bag-mask device and ventilates		
14. Auscultates over the apices and bases of both lungs and over the epigastrum		
15. Secures the ET tube with tape		

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT and AEMT

Orotracheal Intubation for the Adult Patient

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMT or AEMT to perform a STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Prerequisites
Certified EMT or AEMT under Medical Direction

Course Description
This course provides the EMT or AEMT the ability to integrate the complex knowledge of the indications, advantages, disadvantages, contraindications, procedure, and complications to perform orotracheal intubation for the adult patient.

Course Competencies
The student shall:

1. Discuss methods used to predict the difficult airway.
2. Describe the advantages, disadvantages, and complications of intubating the trachea.
3. List the equipment required to perform orotracheal intubation for the adult patient.
4. Explain how to determine correct endotracheal (ET) tube size.
5. List factors to consider when determining correct laryngoscope blade size.
6. Discuss the indications, contraindications, advantages, disadvantages, contraindications, and complications of orotracheal intubation for the adult patient.
7. Demonstrate the entire procedure for orotracheal intubation for the adult patient.
8. List the methods available for confirming placement of the endotracheal tube.
9. Describe how to secure the endotracheal tube.

Lesson Outline

I. **Establish and maintain a patent airway with basic techniques and maneuvers, then consider advanced airway management**

II. **Patients primarily require advanced airway management for 2 reasons:**
   a. Failure to maintain a patent airway and/or
   b. Failure to adequately oxygenate and ventilate

III. **Advanced airway management involves the insertion of a number of advanced airway devices, including orotracheal intubation where the endotracheal tube (ET) is passed through the glottic opening into the trachea**

IV. **Predicting the difficult airway**
   a. Anatomic findings suggestive of a difficult airway may include
      1. Congenital abnormalities (i.e., dysmorphic face)
      2. Recent surgery
      3. Trauma
      4. Infection
      5. Neoplastic diseases (such as cancer)

V. LEMON: mnemonic to guide assessment of the difficult airway
   a. The following can make intubation more difficult
      1. Short, thick necks
      2. Morbid obesity
      3. Dental conditions, such as an overbite or "buck" teeth
   b. Evaluate 3-3-2
      1. First "3" refers to mouth opening
      2. Second "3" refers to mandible length
      3. "2" refers to the distance from the hyoid bone to the thyroid notch; should be at least two fingers wide
   c. Obstruction: note anything that might interfere with visualization or ET tube placement
      1. Foreign body
      2. Obesity
      3. Hematoma
      4. Masses
   d. Neck mobility
   e. "Sniffing position" is ideal for visualization and intubation; adult head slightly elevated and extended
   f. Neck mobility problems are most common with
      1. Trauma patients (due to cervical collars or injury)
      2. Elderly patients (due to osteoporosis or arthritis)

VI. Intubation of the trachea is the best means of achieving complete control of the airway
   a. Advantages
      1. Provision of a secure airway
      2. Protection against aspiration
      3. Provision of an alternative route to the IV or intraosseous (IO) route for certain medications

b. Disadvantages
    1. Special equipment required
    2. Physiologic functions of the upper airway (warming, filtering, humidifying) are bypassed
c. Complications
    1. Bleeding
    2. Hypoxia
    3. Laryngeal swelling
    4. Laryngospasm
    5. Vocal cord damage
    6. Mucosal necrosis
    7. Barotrauma

VII. Equipment: the endotracheal tube

a. Proximal end
    1. Tube
    2. Cuff and pilot balloon
    3. Distal tip
b. Proximal end
    1. Equipped with an adapter that allows it to be attached to any ventilation device
    2. Includes an inflation port with a pilot balloon
    3. Distal cuff is inflated with a syringe
    4. Pilot balloon indicates whether the distal cuff is inflated or deflated once the tube has been inserted into the mouth
    5. Centimeter markings along the length of the ET tube provide a measurement of its depth
    6. Distal end of the tube has beveled tip to facilitate insertion and an opening on the side called Murphy's eye which enables ventilation to occur even if the tip becomes occluded
    7. Tubes range in size.
        1. 2.5 to 9.0 mm in inside diameter
        2. 12 to 32 cm in length
        3. A tube that is too small will lead to increased resistance to airflow and difficulty in ventilating
        4. A tube that is too large can be difficult to insert and may cause trauma.
c. Always have 3 tubes ready
    1. One you think will be appropriate
    2. One a size larger
    3. One a size smaller

VIII. Equipment: the laryngoscope and blades

a. A laryngoscope is required to perform orotracheal intubation by direct laryngoscopy
b. Laryngoscope consists of a handle and interchangeable blades
    1. Handle contains the power source for the light on the blade
    2. When the blade is perpendicular, the light shines near the blade's tip

c. Two most common types of blades:
    1. Straight (Miller, others)
    2. Curved (Macintosh, others)

d. Straight laryngoscope blade
    1. Tip will extend beneath the epiglottis and lift it up
    2. Useful with infants and small children, who often have a long, floppy epiglottis
    3. In an adult, use of a straight blade is more likely to damage teeth if used improperly

e. Curved laryngoscope blade
    1. Less likely to be levered against the teeth by an inexperienced paramedic
    2. Direction of the curve conforms to that of the tongue and pharynx
    3. Tip is placed in the vallecula (space between the epiglottis and the base of the tongue)
    4. Indirectly lifts the epiglottis to expose the vocal cords

f. Have curved and straight blades available

g. Blade size
    1. Ranges from 0 to 4
    2. 0, 1, and 2 are appropriate for infants and children
    3. 3 and 4 considered adult sizes
    4. For adults, usually based on paramedic experience and the size of the patient

h. Stylet
    1. Semirigid wire that is inserted into the ET tube
    2. Molds and maintains the shape of the tube
    3. Allows you to guide the tip of the tube over the arytenoid cartilage, even if you cannot see the entire glottic opening
    4. Should be lubricated with a water-soluble gel to facilitate its removal
    5. End should be bent to form a gentle curve
    6. End should rest at least 1/2" back from the end of the ET tube
    7. If it protrudes beyond the end of the tube, it may damage the vocal cords.
    8. Bend the other end over the proximal tube connector, so that it cannot slip further into the tube

i. Magill forceps have 2 uses in the emergency setting
    1. Remove airway obstructions under direct visualization.
    2. Guide the tip of the ET tube through the glottic opening if the proper angle cannot be achieved with manipulation of the tube

X. Procedure to perform orotracheal intubation

a. Involves inserting an ET tube through the mouth and into the trachea while visualizing the glottic opening with a laryngoscope

b. Indications
    1. Airway control needed as a result of coma, respiratory arrest, and/or cardiac arrest
    2. Ventilatory support before impending respiratory failure
    3. Prolonged ventilatory support required

4. Absence of a gag reflex
5. Traumatic brain injury
6. Unresponsiveness
7. Impending airway compromise (burns or trauma)
8. Medication administration

c. Contraindications
   1. Intact gag reflex
   2. Inability to open the patient's mouth because of trauma, dislocation of the jaw, or a pathologic condition
   3. Inability to visualize the glottic opening
   4. Copious secretions, vomitus, or blood in the airway

d. Standard precautions
   1. Intubation may expose you to blood or other body fluids, so take proper precautions that include gloves and a mask that covers your entire face

e. Preoxygenation
   1. Adequate preoxygenation with a bag-mask device and 100% oxygen is critical before intubation
   2. Preoxygenate an apneic or hypoventilating patient for 2 to 3 minutes.
   3. During the intubation attempt, the patient will undergo a period of "forced apnea"
   4. Goal of preoxygenation is to prevent hypoxia from occurring during this time
   5. Monitor Spo_2 and achieve as close to 100% saturation as possible during the 2- to 3-minute period
   6. During the intubation attempt, continually monitor Spo_2 and maintain it at greater than 95%

f. Consequences of even brief periods of hypoxia can be disastrous
   1. Do not rely solely on pulse oximetry to quantify oxygenation status

g. Positioning the patient
   1. Airway has three axes: mouth, pharynx, larynx
   2. At acute angles when the head is in a neutral position, makes laryngoscopy difficult
   3. Must be aligned to the greatest extent possible to facilitate visualization of the airway

h. The "sniffing position"
   1. Approximately a 20° extension of the atlanto-occipital joint
   2. 30° flexion of the neck at C6 and C7 for a patient with a short neck and/or "no chin"
   3. Can be achieved in most supine patients by extending the head and elevating the occiput 2.5 to 5 cm
   4. Elevate the head and/or neck with folded towels until the ear is at the level of the sternum

i. Blade insertion
   1. After you have positioned the patient's head and provided preoxygenation, direct your partner to stop ventilating
   2. Position yourself at the top of the patient's head
   3. Grasp the laryngoscope with your left hand, as far down on the handle as possible.

4. If the mouth is not open, place the side of your right-hand thumb just below the bottom lip and push the mouth open, or "scissor" your thumb and index finger between the molars, or open the mouth with the tongue-jaw lift maneuver
5. Insert the blade into the right side of the mouth
6. Use the blade flange to sweep the tongue gently to the left while moving the blade into the midline
7. Slowly advance the blade while sweeping the tongue to the left, the curved blade into the vallecula and the straight blade beneath the epiglottis
8. Exert gentle traction at a 45° angle to the floor as you lift the patient's jaw
9. Do not "pry" back on the laryngoscope
10. Keep your back and your left arm straight as you pull upward

j. Visualizing the glottic opening
   1. Continue lifting the laryngoscope as you look down the blade
   2. Identifying the epiglottis or the arytenoid cartilage enables to you make small adjustments in the position of the blade
   3. With the curved blade, "walk" the blade down the tongue
   4. With the straight blade, insert the blade straight back until the tip touches the posterior pharyngeal wall
   5. As you work the tip of the blade into position, the glottic opening should come into full view
   6. The vocal cords are the white fibrous bands that lie vertically within the glottic opening; they should be slightly open.

k. ET tube insertion
   1. Pick up the ET tube in your right hand, holding it near the connector as you would hold a pencil
   2. Insert the tube from the right corner of the mouth through the vocal cords
   3. Continue to insert the tube until the proximal end of the cuff is 1 to 2 cm past the vocal cords
   4. If you cannot see the vocal cords, do not insert the tube
   5. Blade is designed to visualize the glottic opening, not as a guide for the tube
   6. Will obscure your view of the glottic opening and should be avoided
   7. After you have seen the ET tube cuff pass roughly 1/2" beyond the vocal cords, gently remove the blade, hold the tube securely with your right hand, and remove the stylet from the tube
   8. Inflate distal cuff with 5 to 10 mL of air, then detach syringe from the inflation port
   9. If the syringe is not removed immediately, air from the cuff may leak back into the syringe
   10. Inflating the distal cuff with excess pressure may cause tissue necrosis of the tracheal wall
   11. Have your assistant attach the bag-mask device to the ET tube and continue ventilation

12. In-line T-piece capnography monitor should be placed between the bag-mask device and the ET tube

l. Ventilation
    1. As the first ventilations are delivered, look at the patient's chest to ensure that it rises with each ventilation
    2. At the same time, listen with a stethoscope to both lungs and to the stomach
    3. If the tube is properly positioned, you will hear equal breath sounds bilaterally and a quiet epigastrium
    4. Epigastric sounds may be transmitted to the lungs in obese patients or patients with significant gastric distention
    5. Ventilation should continue as dictated by the patient's age
    6. Do not stop chest compressions to deliver ventilations (asynchronous CPR).

m. Confirmation of tube placement
    1. Visualizing the ET tube passing between the vocal cords is the first (and most reliable) way to confirm that the tube has entered the trachea
    2. Unequal or absent breath sounds suggest esophageal placement, right mainstem bronchus placement, pneumothorax, bronchial obstruction
    3. Bilaterally absent breath sounds or gurgling over the epigastrium indicates that you have intubated the esophagus not the trachea; you should immediately remove the ET tube, be prepared to vigorously suction the airway, ventilate with a bag-mask device and 100% oxygen for 30 seconds to 1 minute before you reattempt intubation.
    4. If breath sounds are heard only on the right side of the chest, the tube has likely been advanced too far, loosen or remove the tube-securing device, deflate the distal cuff, while ventilation continues, slowly retract the tube while simultaneously listening for breath sounds over the left side of the chest, stop as soon as bilaterally equal breath sounds are heard, note the depth of the tube (in cm) at the patient's teeth, re-inflate the distal cuff, secure the tube, and resume ventilation.
    5. If the ET tube has been properly positioned in the trachea, the bag-mask device should be easy to compress and you should see corresponding chest expansion
    6. Increased resistance during ventilations may indicate gastric distention, esophageal intubation or tension pneumothorax
    7. Continuous waveform capnography, in addition to a clinical assessment, is the most reliable method of confirming and monitoring correct placement
    8. The ideal time to attach the capnography T-piece is when the bag-mask device is attached to the ET tube
    9. If waveform capnography is not available, a colorimetric $ETCO_2$ detector or an esophageal detector device can be used

n. After confirming proper tube placement, note and mark the ET tube where it emerges from the mouth
    1. Enables health care personnel to determine whether the tube has slipped in or out

o. Securing the tube

1. Never leave the ET tube unattended before it has been secured with an appropriate device
2. Support the secured tube manually while you ventilate the patient to avoid a sudden jolt from the bag-mask device
3. Many commercial tube-securing devices are available.
4. Secure the ET tube by following the suggested recommendations of the device's manufacturer
5. If you do not have a commercially manufactured device, you can secure the tube in place with tape and insert a bite block or oral airway

p. It is important to minimize head movement in an intubated patient.

1. Apply a cervical collar
2. Place the patient on a long backboard
3. Stabilize the patient's head with lateral immobilization blocks

References

- 2009 National EMS Education Standards – Paramedic (NHTSA, 2009)
- McDonald, Jeff, ALS Skills Review (AAOS, 2009)
- Caroline, Nancy, Emergency Care in the Streets, 7th Edition (AAOS, 2013)

Appendix A
Orotracheal Intubation for the Adult Patient

Name: _____
Date: _____
Examiner: _____

Procedure	Satisfactory	Unsatisfactory
1. Ensures body substance isolation		
2. Measures and inserts an oropharyngeal airway		
3. Preoxygenates the patient for 2 to 3 minutes with a bag-mask device and 100% oxygen		
4. Checks, prepares, and assembles equipment		
5. Places the patient's head in the sniffing position		
6. Removes the oropharyngeal airway		
7. Inserts the laryngoscope blade into the right side of the mouth and displaces the tongue to the left		
8. Gently lifts the long axis of the laryngoscope handle to visualize the glottic opening and the vocal cords		
9. Inserts the ET tube through the right corner of the mouth		
10. Visualizes entry of the ET tube between the vocal cords		
11. Removes the laryngoscope from the patient's mouth		
12. Removes the stylet from the ET tube		
13. Inflates the distal cuff of the ET tube with 5 to 10 mL of air and immediately detaches the syringe from the inflation port		
14. Attaches an $ETCO_2$ detector (waveform capnography preferred) to the ET tube		
15. Attaches the bag-mask device and ventilates		
16. Auscultates over the apices and bases of both lungs and over the epigastrum		
17. Auscultates over the apices and bases of both lungs and over the epigastrum		

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for a Paramedic

Rapid Sequence Intubation (RSI)

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR [Special Training Required] skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR [Special Training Required] skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under "on-line" medical direction.

Recommendations for Paramedic Performance of Rapid Sequence Intubation (RSI) in the Prehospital EMS Environment

INTRODUCTION

Rapid sequence intubation (RSI) is an advanced airway STR skill, under Medication Assisted Intubation in Table 5.1, for Paramedics that some Arizona Emergency Medical Services (EMS) Providers may consider beneficial for the care of their patients. At this time, there is debate about the precise prehospital patient population most benefited by RSI and about the optimal structure and implementation of an RSI program in the prehospital EMS environment.

The Arizona Department of Health Services (Department) views RSI as an important prehospital tool, the safe and appropriate use of which requires a tremendous amount of time, resources, and dedication. This document provides the Department's recommendations for Paramedic performance of RSI in the prehospital EMS environment. Ultimately, whether an EMS Provider's Paramedics are authorized to perform RSI and how the EMS Provider's RSI program is structured and implemented falls to the discretion of the EMS Provider's administrative medical director.

RECOMMENDATIONS FOR PARAMEDIC PERFORMANCE OF RSI

Initial Sedation Agent: Etomidate
Paralytic Agent: Succinylcholine
Continued Sedation Agent: Midazolam HCl or diazepam
Analgesic Agent: Morphine sulfate, fentanyl, or ketamine
Indications for Performance of RSI: See Exhibit A
Contraindications for Performance of RSI: See Exhibit A
Training Prerequisite for Performance of RSI:

Require successful completion of standardized competency-based training consistent with Exhibit A before a Paramedic is authorized to perform RSI.

Safety Measures in Performance of RSI:
Use the following with each patient upon whom RSI is performed:

1. A continuous in-line CO2 monitor with capnographic waveform printing capabilities;
2. An automatic transport ventilator (ATV) device to ensure appropriate rate control and tidal volume ventilation; and
3. If endotracheal intubation is not successful, one of the following alternative airway management devices:
    a. Esophageal tracheal double lumen airway device (ETDLAD),
    b. Laryngeal mask airway (LMA), or
    c. Intubating laryngeal mask airway (ILMA).

Administrative Medical Director Discretion and Supervision:

An administrative medical director should:

1. Authorize only select Paramedics to perform RSI, based upon significant time, experience, and skill as practicing Paramedics;
2. Require successful completion of standardized competency-based training consistent with Exhibit A before a Paramedic is authorized to perform RSI;
3. Require as a prerequisite to performing RSI that a Paramedic demonstrate proficiency to the administrative medical director by performing at least 12 endotracheal intubations, with each intubation performed:
    a. In an operating room, emergency department, or coroner's office; or
    b. If these are not available, with a mannequin simulator;
4. Ensure that each Paramedic authorized to perform RSI maintains proficiency by successfully performing at least 12 endotracheal intubations each year, including at least one prehospital RSI; and
5. Ensure that complete data is collected, reviewed, and analyzed through a data management system, a data collection program, and a quality management program as described below.

Data Collection and Review, Quality Management: An EMS Provider offering RSI should have:

1. A data management system to track participating Paramedics' endotracheal intubations, including at least:
    a. The number of attempted endotracheal intubations, with a separate figure for attempted RSIs;
    b. The number of successful endotracheal intubations, with a separate figure for successful RSIs; and
    c. The number of unsuccessful endotracheal intubations, with a separate figure for unsuccessful RSIs;
2. A data collection program that includes:
    a. EMT documentation of at least the information listed in Exhibit A, subsection (VII)(N), using a form such as Exhibit B;
    b. Collecting real-time monitoring printouts of patient physiologic parameters, including heart rate, oxygen saturation, and end-tidal CO2; and
    c. Collecting follow-up information, including patient outcome, from hospitals receiving patients upon whom RSI was performed, using a form such as Exhibit C; and
3. A quality management program that includes:
    a. Administrative medical director review of every attempted or completed RSI, including the EMT documentation described in subsection (2)(a) and

the real-time monitoring printouts of patient physiologic parameters described in subsection (2)(b);

b. Administrative medical director review of all patient follow-up information obtained from receiving hospitals as described in subsection (2)(c); and

c. A process for taking corrective action, such as requiring a Paramedic to complete remedial training or rescinding a Paramedic's authority to perform RSI, when the administrative medical director detects a problem in a Paramedic's performance of RSI.

Submission of Information to MDC and DHS

An EMS Provider offering RSI should:

1. Voluntarily submit RSI data to the Medical Direction Commission (MDC) on a quarterly basis; and
2. Voluntarily submit to ADHS's Bureau of Emergency Medical Services a letter of intent to have an RSI program, copies of the training outline and protocols to be used, and a description of the quality management program to be used.

EXHIBIT A: Training Outline for RSI

INTRODUCTION

Purpose: To prepare Arizona certified Paramedics to perform rapid sequence intubation (RSI)

RSI: The use of a sedation agent and a paralytic agent to facilitate endotracheal intubation

Design: Didactic and psychomotor skills education and training in the techniques of RSI, including advanced airway management; recognition of indications, contraindications, and complications; pharmacology; protocols; and special considerations

Prerequisites:
Currently certified Paramedic, active in the field, with permission of the employing EMS Provider's administrative medical director

Competencies:

A. Identify and simulate advanced airway management according to the standards and procedures outlined in the course. (I)
B. Identify the indications, contraindications, and complications for RSI. (II, III, IV)
C. List the anticipated mechanical and pharmacological interventions that may be used before, during, and after RSI. (I, V, VI, VII, VIII)
D. Identify and explain the steps in the algorithm for RSI. (VI, VII)
E. Identify special patient management modalities for RSI. (VII, VIII)
F. Demonstrate use of the continuous in-line CO2 monitor with capnographic waveform printing capability and the ability to interpret the end-tidal CO2 measurement values and waveforms. (VI, VII)
G. Demonstrate cricothyrotomy. (I, VI, VII)
H. Demonstrate use of the laryngeal mask airway (LMA), intubating laryngeal mask airway (ILMA), and/or esophageal tracheal double lumen airway device (ETDLAD). (I, VI, VII)

COURSE OUTLINE

I. Advanced Airway Management

A. Lecture

B. Skills demonstration:

1. Demonstration of basic life support (BLS) airway management:
   a. Bag-valve mask (BVM),
   b. Oral pharyngeal airway (OPA), and
   c. Sellick's maneuver;
2. Demonstration of appropriate ventilation rate and volumes;
3. Demonstration and application of airway-difficulty-assessment parameters, using the Mallampati classification or a similar airway classification scale;
4. Demonstration of appropriate interpretation of pulse oximetry values, capnography waveforms, and ECG values;
5. Demonstration of oral endotracheal intubation;
6. Demonstration of confined space intubation (ambulance or helicopter setting);
7. Demonstration of dual lumen airway placement; and
8. Demonstration of surgical cricothyrotomy.

II. Indications for RSI

A. Respiratory failure

B. Loss of gag reflex or protective airway reflex

C. Glasgow Coma Scale score of 7 or less

D. Severe head trauma

E. Combative patient

F. Spinal cord injury

G. Facial and airway burns

H. Asthma or respiratory illness

I. The benefit of obtaining airway control must be weighed against the risk of complications caused by the procedure.

III. Contraindications for RSI

A. Absolute

1. Known hypersensitivity to any drug used in RSI
2. Patient in whom cricothyrotomy would be impossible
3. Patient in whom intubation would be impossible
4. Neck injury or swelling that compromises the airway
5. Patient younger than 14 years of age
6. Upper airway obstruction
7. Known or suspected epiglottitis
8. Known history of myasthenia gravis or another skeletal muscle myopathy

B. Relative

1. Spontaneous breathing with adequate ventilation
2. Patient in whom cricothyrotomy would be difficult
3. Patient in whom intubation would be difficult

IV. Complications of RSI

A. Inability to secure the airway after administration of the paralytic agent

B. Arrhythmias:

1. Tachycardia
2. Bradycardia
3. Asystole

C. Aspiration
D. Bronchospasm
E. Inability to evaluate neurological status and seizures
F. Emesis
G. Prolonged apnea
H. Histamine flush
I. Hypotension

V. Pharmacology

A. Etomidate: Review Drug Profile for Etomidate
B. Succinylcholine: Review Drug Profile for Succinylcholine
C. Midazolam HCl: Review Drug Profile for Midazolam Hydrochloride
D. Diazepam: Review Drug Profile for Diazepam
E. Morphine sulfate: Review Drug Profile for Morphine Sulfate

VI. Preparation for Procedure

A. Maintain and continually assess basic life support procedures.
B. Maintain the patient's airway and, if indicated, c-spine immobilization.
C. Have the following equipment immediately available:
    1. BVM with proper size mask and OPA;
    2. Suction device;
    3. Intubation equipment:
        a. Endotracheal tubes,
        b. Laryngoscope with blades,
        c. Stylet, and
        d. 10cc syringe;
    4. Pulse oximeter;
    5. Continuous in-line CO2 monitor with capnographic waveform printing capability;
    6. ECG monitor;
    7. Cricothyrotomy equipment;
    8. Alternative airway equipment:
        a. LMA,
        b. ILMA, or
        c. ETDLAD; and
    9. Automatic transport ventilator (ATV) device.
D. Breathing:
    1. Assist ventilations with ATV (or BVM, if ATV unavailable) if needed, at appropriate rates and volumes.
    2. Apply and assess values from pulse oximeter and in-line CO2 monitor waveforms.
    3. Provide oxygen via ATV (or BVM, if ATV unavailable) to pre-oxygenate the patient so that the patient can be apneic for 2-3 minutes without serious hypoxia, by:
        a. Providing 100% oxygen for at least 1-2 minutes (preferably 4-5 minutes) to establish an oxygen reserve; or
        b. If unable to wait, giving 4 vital capacity breaths.
    4. **Ensure that patient is not hyperventilated at any time!**
E. Perform circulation assessment.
F. Establish IV of normal saline at 30cc/hr or greater.
G. Apply ECG monitor (must be used before, during, and after procedure).

H. Reassess values (pulse oximeter, in-line CO2 monitor waveforms, and ECG rate and rhythm).

I. Perform neurological exam before administering paralytic agent, by:
   1. Determining Glasgow Coma Scale score,
   2. Assessing pupils, and
   3. Detecting extremity movement or lack thereof.

J. To the extent possible, obtain a focused history and detailed assessment of patient to determine appropriate use of the procedure.

VII. Procedure

A. Prepare the drugs and intubation equipment, including the suction equipment.

B. Pre-oxygenate with 100% oxygen, with appropriate rate and depth of ventilation.

C. Assess values (pulse oximetry, in-line CO2 monitor waveforms, and ECG rate and rhythm) and pupil response at least every 5 minutes (monitors must be left in place continuously).

D. Provide supportive explanations to patient, family, and bystanders, as needed.

E. Maintain cricoid pressure throughout entire procedure, until intubation is confirmed.

F. Administer Etomidate.

G. Administer Succinylcholine.

H. Intubate patient.

I. Assure adequate sedation and analgesia for prolonged paralysis.

J. Maintain spinal immobilization if patient has possible spinal injury.

K. Confirm proper endotracheal tube placement, using:
   1. Continuous in-line CO2 monitoring;
   2. Continuous pulse oximetry monitoring; and
   3. At least one of the following methods:
      a. Bilateral breath sounds,
      b. Negative epigastric sounds,
      c. Use of an intubation detector bulb, or
      d. Visualization of the tube passing through the vocal chords.

L. If intubation is unsuccessful:
   1. Ventilate the patient with ATV (or BVM, if ATV unavailable) and 100% oxygen until the next attempt;
   2. Consider administering Midazolam or Diazepam if it has been more than 3 minutes since Etomidate administration, and administer if determined to be beneficial; and
   3. Attempt intubation again.

M. If the second intubation attempt is unsuccessful:
   1. Ventilate the patient with ATV (or BVM, if ATV unavailable) and 100% oxygen;
   2. If possible, obtain airway management using an ETDLAD, LMA, or ILMA; and
   3. If unable to adequately ventilate patient using other airway adjuncts, perform surgical cricothyrotomy.

N. Document at least the following, using a form such as Exhibit B:
   1. Incident number and date;
   2. Agency and unit identification;
   3. Identification of each Paramedic involved;
   4. Call type;
   5. Patient age, sex, and weight;
   6. Indications and contraindications for RSI present;
   7. Patient's Glasgow Coma Scale score;

8. Pre-oxygenation performed (ATV, BVM, or vital capacity breaths);
9. Patient vitals before and after the procedure (documented at least every 5 minutes after the procedure), including:
    a. Pulse,
    b. Blood pressure,
    c. Respiratory rate, and
    d. O2 saturation;
10. End-tidal CO2 measurements, including waveform interpretation (continuous throughout entire patient management);
11. Medication name, dose, route, and time for each administration of medication, including continued sedation, if any;
12. Whether the Sellick's maneuver was used;
13. Number of RSI and other intubation attempts;
14. Methods used to confirm placement of the endotracheal tube;
15. Whether alternative airway equipment was used and, if so, an explanation;
16. Whether surgical cricothyrotomy was performed;
17. An explanation of any repeated doses of medication (e.g., medication name and reason, such as lack of paralysis);
18. An explanation of the rationale for using RSI;
19. If intubation was unsuccessful, an explanation of why intubation was unsuccessful; and
20. Complications encountered.

VIII. Special Considerations

A. The benefits of obtaining airway control must be weighed against the risk of complications caused by the procedure.
B. Once Succinylcholine is given, the Paramedic must be vigilant because the patient is paralyzed and unable to breathe independently.
C. Paralysis can be prolonged with repeated doses of Succinylcholine.
D. A Paramedic must maintain c-spine immobilization if needed.
E. A Paramedic must continuously monitor in-line CO2 and pulse oximetry.
F. A Paramedic must continuously monitor the rate and depth of ventilations.
G. Because a paralyzed patient may still be awake and in severe pain, adequate sedation and analgesia must be provided before, during, and after the procedure.

IX. EMS Provider's Specific Protocols

A. Prerequisites to performing RSI
B. Annual requirement to maintain proficiency
C. Data management system
D. Data collection program
E. Quality management program
F. Algorithm for RSI
G. Drug profiles

EXHIBIT B. FORM FOR PARAMEDIC DOCUMENTATION OF RSI

Incident Number	Date	Agency	Unit
Medic 1	Medic 2	Medic 3	
Call Type	Patient Age	Patient Sex	Patient Weight

INDICATIONS/CONTRAINDICATIONS FOR RSI

Respiratory Failure YO NO	Loss of Gag/Protective Airway Reflex YO NO
Glasgow Coma Scale Score < 8 YO NO GCS Score:	Severe Head Trauma YO NO
Combative Patient YO NO	Spinal Cord Injury YO NO
Facial and Airway Burns YO NO	Asthma or Respiratory Illness YO NO
Absolute Contraindications Present YO NO If Yes, Explain:	Relative Contraindications Present YO NO If Yes, Explain:

PROCEDURAL DATA

Pre-oxygenation With 100% O_2 Performed: ATVO BVMO Vital Capacity BreathsO		Continuous End-Tidal CO_2 Monitoring YO NO (Attach Printout)	
Vitals Before:	Vitals 5 Min. After:	Vitals 10 Min. After:	Vitals 15 Min. After:
Etomidate Administration	Dose:	Route:	Time:
Succinylcholine Administration	Dose:	Route:	Time:
Other Medication Administration	Name & Dose:	Route:	Time:
Other Medication Administration	Name & Dose:	Route:	Time:
Sellick's Maneuver Used YO NO		# RSI Attempts	# Intubation Attempts
ET Tube Placement Confirmed By: Continuous In-Line CO_2 Monitoring YO NO Continuous Pulse Oximetry YO NO Bilateral Breath Sounds YO NO Negative Epigastric Sounds YO NO Intubation Detector Bulb YO NO Visualization of Tube YO NO		Alternative Airway Equipment Used YO NO If Yes, Explain: Surgical Cricothyrotomy Performed YO NO	
Explain Repeated Doses of Medication:		Explain Rationale for Using RSI:	
If Intubation Unsuccessful, Explain Why:			

COMPLICATIONS

None O	Tachycardia O	Prolonged Hypoxia O
Bronchospasm O	Bradycardia O	Medication Error O
Hypotension O	Other Dysrhythmia O	Other: _____

EXHIBIT C. RSI HOSPITAL FOLLOW-UP FORM

Date	Agency	Unit	Incident Number
Hospital Name	Time of Arrival	Patient Age	Patient Sex

Hospital Provider:
Please complete this follow-up form as soon as possible (within 12 hours) to assist with the evaluation of our EMS Agency's RSI program. Once completed, please fax to _____ and mail the original in the attached envelope. Questions or comments may be directed to the following EMS Agency contact: at .

Please do not place in the medical record. Thank you.

Airway type used by EMS Agency:

If endotracheal intubation was performed by EMS Agency, how was initial tube placement confirmed at Hospital?

Was X-ray performed? Yes LI No LI

Was endotracheal tube placement adequate? Yes LI No LI

Arterial blood gases (initial set if performed):

pH _____ PCO_2 _____ PaO_2 _____ HCO_3 _____ Be ____

Diagnosis: _____

Outcome: DOA LI Died in ED LI To ICU LI Other: _____

Airway managed appropriately by EMS Agency? Yes LI No LI

Agree with the prehospital need for intubation? Yes LI No LI

If no, why not? _____

Did EMS Agency administer appropriate medication (paralysis and sedation)? Yes LI No LI

If no, explain: _____

Other comments:

Form completed by: _____ Date:

Not part of hospital record

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT - AEMT

12-Lead Acquisition for the EMT

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMT - AEMT can only use this skill under "on-line" medical direction.

Prerequisites:
Certified EMT, under Medical Direction

Course Description:
The 12-lead ECG is a vital tool for EMT's and AEMT in both the prehospital and hospital setting. It is extremely important to know the exact placement of each electrode on the patient. Incorrect placement can lead to a false diagnosis of infarction or negative changes on the ECG.

Course Competencies:
At the completion of this STR, the student should be able to perform the following competencies.
1. Describe the anatomy of the heart:
    a) Including the position in the thoracic cavity,
    b) Layers of the heart,
    c) Chambers of the heart,
2. Identify the structure and course of all divisions and subdivisions of the cardiac conduction system.
3. Identify and describe how the heart's pacemaking control, rate, and rhythm are determined.
4. Define the functional properties of cardiac muscle.
5. Identify how heart rates, durations, and amplitudes may be determined from 12-Lead EKG recordings.
6. Explain the location and lead placement on the chest wall for the 12-lead EKG.
7. List the necessary components when documenting 12-lead EKG acquisition.
8. Identify those situations that adversely affect the proper acquisition of a 12-lead EKG
9. List the methods to deliver the 12-lead EKG to the receiving facility.
10. Skills check –off.

12-Lead Explained

One of the most common questions regarding a 12-lead ECG is why there are only 10 electrodes. It's important to fully understand what the term "lead" actually means. A lead is a view of the electrical activity of the heart from a particular angle across the body. Think of a lead as a picture of the heart and the 10 electrodes give you 12 pictures. In other words, a lead is a picture that is captured by a group of electrodes.

Reducing Artifact

The heart's electrical signal is very small and unfortunately this can be combined with other signals of similar frequency to create artifact. It's not uncommon for 12-lead ECG's to have some form of artifact; however, it's important to try to reduce any interference to ensure an accurate ECG. Below is a list of guidelines that will help reduce artifact when performing ECG's.

Patient Positioning

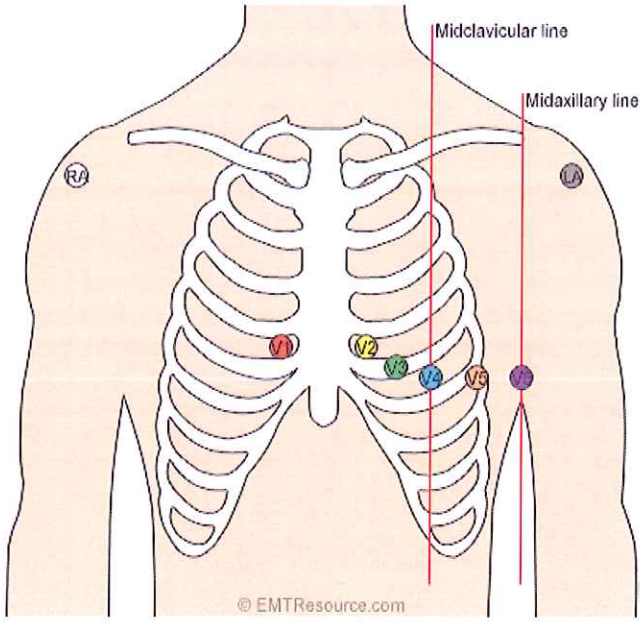
Place the patient in a supine or semi-Fowler's position. If the patient cannot tolerate being flat, you can do the ECG in a more upright position.
Instruct the patient to place their arms down by their side and to relax their shoulders.
Make sure the patient's legs are uncrossed.
Move any electrical devices, such as cell phones, away from the patient as they may interfere with the machine.

Skin Preparation

- Dry the skin if it's moist or diaphoretic.
- Shave any hair that interferes with electrode placement. This will ensure a better electrode contact with the skin.
- Rub an alcohol prep pad or benzoin tincture on the skin to remove any oils and help with electrode adhesion.

Electrode Application

- Check the electrodes to make sure the gel is still moist.
- Do not place the electrodes over bones.
- Do not place the electrodes over areas where there is a lot of muscle movement.



ELECTRODE PLACEMENT

V1	4th Intercostal space to the right of the sternum
V2	4th Intercostal space to the left of the sternum
V3	Midway between V2 and V4
V4	5th Intercostal space at the midclavicular line
V5	Anterior axillary line at the same level as V4
V6	Midaxillary line at the same level as V4 and V5
RL	Anywhere above the ankle and below the torso
RA	Anywhere between the shoulder and the elbow
LL	Anywhere above the ankle and below the torso
LA	Anywhere between the shoulder and the elbow

Electrode Misplacement

Up to 50% of cases have the V1 and V2 electrodes in a more superior location, which can mimic an anterior MI and cause T wave inversion.
Up to 33% of cases have the precordial electrodes (V1-V6) inferiorly or laterally misplaced, which can alter the amplitude and lead to a misdiagnosis.

Transmission of 12 Lead

Transmission of 12-leads can occur via cellular-based proprietary systems or, depending upon specific devices, pictures of acquired 12-leads can be taken and sent by text or e-mail using smartphones. EMTs are cautioned to check applicable patient privacy laws and regulations specific to their area and local protocol prior to using any cell phone.

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for I-99 and Paramedic

Carotid Massage – (<17 y.o.)

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR [Special Training Required] skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR [Special Training Required] skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under "on-line" medical direction.

Course Description:

This course provides the I-99 and/or Paramedic an overview of carotid sinus massage procedure as a treatment option for tachycardic rhythms requiring conversion. The course presents indications, contraindications, technique, and complications for the carotid sinus massage procedure. The course includes lecture, simulated psychomotor demonstration and testing, and a summative written exam.

Prerequisites:

Certified I-99 and Paramedic under Medical Direction

Course Competencies:

This course is designed to develop the following course competencies:

1. Integrate knowledge of anatomy, physiology, and pathophysiology of the cardiovascular and nervous systems to the intervention of tachycardic rhythms requiring conversion. (I)
2. Identify the indications and contraindications for use of carotid sinus massage. (II)
3. Carotid sinus massage procedural review (III)
4. Recognize the desired response and potential complications associated with carotid sinus massage. (IV)
5. Demonstrate competency by written examination and simulated psychomotor demonstration. (V)

Lesson Outline:

1. Anatomy, Physiology, and Pathophysiology Review (I)
    a. Cardiovascular System
        i. Cardiac Anatomy, Physiology, Electrophysiology
            1. Cardiac anatomy and physiology
                a. Circulation of blood flow through the cardiovascular system.
                b. Frank-Starling Law
                c. Beta-1 stimulation resulting in positive chronotropic, inotropic, and dromotropic effects.
            2. Electrophysiology
                a. Electrical conduction system
                b. Depolarization, repolarization, and electrolyte roles
            3. ECG Identification of Supraventricular Tachycardia (SVT) and Paroxysmal Supraventricular Tachycardia (PSVT)
    b. Nervous System
        i. Nervous System Anatomy and Physiology
            1. Relevant cranial nerve anatomy, physiology, and location and cardiac response.
                a. Vagus Nerve (Cranial Nerve X)
                b. Glossopharyngeal Nerve (Cranial Nerve IX)
                c. Cardiac effects of glossopharyngeal nerve stimulation
2. Current Advanced Cardiovascular Life Support (ACLS) Guidelines (I)
    a. Review current ACLS guidelines related to the treatment and intervention of tachycardic rhythms with a pulse
3. Carotid Sinus Massage
    a. Indications (II)
        i. Conversion of Supraventricular Tachycardia (SVT) and Paroxysmal Supraventricular Tachycardia (PSVT) refractory to prior vagal stimulating attempts such as Valsalva Maneuver and coughing in patients less than 17 years of age
    b. Contraindications (II)
        i. Over 17 years of age
        ii. Patients with history of transient ischemic attack (TIA) or cerebrovascular accident (CVA)
    c. Procedure (III)
        i. Patient positioning
        ii. Landmark identification
        iii. Pressure application and duration
    d. Desired Responses and Complications (IV)
        i. Desired responses to heart rate or rhythm
            1. Conversion of Supraventricular Tachycardia (SVT) and Paroxysmal Supraventricular Tachycardia (PSVT)

ii. Complications
    1. Exaggerated cardiac response to carotid sinus massage (hypotension, bradycardia, asystole)
    2. Increased risk of stroke associated with atherosclerosis

e. Psychomotor Demonstration (V)
    i. Confirm through 4-lead and 12-lead of persistent tachycardia requiring conversion
    ii. Place patient in supine position with neck hyperextended
    iii. Demonstrate ability to identify landmark for carotid sinus massage located inferior to the angle of the mandible at the level of the thyroid cartilage
    iv. Apply pressure to single carotid sinus for at least 5 seconds, but no more than 10 seconds while monitoring for desired response
    v. If carotid sinus massage is ineffective, wait 2 minutes and attempt on the other side of the neck
    vi. If procedure is still ineffective, continue with ACLS treatment algorithm

f. Medical Director approved skills testing and written exam (V)
    i. See sample skill sheet (appendix A)

References: 2015 American Heart Association Emergency Cardiovascular Care Guidelines http://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf

Frisch, D.R., Zimetbaum, P.J.. (2016). Vagal Maneuvers.

Appendix A

Sample Skill Sheet for Carotid Sinus Massage

Action	Satisfactory	Unsatisfactory
1. Confirm through 4-lead and 12-lead of persistent tachycardia requiring conversion		
2. Place patient in supine position with neck hyperextended		
3. Identify appropriate landmark for procedure		
4. Applies pressure for at least 5 seconds but no more than 10 seconds		
5. Ensure effectiveness of intervention through noted heart rate and rhythm change. If not effective, waits 2 minutes and attempts carotid sinus massage on opposite side of the neck		
6. If still not effective, continue with appropriate ACLS algorithm		

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT, AEMT, I-99, and Paramedic

2/27/16

Mechanical CPR Device

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill. Upon successful completion of this training, an EMCT can only use this skill under "on-line" medical direction.

Course Description:

This course provides the EMCT an overview of mechanical CPR devices. This course presents the possible indications, contraindications, advantages, disadvantages, complications, and documentation recommendations for use of a mechanical CPR device. The course includes lecture, skills demonstration, skills practice, skills testing, and a summative written exam.

Prerequisites:
Certified EMT, AEMT, I-99, and Paramedic under Medical Direction

Course Competencies:

This course is designed to develop the following:

1. Integrate complex knowledge of the anatomy, physiology, and pathophysiology of the airway, respiratory, and cardiovascular systems to resuscitation of cardiac arrest patients. (I)
2. Identify the indications and contraindications for the use of mechanical CPR devices. (II)
3. Recognize the advantages, disadvantages, and complications for use of mechanical CPR devices. (III)
4. List the documentation requirements for use of mechanical CPR devices. (IV)
5. Demonstrate competent use of a mechanical CPR device through Medical Director-approved written and skills testing. (V)

Lesson Outline:

I. **Focused anatomy, physiology review (I)**
   a. Airway
      i. Relevant upper airway anatomy review
      ii. Relevant lower airway anatomy review
      iii. Relevant airway anatomy and physiology and management of cardiac arrest patients
   b. Respiratory system
      i. Respiratory anatomy and physiology
         1. Ventilation
         a. Assessment of ventilation
         b. Methods of artificial ventilation of cardiac arrest patients
         2. Respiration
            a. External respiration
            b. Internal respiration
            c. Importance of supporting cellular respiration in cardiac arrest patients
      ii. Relevant respiratory anatomy and physiology and management of cardiac arrest patients
   c. Cardiovascular system
      i. Cardiovascular anatomy and physiology
         1. Relevant cardiovascular anatomy and physiology and management of cardiac arrest patients
            a. Thoracic landmarks
            b. The heart
            c. The need for high-quality CPR

II. **Current CPR guidelines (I)**
   a. Review current CPR guidelines

III. **Mechanical CPR devices**
   a. Indications (manual CPR is standard of care; however, mechanical CPR devices may be useful when): (II)
      i. CPR will be provided for a prolonged period
      ii. Personnel resources are limited
      iii. Manual CPR compromises EMCT's safety
   b. Contraindications (II)
      i. Consult manufacturer's guidelines for specifics
      ii. General contraindications include:
         1. Pediatric patients
         2. Obese patients
         3. Pregnant patients
   c. Advantages (III)
      i. Maintains consistent rate and depth of chest compressions
      ii. May reduce EMCT fatigue during prolonged resuscitation
      iii. May be useful in situations where personnel resources are limited
      iv. May improve EMCT safety during transport of cardiac arrest patient

d. Complications and disadvantages (III)
    i. Possible delay in transport to initiate mechanical CPR
    ii. Possible prolonged interruption in chest compressions when initiating mechanical CPR
    iii. Mechanical CPR not suitable for some patients, e.g. pediatrics, obese patients, pregnant patients
    iv. Possible mechanical failure
    v. Oxygen-powered devices may pose risk of fire in environment where it is unsafe to use oxygen
e. Documentation (IV)
    i. Online medical direction approval
    ii. Application of mechanical CPR and assessment of effectiveness
    iii. Duration of use and any complications encountered
f. Skills practice (V)
    i. Consult manufacturer's guidelines for specifics
    ii. General application of mechanical CPR device
        1. Confirm cardiac arrest and begin or continue high-quality manual CPR
        2. Ensure safe environment for mechanical CPR device
        3. Prepare mechanical CPR device according to manufacturer's specifications
        4. Place mechanical CPR device according to manufacturer's specifications with minimum interruption in chest compressions
        5. Initiate mechanical CPR device and adjust as needed according to manufacturer's specifications
        6. Ensure effectiveness of mechanical compressions
        7. Demonstrate ability to pause mechanical CPR device during assessment of cardiac rhythm and defibrillation according to manufacturer's specifications
        8. If unable to confirm effectiveness of mechanical CPR, or in event of mechanical failure, remove device according to manufacturer's specifications and continue manual CPR as needed
        9. Demonstrate ability to safely lift and move patient with mechanical CPR device applied
        10. Demonstrate ability to change power supply according to manufacturer's specifications
        11. Demonstrate proper decontamination and storage procedure for mechanical device according to manufacturer's specifications
        12. Document use of mechanical CPR device
g. Medical Director approved skills testing and written exam (V)
    i. See sample skill sheet (appendix A)
    ii. See sample test questions (appendix B)

References:

- 2009 National Education Standard Curriculum
  http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf
- 2015 Emergency Cardiovascular Care Guidelines
  https://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf
- Mechanical CPR Devices Consensus on Science
  https://volunteer.heart.org/apps/pico/Pages/PublicComment.aspx?q=782

Appendix A:

Sample Skill Sheet for Mechanical CPR Device

Name: _____
Date: _____
Examiner: _____

Action*	Satisfactory	Unsatisfactory
1. Confirm cardiac arrest and begin high-quality manual CPR		
2. Ensure safe environment for device use and prepare device		
3. Properly place device with minimum interruption in chest compressions		
4. Initiate device and adjust as needed		
5. Ensure effectiveness of mechanical compressions		
6. Pause device during assessment of cardiac rhythm and defibrillation		
7. Safely lift and move patient with device applied		
8. Change power supply as needed		
9. Quickly remove device and resume manual CPR in event of mechanical failure		
10. Document use of device		

*All actions should be performed according to device manufacturer's specifications and local protocols.

Appendix B:

Sample Test Questions for Mechanical CPR Device

1. Mechanical CPR devices:

A. should be immediately applied to all cardiac arrest patients
B. are indicated for all age groups
C. should be considered during prolonged resuscitation situations
D. are safe for use on pregnant patients over 36 weeks gestation

2. Which of the following is required for use of a mechanical CPR device?

A. Medical direction approval
B. The presence of at least one ALS provider
C. Witnessed onset of sudden cardiac arrest
D. An external electrical power source

3. Which of the following should always be performed prior to use of a mechanical CPR device?

A. Defibrillation
B. Insertion of an advanced airway
C. Spinal immobilization
D. High-quality manual CPR

4. Which of the following is a contraindication for use of a mechanical CPR device?

A. Pediatric patients
B. Adult patients over 50 years of age
C. Unwitnessed cardiac arrest patients
D. Use of the device during transport

5. Current CPR guidelines emphasize the importance of:

A. The delivery of high-quality compressions
B. Use of advanced airway devices on all cardiac arrest patients
C. Early termination of resuscitation
D. Use of mechanical CPR devices on all cardiac arrest patients

6. Mechanical CPR devices offer the following advantage:

A. They require no prior training in order to use effectively
B. All manufacturers adhere to the same guidelines
C. A clear scientific superiority over manual CPR
D. Greater EMCT safety during transport

7. Which of the following is a disadvantage of using a mechanical CPR device?

A. Inconsistent rate and depth of compressions
B. Possible prolonged delay in compressions during device set-up
C. The device cannot be used during transport
D. The device cannot be used around oxygen

8. After using a mechanical CPR device, you should document:

A. The brand name of the device used
B. The date you were trained on use of the device
C. Any complications encountered during device use
D. Your suggestions for improving the device

9. After initiating mechanical CPR, you should:

A. immediately transport the patient
B. Turn off all oxygen sources
C. Intermittently resume manual compressions
D. Ensure the device is positioned and working properly

10. While using a mechanical CPR device, there is a mechanical failure of the device. You should immediately:

A. resume manual CPR
B. contact medical direction
C. document the failure
D. determine the cause of the failure

Answers for Sample Test Questions and Related Learning Objective:

1. C (II)
2. A (II)
3. D (V)
4. A (II)
5. A (I)
6. D (III)
7. B (III)
8. C (IV)
9. D (V)
10. A (V)

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT **03/08/16**

EMT Medication Administration Routes –

Auto-Injector – Buccal – Intranasal – Small Volume Nebulizer

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under medical direction.

Course Description:
This course provides the EMT an overview of medication administration routes – Auto injector, buccal, Intranasal and small volume nebulizer. This course presents the possible indications, contraindications, advantages, disadvantages, complications, and documentation recommendations for medication administration. The course includes lecture, skills demonstration, skills practice, skills testing, and a summative written exam.

Prerequisites:
Certified EMT under Medical Direction

Course Competencies:
This course is designed to develop the following course competencies:

1. Integrate knowledge of the anatomy, physiology, and pathophysiology of the body systems to the administration of medications
2. Recognize the advantages, disadvantages, and complications of administering medications to a patient via the different routes.
3. Identify the indications and contraindications for the delivery of medications.
4. Identify Standard Precautions used during medication administration
5. List the documentation requirements for medication administration
6. Demonstrate competent administration of medications via the inhalation, buccal, intranasal and intramuscular routes through Medical Director-approved written and skills testing.

Lesson Outline:

I. **Focused anatomy, physiology review**
   a. Respiratory System
      i. Relevant upper airway anatomy review
      ii. Relevant lower airway anatomy review
      iii. Relevant airway anatomy and physiology and administration of medications
   b. Cardiovascular system
      i. Cardiovascular anatomy and physiology
      ii. Relevant cardiovascular anatomy and physiology and administration of medications
   c. Digestive system
      i. Digestive anatomy and physiology
      ii. Relevant digestive system anatomy and physiology and administration of medications

II. **Routes of medication administration, absorption rates and complications of delivery**
   a. Inhalation
   b. Buccal
   c. Intranasal
   d. Intramuscular

III. **Indications and contraindications for the delivery of medications**
   a. Inhalation route
   b. Buccal route
   c. Intranasal route
   d. Intramuscular route

IV. **Standard Precautions used during medication administration**
   a. Gloves
   b. Eye Protection
   c. Mask
   d. Sharps container
   e. Others as needed

V. **Delivery of medications via:**
   a. Inhalation route
   b. Buccal route
   c. Intranasal route
   d. Intramuscular route

VI. **Documentation requirements for medication administration**
   a. Name/certification number of provider administering medication
   b. Name of drug administered
   c. Dose
   d. Route
   e. Time administered
   f. Patient response to medication

VII. **Skills Practice**

a. Inhalation – SVN
b. Buccal – Gel
c. Intranasal - MAD
d. Intramuscular – Auto-injector

VIII. **Medical Director approved skills testing and written exam**

a. See sample skills sheets (appendix A
b. See sample test questions (appendix B)

References:

- 2009 National Education Standard Curriculum http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf
- Pharmacology Applications – American Academy of Orthopedic Surgeons

Appendix A:

Administering Medications by Small Volume Nebulizer

Name: _____

Date: _____

Examiner: _____

OVERVIEW	Possible Points	Points Awarded
Takes or verbalizes standard precautions	1	
Obtains order from medical direction either on-line or off-line	1	
Obtains baseline vital signs and lung sounds	1	
Assures right patient, right medication, right dose, right route, right time	5	
Checks expiration date of medication	1	
Insert medication into the container on the nebulizer	1	
Attaches medication container to the nebulizer, mouthpiece and tubing	1	
Attach O2 tubing to regulator and set to 6 LPM	1	
Instructs patient to breathe through SVN	1	
Reassesses breathing status and vital signs	1	
Records activity, time and patient response	1	
Verbalizes continued reassessment and monitoring of the patient during transport	1	
TOTAL	16	

CRITICAL CRITERIA

__ Did not take or verbalize standard precautions
__ Did not contact medical direction or verbalize standing order prior to administration of medication
__ Did not obtain baseline vital signs & lung sounds before administering medication
__ Did not verify 5 rights
__ Did not check medication expiration date
__ Unsafely administered medication
__ Did not reassess vital signs and patient status after medication administration

Appendix A:

Buccal Medication Administration

Name: _____
Date: _____
Examiner: _____

OVERVIEW	Possible Points	Points Awarded
Takes or verbalizes standard precautions	1	
Obtains order from medical direction either on-line or off-line	1	
Obtains baseline vital signs	1	
Assures right patient, right medication, right dose, right route, right time	5	
Checks expiration date of medication	1	
Places medication between patients cheek and gum, or asks patient to do so	1	
Advises the patient not to chew or swallow the medication, but let it dissolve slowly	1	
Records activity, time and patient response	1	
Verbalizes continued reassessment and monitoring of the patient during transport	1	
TOTAL	13	

CRITICAL CRITERIA

__ Did not take or verbalize standard precautions
__ Did not contact medical direction or verbalize standing order prior to administration of medication
__ Did not obtain baseline vital signs before administering medication
__ Did not verify 5 rights
__ Did not check medication expiration date
__ Unsafely administered medication
__ Did not reassess vital signs and patient status after medication administration

Appendix A:

Intranasal Medication Administration

Name: _____
Date: _____
Examiner: _____

OVERVIEW	Possible Points	Points Awarded
Takes or verbalizes standard precautions	1	
Obtains order from medical direction either on-line or off-line	1	
Obtains baseline vital signs	1	
Assures right patient, right medication, right dose, right route, right time	5	
Checks expiration date of medication	1	
Draws up appropriate dose of medication in syringe	1	
Attaches mucosal atomizer device (MAD) to syringe	1	
Explains procedure to patient, and need for medication	1	
Sprays half the medication dose into each nostril	1	
Disposes of the atomizer device and syringe in appropriate container	1	
Records activity, time and patient response	1	
Verbalizes continued reassessment and monitoring of the patient during transport	1	
TOTAL	16	

CRITICAL CRITERIA

__ Did not take or verbalize standard precautions
__ Did not contact medical direction or verbalize standing order prior to administration of medication
__ Did not obtain baseline vital signs before administering medication
__ Did not verify 5 rights
__ Did not check medication expiration date
__ Unsafely administered medication
__ Did not reassess vital signs and patient status after medication administration

Appendix A:

Administering Medications by Auto-injector

Name: _____
Date: _____
Examiner: _____

OVERVIEW	Possible Points	Points Awarded
Takes or verbalizes standard precautions	1	
Obtains order from medical direction either on-line or off-line	1	
Assures right patient, right medication, right dose, right route, right time	5	
Checks expiration date of medication	1	
Removes safety cap from auto-injector	1	
Selects appropriate injection site (thigh or shoulder)	1	
Pushes injector firmly against site until injector activates	1	
Holds injector firmly against site until medication is injected	1	
Properly discards auto-injector in biohazard container	1	
Records activity, time and patient response	1	
Verbalizes continued reassessment and monitoring of the patient during transport	1	
TOTAL	15	

CRITICAL CRITERIA

__ Did not take or verbalize standard precautions
__ Did not contact medical direction or verbalize standing order prior to administration of medication
__ Did not verify 5 rights
__ Did not check medication expiration date
__ Unsafely administered medication
__ Did not discard auto-injector in biohazard container
__ Did not reassess vital signs and patient status after medication administration

Appendix B:

Sample Test Questions for EMT Medication Administration

1. **A drug that is contraindicated for a particular patient:**
    a. Will likely result in immediate death.
    b. Is usually given at half its usual dose.
    c. Should be given with extreme caution.
    d. Should not be administered to the patient.
2. **Medication routes, from slowest to fastest rates of absorption, are:**
    a. Buccal, intramuscular, inhalation, intravenous.
    b. Intramuscular, buccal, intravenous, inhalation.
    c. Intravenous, inhalation, buccal, intramuscular.
    d. Buccal, inhalation, intramuscular, intravenous.
3. **Which of the following is NOT always considered a mandatory action AFTER administering a medication?**
    a. Contacting on-line medical control.
    b. Monitoring the patient's condition.
    c. Immediately disposing of any sharps.
    d. Documenting the time of administration.
4. **Which of the following statements regarding sharps containers is correct?**
    a. Sharps containers should be International Orange and have a screw on lid.
    b. A small sharps container is ideal for carrying in your cargo pants or pocket.
    c. Needles should be placed in a sharps container after patient care is complete.
    d. Sharps containers should be puncture-proof and should bear a biohazard logo.
5. **When administering a medication via the auto-injector, you should:**
    a. Pinch the skin over the upper arm and insert the needle at a 45° angle.
    b. Insert the needle at a 90° angle over the lateral thigh.
    c. Insert the needle at a 90° angle into the abdominal muscle.
    d. Pinch the skin in on the medial thigh and insert the needle at a 45° angle.
6. **Which of the following statements regarding the mucosal atomizer device (MAD) is correct?**
    a. Midazolam (versed) is the only emergency medication that can be administered by EMTs intranasally with the MAD.
    b. The MAD is used to inject a straight stream of select emergency drugs directly into the nasal canal.
    c. When administering a drug with the MAD, you should spray half of the dose into each nostril.
    d. Drugs administered with the MAD have an onset of action that is slightly slower than the intramuscular route.
7. **The MOST common inhaled medication is:**
    a. Alupent.
    b. Oxygen.
    c. Ventolin.
    d. Bronkosol.

8. **When administering a medication via small-volume nebulizer, you should set the oxygen flow rate at ___ L/min.**
    a. 3
    b. 4
    c. 6
    d. 10
9. **IMMEDIATELY after administering intramuscular injection via the auto-injector, you should:**
    a. Dispose of the auto-injector in a sharps container.
    b. Monitor the patient and obtain another set of vital signs.
    c. Reassess the patient for signs of clinical improvement.
    d. Document the medication name and time of administration.
10. **When administering medication to a patient via the buccal route, you should:**
    a. Have the patient swallow the medication.
    b. Place the medication between the cheek and gum (or have pt. do so) and allow medication to dissolve.
    c. Mix medication with water and have patient drink it.
    d. Shake container vigorously to mix medication.

Answers for Sample Test Questions

1. d
2. c
3. a
4. d
5. b
6. c
7. b
8. c
9. a
10. b

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for I-99

Intradermal Injection

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an I-99 to perform a STR [Special Training Required] skill, the Medical Director shall ensure that the EMCT has completed training specific to the skill consistent with the knowledge and competencies established according to A.R.S. 36-2204. Periodically thereafter the Medical Director shall reassess an EMCT's competency in the STR [Special Training Required] skill according to policies and procedures required in R9-25-201 (C) (3) (b) (viii).

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Course Description

This course provides an I-99 the ability to integrate the complex knowledge of the indications, contraindications, and complications of performing an intradermal injection.

Prerequisites

Certified Paramedic under Medical Direction

Course Competencies

The student shall:

1. Integrate the complex knowledge of anatomy and physiology to intradermal injection. (I)
2. Discuss the purpose for performing an intradermal injection. (II)
3. List the indications and contraindications of performing an intradermal injection. (III, IV)
4. List the equipment used to perform an intradermal injection. (V)
5. List the pharmacologic agents authorized for the Paramedic to administer by an intradermal injection. (VI)
6. Perform an intradermal injection. (VII)
7. List the complications of performing an intradermal injection. (VIII)
8. Identify benchmarks for documenting an intradermal injection. (IX)
9. Demonstrate minimum score accuracy on cognitive and psychomotor examinations. (X)

Lesson Outline

I. Anatomy and physiology of the umbilical cord
   a. Anatomy of the dermis
   b. Physiology of the dermis

II. Purpose
   a. Vaccinations by intradermal injection have improved immune response
   b. Potential reduction of the antigen dose
   c. Decreased pain and anxiety

III. Indications
   a. Route for administering vaccinations
   b. Route for skin testing

IV. Contraindications
   a. Known hypersensitivity to the pharmacologic agent selected for administration
   b. Excessive hair at the injection site
   c. Disfigured skin at the site

V. Equipment list
   a. Body substance isolation/personal protective equipment
   b. Sharps container
      Tuberculin syringe or small syringe (1 mL or smaller) with a 3/8 to 5/8 inch, 25 to 27 gauge needle
   c. Alcohol prep
   d. Pharmacologic agent
   e. IV catheters: 20 g., 22 g. (umbilical vascular catheters)
   f. Tape or commercially-available IV securing device
   g. 4" X 4" gauze pads
   h. Scalpel
   i. Antiseptic cleansing preps (povidone-iodine, betadine, alcohol)
   j. Other equipment required by Medical Direction and local protocol

VI. Pharmacologic agents authorized for the Paramedic to administer by intradermal injection
   a. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502* Table 5.4 Agents authorized for the Paramedic to administer by intradermal injection listed in the *Arizona Drug Profiles* and/or other information approved by the Medical Director

VII. Procedure (Appendix A)
   a. Ensure body substance isolation
   b. Assemble, check, and prepare equipment
   c. Select the injection site
   d. Swipe the site with an alcohol prep
   e. Pull the patient's skin so that it is taut
      Insert the needle at a 5 to 15-degree angle almost parallel the patient's skin with the bevel facing up
   f. Insert the needle 1/8-inch
      Administer the medication slowly while observing the site for blanching and the appearance of a wheal

g. After administering all of the medication, withdraw the needle slowly
h. Place the syringe and needle device into a sharps container
i. Do not massage the injection site

VIII. Complications
a. Bleeding at the injection site
b. Blanching at the injection site
c. If no wheal forms, the injection was not performed correctly

IX. Documentation
a. Benchmarks for documenting an intradermal injection

X. Cognitive and psychomotor examinations

References

- 2009 National EMS Education Standards – Paramedic (NHTSA, 2009)
- McDonald, Jeff, ALS Skills Review (AAOS, 2009)
- Campbell, Sue & Melissa Robinson, Paramedic Lab Manual (Brady, 2005)
- Caroline, Nancy, Emergency Care in the Streets, 7th Edition (AAOS, 2013)

Appendix A
Intradermal Injection

Procedure	Satisfactory	Unsatisfactory
1. Ensures body substance isolation		
2. Assembles, checks, and prepares equipment		
3. Selects the injection site		
4. Swipes the site with an alcohol prep		
5. Pulls the patient's skin so that it is taut		
6. Inserts the needle at a 5 to 15-degree angle almost parallel to the patient's skin with the bevel facing up		
7. Inserts the needle 1/8-inch		
8. Administers the medication slowly while observes the site for blanching and the appearance of a wheal		
9. After administering all of the medication, withdraws the needle slowly		
10. Places the syringe and needle device into a sharps container		

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for AEMT

Intraosseous Venous Initiation

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMT can only use this skill under "on-line" medical direction.

Intraosseous (IO) access is an effective route for fluid resuscitation, drug delivery and laboratory evaluation that may be attained in all age groups and has an acceptable safety profile.

Course Description:
Includes review of the anatomy of the circulatory system, system focused anatomy, physiology, and pathophysiology. Skills will include peripheral intravenous cannulation techniques via IO access, fluid resuscitation, obtaining venous blood samples for laboratory analysis; infection control for the safety of self and victim; complications of intravenous cannulation.

Prerequisites:
Certified AEMT, under Medical Direction

Course Competencies:
This course is designed to develop the following course competencies:

1. Identify and describe the vascular anatomy and venous access for the neonate, infant, pediatric and adult patients (I)
2. Identify the need for fluid resuscitation in neonate, infant, pediatric and adult patients (II)
3. Identify and differentiate isotonic, hypotonic and hypertonic solutions (III)
4. Select fluids; set up and manage equipment (IV)
5. Identify and demonstrate aseptic and safety techniques (V)
6. Identify and describe indications and contraindications for intravenous site selection (VI)
7. Perform all peripheral intravenous cannulation techniques (VII)
8. Perform blood drawing techniques (VIII)
9. Monitor infusion (IX)
10. Demonstrate 100% accuracy in intravenous techniques in selected scenarios (X)
11. Demonstrate 85% proficiency on a written examination (XI)

Focused Anatomy and Physiology

1. **Basic Cell Physiology**
    a. Cell Membrane
    b. Fluids (Electrolytes)
        i. Hypertonic
        ii. Hypotonic
        iii. Isotonic
    c. Movement of fluids
        i. Diffusion
        ii. Filtration
        iii. Active Transport
        iv. Osmosis
2. **Fluid Compartments**
    a. Extracellular
        i. Intravascular
        ii. Interstitial
    b. Intracellular
3. **Fluid Balance**
    a. Homeostasis
    b. Dehydration
    c. Overhydration
4. **Acid/Base Balance**
    a. VERY BRIEF!
5. **Causes of Shock**
    a. Recognition of Shock
    b. Stages of Shock
        i. Compensated
        ii. Uncompensated
        iii. Irreversible
    c. Types of Shock
        i. Hypovolemic
            1. Hemorrhagic
            2. Neurogenic
            3. Septic
            4. Anaphylactic
            5. Obstructive
            6. Cardiogenic
    d. Treatment of Shock
    e. ALOC
        i. AEIOUTIPS
6. **Intraosseous/Intravenous Techniques and Administration**
    a. Indications for Vascular Access
        i. Restore fluid volume
        ii. Restore and maintain electrolyte balance
        iii. Administration of medications
        iv. Obtaining blood specimen
        v. Note:
            a. IO access is the recommended technique for circulatory access in cardiac arrest.

b. In decompensated shock IO access should be established if vascular access is not rapidly achieved (if other attempts at venous access fail, or if they will take longer than ninety seconds to carry out.)
c. Contraindications for IO access:
    i. Proximal ipsilateral fracture
    ii. Ipsilateral vascular injury
    iii. Osteogenesis imperfecta

7. Complications of IO access:

a. Failure to enter the bone marrow, with extravasation or subperiosteal infusion
b. Through and through penetration of the bone
c. Osteomyelitis (rare in short term use)
d. Physeal plate injury
e. Local infection, skin necrosis, pain, compartment syndrome, fat and bone microemboli have all been reported but are rare

8. Intravenous Solutions

a. Isotonic
b. Hypotonic
c. Hypertonic
d. Indications for each

9. Needle/Catheters and Intravenous Administration Sets

a. Types
b. Sizes

10. Administration sets

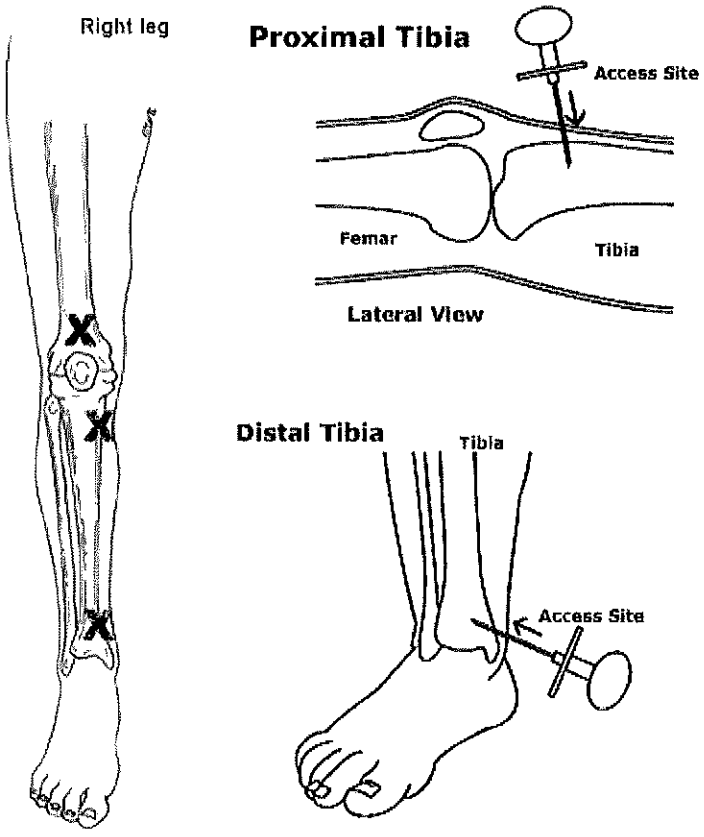
a. pediatric
b. blood pump
c. 3-way
d. pressure infuser

11. Set-up

a. Asepsis and Safety
    i. Site preparation
    ii. Universal precautions
    iii. "Sharp" disposal

12. Site selection/Procedure

a. Identify the appropriate site
   i. Proximal tibia: Anteromedial surface, 2-3 cm below the tibial tuberosity
   ii. Distal tibia: Proximal to the medial malleolus
   iii. Distal femur: Midline, 2-3 cm above the external condyle



b. Prepare the skin
c. Insert the needle through the skin, and then with a screwing motion perpendicularly / slightly away from the physeal plate into the bone. There is a give as the marrow cavity is entered
d. Remove the trocar and confirm position by aspirating bone marrow through a 5 ml syringe.
e. Marrow cannot always be aspirated but it should flush easily.
f. Secure the needle and start the infusion (this needs to be manually administered) as boluses with the 20 ml syringe.

13. EZ-IO® Proximal Tibia Insertion Technique - Adult

a. Prepare the site by using antiseptic of your choice
b. Use a clean, "no touch" technique
c. Remove the needle set cap
d. Stabilize the extremity
e. Aim the needle set at a 90-degree angle to center of the bone
f. Push the needle set tip through the skin until the tip rests against the bone
g. The 5mm mark must be visible above the skin for confirmation of adequate needle set length
h. Gently drill, advancing the needle set approximately 1-2cm after entry into the medullary space or until the needle set hub is close to the skin

i. Hold the hub in place and pull the driver straight off
j. Continue to hold the hub while twisting the stylet off the hub with counter clockwise rotations
    i. The catheter should feel firmly seated in the bone (1st confirmation of placement)
k. Place the stylet in a sharps container
l. Place the EZ-Stabilizer dressing over the hub
m. Attach a primed EZ-Connect® extension set to the hub, firmly secure by twisting clockwise
n. Pull the tabs off the EZ-Stabilizer dressing to expose the adhesive, apply to the skin
o. Aspirate for blood/bone marrow (2nd confirmation of placement)

14. Peripheral Intravenous Cannulation

a. Drawing Blood
    i. Indication
    ii. Site preparation
    iii. Universal precautions
    iv. "Sharp" disposal
    v. Identification of specimen(s)
    vi. Documentation

15. Monitoring the Intravenous Infusion

a. Signs and symptoms of infiltration and extravasation

16. Techniques for removal

17. Documentation

18. Practical's

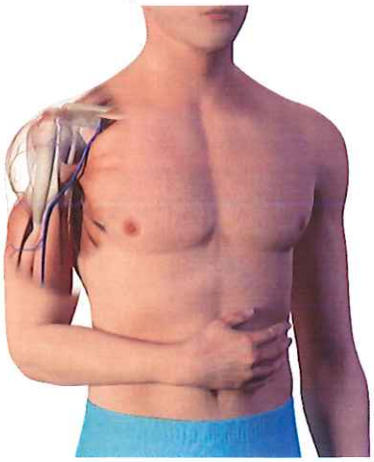
a. Mannequin
b. Human subjects

19. Final Written Examinations

EZ-IO® Proximal Humerus Identification & Insertion Technique - Adult

Identify the proximal humerus:

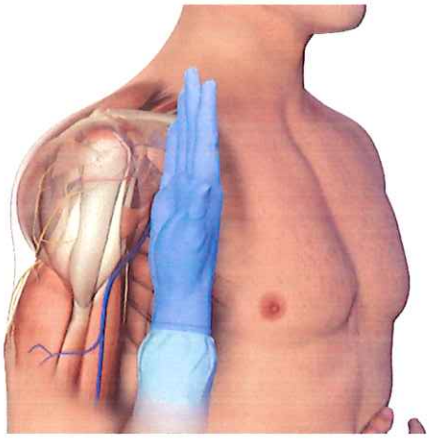
Place the patient's hand over the abdomen (elbow adducted and humerus internally rotated)



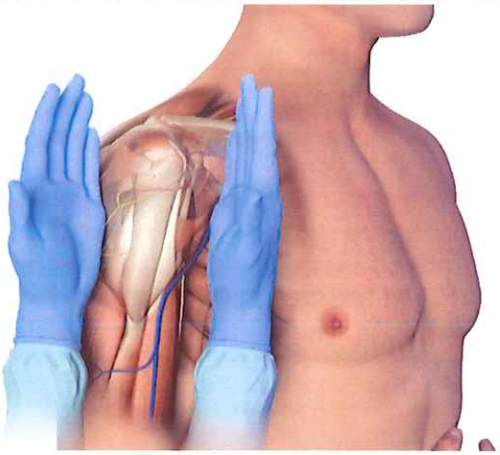
Place your palm on the patient's shoulder anteriorly

- The area that feels like a "ball" under your palm is the general target area
- You should be able to feel this ball, even on obese patients, by pushing deeply

Place the ulnar aspect of one hand vertically over the axilla

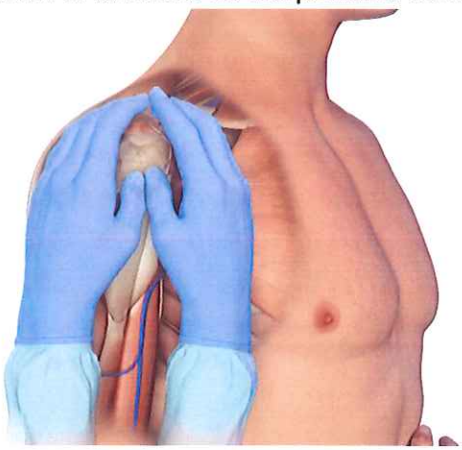


Place the ulnar aspect of the opposite hand along the midline of the upper arm laterally.



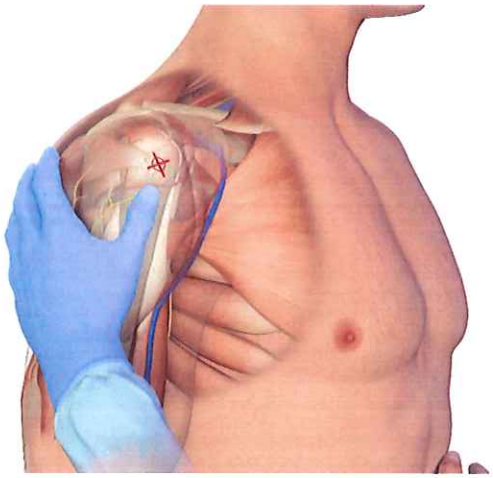
Place your thumbs together over the arm.

- This identifies the vertical line of insertion on the proximal humerus

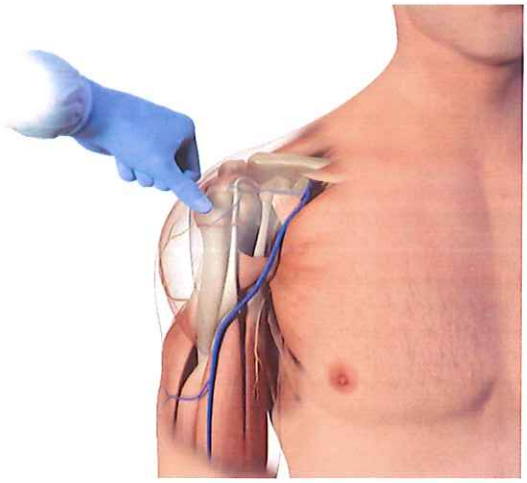


Palpate deeply as you climb up the humerus to the surgical neck.

- It will feel like a golf ball on a tee – the spot where the "ball" meets the "tee" is the surgical neck

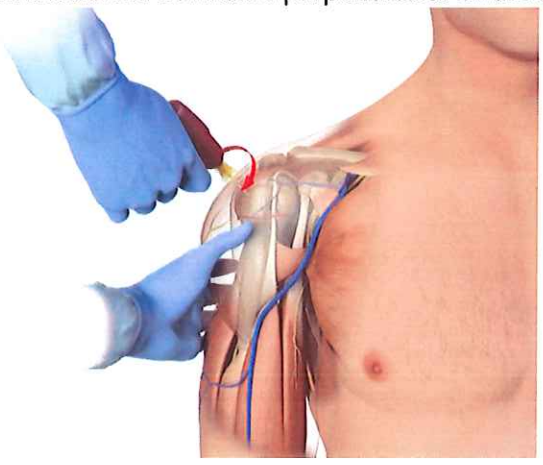


- The insertion site is on the most prominent aspect of the greater tubercle, 1 to 2 cm above the surgical neck

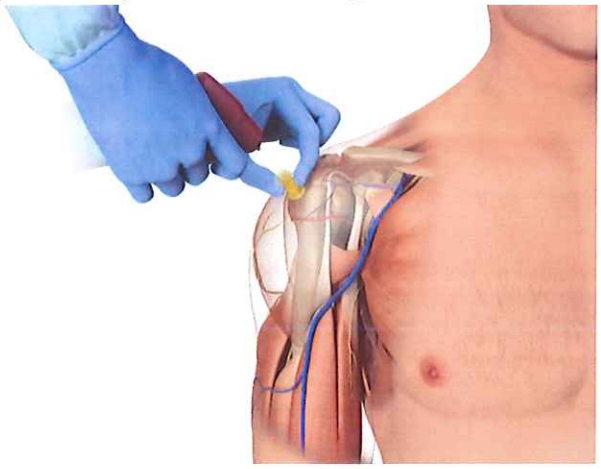


Insertion:

- Prepare the site by using antiseptic solution of your choice
- Use a clean, "no touch" technique
- Remove the needle cap
- Point the needle set tip at a 45-degree angle to the anterior plane and posteromedial
- Push the needle tip through the skin until the tip rests against the bone
- The 5mm mark must be visible above the skin for confirmation of adequate needle length
- Gently drill into the humerus 2cm or until the hub reaches the skin in an adult.
    - The hub of the needle set should be perpendicular to the skin



- Hold the hub in place and pull the driver straight off



- Continue to hold the hub while twisting the stylet off the hub with counter clockwise rotations
    - The needle should feel firmly seated in the bone (1st confirmation of placement)
- Place the stylet in a sharps container
- Place the EZ-Stabilizer™ dressing over the hub
- Attach a primed EZ-Connect® extension set to the hub, firmly secure by twisting clockwise
- Pull the tabs off the EZ-Stabilizer dressing to expose the adhesive, apply to the skin
- Aspirate for blood/bone marrow (2nd confirmation of placement)
- Secure the arm in place across the abdomen

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for AEMT

Rectal Medication Administration

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an AEMT can only use this skill under "on-line" medical direction.

UNIT TERMINAL OBJECTIVE

At the completion of this unit, the AEMT student will be able to safely and precisely access the venous circulation and administer medications.

COGNITIVE OBJECTIVES

At the completion of this unit, the AEMT student will be able to:

1. Review the specific anatomy and physiology pertinent to medication administration.
2. Review mathematical principles.
3. Review mathematical equivalents.
4. Differentiate temperature readings between the Centigrade and Fahrenheit scales.
5. Discuss formulas as a basis for performing drug calculations.
6. Discuss legal aspects affecting medication administration.
7. Discuss the "six rights" of drug administration and correlate these with the principles of medication administration.
8. Discuss medical asepsis and the differences between clean and sterile techniques.
9. Describe use of antiseptics and disinfectants
10. Describe the use of universal precautions and body substance isolation (BSI) procedures when administering a medication.
11. Describe the indications, equipment needed, techniques utilized, precautions, and general principles of rectal medication administration
12. Describe disposal of contaminated items and sharps
13. Synthesize a pharmacologic management plan including medication administration.
14. Integrate pathophysiological principles of medication administration with patient management.

AFFECTIVE OBJECTIVES

At the completion of this unit, the AEMT student will be able to:

1. Comply with AEMT standards of medication administration.
2. Comply with universal precautions and body substance isolation (BSI).
3. Defend a pharmacologic management plan for medication administration.
4. Serve as a model for medical asepsis.
5. Serve as a model for advocacy while performing medication administration.

PSYCHOMOTOR OBJECTIVES

At the completion of this unit, the AEMT student will be able to:

1. Use universal precautions and body substance isolation (BSI) procedures during medication administration.
2. Demonstrate clean technique during medication administration.
3. Demonstrate rectal administration of medications
4. Perfect disposal of contaminated items and sharps.

Lesson Plan

1. **Review of mathematical principles**
    a. Multiplication and division
    b. Roman numerals
    c. Fractions
    d. Decimal fractions
    e. Proportions
    f. Percent
2. **Mathematical equivalents used in pharmacology**
    a. The metric system
    b. Fahrenheit scale for temperature reading
    c. Celsius (centigrade) scale for temperature reading
    d. Converting between Fahrenheit and Celsius temperatures
3. **Calculating drug dosages**
    a. Calculation methods
        i. Fraction method
        ii. Ratio method
        iii. Desired dose over available concentration method
    b. Calculating dosages
        i. Calculating dosages for infants and children
            1. Body weight
            2. Use of tables, charts, and other adjuncts
            3. Length-based resuscitation tapes
4. **Medical direction**
    a. Medication administration is bound by the AEMT's on-line or off-line medical direction
    b. Role of the medical director
    c. Patient management protocols
        i. Written standing orders

ii. Legal considerations - policies and procedures which specify regulations of medication administration

5. **Principles of medication administration**
    a. Local drug distribution system - policies which establish stocking and supply of drugs
    b. AEMT's responsibility associated with the drug order
        i. Verification of the drug order
    c. The "six rights" of medication administration
        i. "Right" patient
        ii. "Right" drug
        iii. "Right" dose
        iv. "Right" route
        v. "Right" time
        vi. "Right" documentation
6. **Medical asepsis**
    a. Clean technique versus sterile technique
    b. Sterilization
    c. Antiseptics
    d. Disinfectants
7. **Universal precautions and body substance isolation (BSI) in medication administration**
8. **Rectal administration of medications**
    a. Indications for rectal administration of medications
    b. Required equipment
    c. Techniques utilized
    d. Precautions
    e. General principles for rectal administration of medications
9. **Disposal of contaminated items and sharps**
    a. Follow local protocol for disposal of contaminated items and sharps

General Guidelines for Rectal Medications

1. When giving a rectal suppository there are some basic things to remember:
2. Provide privacy for the individual.
3. Think about how you would like to be assisted if you needed a suppository.
4. Be sensitive to the individual's sense of modesty.
5. Be careful to fully explain what you are doing.
6. Wear gloves.
7. Unwrap the suppository.
    a. Most suppositories are wrapped in a foil or plastic wrap: you must unwrap the suppository before you insert it into the rectum.
8. Lubricate the suppository with K-Y Jelly or another water-based lubricant (not Vaseline).
9. Assist the person to lie on their side.
10. Gently lift up the top cheek of the buttocks and locate the rectum.
11. Gently insert the suppository into the rectum and push it in gently but as far as you can (the length of your index finger).
12. Tuck the suppository up against the rectal wall.
13. Ask the individual to hold the suppository in for as long as possible.

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT

Intravenous Initiation – Peripheral

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR [Special Training Required] skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR [Special Training Required] skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill. Upon successful completion of this training, an EMT can only use this skill under "on-line" medical direction.

Course Description:
Includes review of the anatomy of the circulatory system, system focused anatomy, physiology, and pathophysiology. Skills will include peripheral intravenous cannulation techniques, fluid resuscitation, obtaining venous blood samples for laboratory analysis; infection control for the safety of self and victim; complications of intravenous cannulation.

Prerequisites:
Certified EMT, under Medical Direction

Course Competencies:
This course is designed to develop the following course competencies:
1. Identify and describe the vascular anatomy and venous access for the neonate, infant, pediatric and adult patients (I)
2. Identify the need for fluid resuscitation in neonate, infant, pediatric and adult patients (II)
3. Identify and differentiate isotonic, hypotonic and hypertonic solutions (III)
4. Select fluids; set up and manage equipment (IV)
5. Identify and demonstrate aseptic and safety techniques (V)
6. Identify and describe indications and contraindications for intravenous site selection (VI)
7. Perform all peripheral intravenous cannulation techniques (VII)
8. Perform blood drawing techniques (VIII)
9. Monitor infusion (IX)
10. Demonstrate 100% accuracy in intravenous techniques in selected scenarios (X)
11. Demonstrate 85% proficiency on a written examination (XI)

Focused Anatomy and Physiology

1. Basic Cell Physiology
    a. Cell Membrane
    b. Fluids (Electrolytes)
        i. Hypertonic
        ii. Hypotonic
        iii. Isotonic
    c. Movement of fluids
        i. Diffusion
        ii. Filtration
        iii. Active Transport
        iv. Osmosis
2. Fluid Compartments
    a. Extracellular
        i. Intravascular
        ii. Interstitial
    b. Intracellular
3. Fluid Balance
    a. Homeostasis
    b. Dehydration
    c. Overhydration
4. Acid/Base Balance
    a. VERY BRIEF!
5. Causes of Shock
    a. Recognition of Shock
    b. Stages of Shock
        i. Compensated
        ii. Uncompensated
        iii. Irreversible
    c. Types of Shock
        i. Hypovolemic
            1. Hemorrhagic
            2. Neurogenic
            3. Septic
            4. Anaphylactic
            5. Obstructive
            6. Cardiogenic
    d. Treatment of Shock
    e. ALOC
        i. AEIOUTIPS
6. Intravenous Techniques and Administration
    a. Indications for Vascular Access
        i. Restore fluid volume
        ii. Restore and maintain electrolyte balance
        iii. Administration of medications
        iv. Obtaining blood specimen
7. Identification of common vascular sites

8. Intravenous Solutions
    a. Isotonic
    b. Hypotonic
    c. Hypertonic
    d. Indications for each
9. Needle/Catheters and Intravenous Administration Sets
    a. Types
    b. Sizes
10. Administration sets
    a. pediatric
    b. blood pump
    c. 3-way
    d. pressure infuser
11. Set-up
    a. Asepsis and Safety
        i. Site preparation
        ii. Universal precautions
        iii. "Sharp" disposal
12. Site selection
13. Peripheral Intravenous Cannulation
    a. Drawing Blood
        i. Indication
        ii. Site preparation
        iii. Universal precautions
        iv. "Sharp" disposal
        v. Identification of specimen(s)
        vi. Documentation
14. Monitoring the Intravenous Infusion
    a. Signs and symptoms of infiltration and extravasation
15. Techniques for removal
16. Documentation
17. Practical's
    a. Mannequin
    b. Human subjects
18. Final Written Examinations

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for Paramedic

Umbilical Vein Catheterization

This training is authorized by the EMCT agency Medical Director using the 2009 National EMS Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing a Paramedic to perform a STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under "on-line" Medical Direction.

Course Description:
This course provides the Paramedic an overview of the anatomy and physiology of the umbilical cord prior to and after birth with the indications, contraindications, procedure, and complications associated with umbilical vein catheterization.

Prerequisites:
Certified Paramedic under Medical Direction

Course Competencies
The student shall:

1. Integrate the complex knowledge of the anatomy and physiology to umbilical vein catheterization. (I)
2. Discuss the rationale for umbilical vein catheterization. (II)
3. List the indications and contraindications of umbilical vein catheterization. (III, IV)
4. List the equipment used to perform umbilical vein catheterization. (V)
5. Perform umbilical vein catheterization. (VI)
6. List the complications of umbilical vein catheterization. (VII)
7. Identify benchmarks for documenting umbilical vein catheterization. (VIII)
8. Compare the advantages of intraosseous access with umbilical vein catheterization. (IX)
9. Demonstrate minimum score accuracy on cognitive and psychomotor examinations. (X)

Lesson Outline

I. **Anatomy and physiology of the umbilical cord**
   a. Anatomy including the umbilical vein and arteries
   b. Physiology of the umbilical cord prior to and after birth

II. **Rationale**
   a. The umbilical vein remains patent and viable after birth
   b. The umbilical vein can be catheterized

III. **Indications**
   a. To obtain vascular access during and following neonatal resuscitation
   b. To infuse fluids during and following neonatal resuscitation
   c. To administer medications during and following neonatal resuscitation

IV. **Contraindications**
   a. Birth defects of the umbilical cord such as omphalocele
   b. Poor visualization of, or access to the umbilical vein

V. **Equipment list (see Appendix A)**
   a. Body substance isolation/personal protective equipment
   b. Sharps container
   c. IV solution
   d. IV administration set
   e. Umbilical cord clamp and sterile tie
   f. IV catheters: 20 g., 22 g. (umbilical vascular catheters)
   g. Tape or commercially-available IV securing device
   h. 4" X 4" gauze pads
   i. Scalpel
   j. Antiseptic cleansing preps (povidone-iodine, betadine, alcohol)
   k. Other equipment required by Medical Direction and local protocol

VI. **Procedure**
   a. Ensure body substance isolation
   b. Assemble and prepare equipment
   c. Clean the umbilical cord with antiseptic
   d. Place a sterile tie firmly around the base of the umbilical cord close to the neonate's abdominal wall
   e. Apply a clamp onto the umbilical cord 8" to 10" from the neonate's abdominal wall
   f. Cut the umbilical cord horizontally with a scalpel ½" to 1" from the neonate's abdominal wall (between the cord tie and the umbilical cord clamp)
   g. Differentiate the single thin-walled large diameter umbilical vein from the 2 thick-walled umbilical arteries in the stump of the umbilical cord
   h. Insert the IV catheter into the lumen of the umbilical vein
   i. Advance the IV catheter 1½" to 2" until blood return is noted
   j. If resistance to advancement of the IV catheter ius encountered, pull the IV catheter back until blood can be withdrawn without resistance

k. Attach the IV administration set to the IV catheter and adjust the rate of fluid administration.
l. Secure the IV catheter to the umbilical cord

VII. Complications

a. Placement of the IV catheter into the portal vein (liver)
b. Placement of the IV catheter into an artery
c. Hemorrhage
d. Vessel perforation
e. False lumen tract
f. Air embolism
g. IV catheter tip embolism
h. Dysrhythmias

VIII. Documentation

a. Benchmarks for documenting umbilical vein catheterization

IX. Compare the advantages of intraosseous access with umbilical vein catheterization

a. Comparative ease of intraosseous access
b. Comparative effectiveness of intraosseous access
c. Fewer complications associated with intraosseous access

X. Cognitive and psychomotor examinations

a. See skill sheet (Appendix B)
b. See sample examination items (Appendix C)

References

- 2009 National EMS Education Standards – Paramedic (NHTSA, 2009)
- McDonald, Jeff, ALS Skills Review (AAOS, 2009)
- Caroline, Nancy, Emergency Care in the Streets, 7th Edition (AAOS, 2013)
- Umbilical Vein Catheterization: http://emedicine.medscape.com/article/80469-overview
- Umbilical Vein Catheterization for Newborns: http://www.emsworld.com/article/10852257/paramedic-umbilical-vein-catheterization-for-newborns

Appendix A
Equipment/Supplies List

Name: _____
Date: _____
Examiner: _____

1. body substance isolation/personal protective equipment
2. sharps container
3. IV solution
4. IV administration set
5. umbilical cord clamp and sterile tie
6. IV catheters: 20 g., 22 g. (umbilical vascular catheters)
7. tape or commercially-available IV securing device
8. 4" X 4" gauze pads
9. scalpel
10. antiseptic cleaning preps (povidone-iodine, betadine, alcohol)
11. other equipment required by Medical Direction or local protocol

Appendix B
Umbilical Vein Catheterization

Name: _____
Date: _____
Examiner: _____

Procedure	Satisfactory	Unsatisfactory
1. Ensures body substance isolation		
2. Assembles and prepares equipment		
3. Cleans the umbilical cord with antiseptic preps		
4. Places a sterile tie firmly around the base of the umbilical cord close to the neonate's abdominal wall		
5. Applies a clamp onto the umbilical cord 8" to 10" from the neonate's abdominal wall		
6. Cuts the umbilical cord with a scalpel ½" to 1" from the neonate's abdominal wall (between the cord tie and the umbilical cord clamp)		
7. Differentiates the single thin-walled large diameter umbilical vein from the 2 thick-walled small umbilical arteries in the stump of the umbilical cord		
8. Inserts the IV catheter into the lumen of the umbilical vein		
9. Advances the IV catheter 1½" to 2" until blood return is noted		
10. If resistance to advancement of the IV catheter is encountered, pull the IV catheter back until blood can be withdrawn without resistance		
11. Attaches the IV administration set to the IV catheter and adjusts the rate of fluid administration		
12. Secures the IV catheter to the umbilical cord		

Appendix C
Sample Examination Items

1. **A Paramedic is authorized to perform umbilical vein catheterization**
   a. While caring for a critically ill patient 1 to 3 years of age.
   b. When the order is received from on-line Medical Direction.
   c. After attending training by the Arizona College of Emergency Physicians.
   d. When certified to perform the skill by the National Registry of EMTs.

2. **Which of the following can be administered after obtaining umbilical vein access?**
   a. Whole blood
   b. Isotonic solution
   c. Hypertonic solution
   d. Albumin

3. **The umbilical cord**
   a. Is a conduit for nutrients between the fetus and the mother's placenta.
   b. Carries deoxygenated blood from the placenta to the fetus.
   c. Produces amniotic fluid that encloses and protects the fetus.
   d. Transfers warmth from the mother to the fetus.

4. **Which IV catheters should be considered for umbilical venous catheterization?**
   a. 14 g., 16 g.
   b. 16 g., 18 g.
   c. 18 g., 20 g.
   d. 20 g., 22 g.

5. **The umbilical cord contains**
   a. 3 veins and 4 arteries.
   b. 2 veins and 2 arteries.
   c. 3 veins and 3 arteries
   d. 1 vein and 2 arteries.

6. **After delivery, the umbilical arteries**
   a. Hemorrhage.
   b. Have increased peripheral vascular resistance.
   c. Spasm shut.
   d. Vasodilate.

7. **A umbilical vein can be distinguished from a umbilical artery by comparing**
   a. The thickness of the vessel wall.
   b. Direction of blood flow through the vessel.
   c. The color of the vessel.
   d. The quality of the umbilical pulse.

8. **The sterile tie is firmly placed**
   a. 8" to 10" from the birth canal.
   b. 2" from the birth canal.
   c. 8" to 10" from the neonate's abdominal wall.
   d. around the base of the umbilical cord close to the neonate.

9. **How far should the IV catheter be advanced into the lumen of the umbilical vein?**
   a. No less than 3"
   b. 1½ " to 2"
   c. No more than ¼"
   d. 2½" to 3"

10. **Umbilical venous catheterization is indicated for**
   a. Administering albumin.
   b. Obtaining vascular access during and following neonatal resuscitation.
   c. Administering nutrients.
   d. Obtaining vascular access during childbirth.

11. **Umbilical venous catheterization is contraindicated when**
   a. There is a birth defect of the umbilical cord.
   b. The neonate is in cardiac arrest.
   c. The mother has heavy post-partum bleeding.
   d. The neonate has an Apgar score of 5 or less.

12. **Which of the following is <u>least likely</u> considered a complication of umbilical vein** catheterization?
   a. Vessel perforation
   b. Air embolism
   c. Placement of the IV catheter into an artery
   d. Pain upon advancing the IV catheter

13. **Which of the following is considered an alternative to obtaining umbilical venous access?**
   a. Central line placement
   b. Internal jugular IV placement
   c. Intraosseous access
   d. Portal vein access

14. **Dysrhythmias can occur during umbilical venous catheterization when**
   a. The IV catheter is advanced into the neonate's heart.
   b. Mechanical shock occurs in the neonate.
   c. The IV catheter is advanced too quickly.
   d. Sepsis results from poor aseptic technique.

15. **Which medication is most likely administered by umbilical venous access?**
   a. Morphine sulfate
   b. Oxytocin
   c. Epinephrine
   d. Ketamine

Answers:

1. B
2. B
3. A
4. D
5. D
6. C
7. A
8. D
9. B
10. B
11. A
12. D
13. C
14. A
15. C

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for Paramedic **2/27/16**

Morgan Lens Training

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, a Paramedic can only use this skill under "on-line" medical direction.

Course Description:
This course provides the EMCT an overview of the use of a Morgan Lens. This course presents the possible indications, contraindications, advantages, disadvantages, complications, and documentation recommendations for use of a Morgan Lens. The course includes lecture, skills demonstration, skills practice, skills testing, and a summative written exam.

Prerequisites:
Certified Paramedic under Medical Direction

Course Competencies:
This course is designed to develop the following course competencies:

- To provide ocular irrigation to the cornea, cul-de-sac, and conjunctiva for the removal of
  - chemical irritants
  - non-embedded foreign bodies.

Lesson Outline:

I. **GENERAL INFORMATION:**
   a. The device is a scleral lens, molded of medical grade materials to maximum quality, with directional fins, attached tubing and standard luer loc adapter (which may be attached to the Morgan Lens Delivery Set, a standard IV set, or a syringe).
   b. One or both eyes may be irrigated simultaneously.
   c. The use of the Morgan Lens allows the concurrent treatment of other injuries and/or the transportation of the patient without stopping the irrigation process.

II. **INDICATIONS:**
   a. For continuous medication or lavage to the cornea, cul-de-sac, and conjunctiva Ocular injuries due
      i. acid burns or solvents
      ii. gasoline,
      iii. Detergents, etc.
      iv. Alkali burns
      v. Thermal or actinic burns
      vi. Non-embedded foreign bodies
   b. Foreign body sensation with no visible foreign body Severe infections

III. **CONTRAINDICATIONS**
   a. Penetrating eye injuries
   b. Suspected or actual rupture of the globe
   c. To instilling ocular anesthetic agents with known allergies

IV. **PERSONNEL UTILIZED TO PERFORM:**
   a. Initial Assessment- (depends on institutional standards)
   b. Medication Administration- (depends on institutional standards)
   c. Procedure- (depends on institutional standards)

V. **EQUIPMENT NEEDED**
   a. The following materials, with the possible exception of the anesthetic, are assembled and maintained in a suitable "eye tray" or cart in order to reduce the time necessary to
   initiate ocular irrigation.
      i. Morgan Lens (one per eye)
      ii. Morgan Lens Delivery Set (one for irrigating one or both eyes) or IV set (one per eye)
      iii. IV solution for irrigation (see note below)
      iv. Medi-Duct (one per eye) or towels, blue pads, or other suitable fluid collection device
      v. Irrigation solution with a pH and buffering capacity of normal tears. Approximately 7.1

VI. **PROCEDURE FOR OCULAR IRRIGATION WITH THE MORGAN LENS**
   a. Institute standing orders/protocols for use of the Morgan Lens, or obtain physician's order specifically approving use of the Morgan Lens, the type, amount, and strength of a local ocular anesthetic to be instilled, and the type and amount of irrigating solution to be utilized.
   b. Gather necessary equipment
   c. Follow institutional guidelines for necessary universal precautions

d. Prepare and explain procedure to patient
e. Attach Morgan Lens to Morgan Lens Delivery Set or IV tubing
f. Prime tubing and lens with irrigating solution
g. Start minimal flow of irrigation solution
h. INSERT LENS:
    i. Have patient look down
    ii. Insert lens under upper eyelid
    iii. Have patient look up
    iv. Retract lower lid
    v. Drop lens in place
    vi. Release lower lid over Morgan Len
i. Adjust flow to desired rate
j. Tape tubing to patient's forehead to prevent accidental removal
k. Direct and absorb outflow with Medi-Duct, towels, blue pads, or fluid collection device
l. Irrigate with amount specified in protocol or physician's order (generally continue irrigation until the pH of the eye returns to 7.5 to 8.0).
    i. Do not allow flow to stop.
m. REMOVE LENS
    i. Continue flow
    ii. Have patient look up
    iii. Retract lower lid
    iv. Hold position and slide lens out
    v. Terminate flow.
n. Wait 5 to 10 minutes and check pH of eye to ensure it remains in acceptable range. Repeat irrigation if necessary until pH stabilizes.
o. Document procedure
    i. Note use of the Morgan Lens
    ii. Type/ amount of irrigating solution used and length of time of irrigation
    iii. Which eye/eyes were irrigated
    iv. Patient tolerance to procedure,
    v. Visual acuity (both pre- and post-therapy if available)
    vi. pH readings (both pre- and post-therapy if available)
    vii. and any treatment of other injuries or concurrent use of gross decontamination (if indicated).

References:

- Morgan Lens MorTan inc: http://morganlens.com/wp-content/uploads/2014/10/Sample-Policy.pdf

Morgan Lens

Name: _____
Date _____
Evaluator: _____

Activity	Points possible	Points awarded
Verbalizes appropriate indications/contraindications and obtains Medical Direction for the skill	2*	
Verbalizes/demonstrates appropriate infection control precautions based on scenario	1*	
Identifies/selects the appropriate equipment	1	
Prepare and explain the procedure to patient	1	
Attach Morgan Lens to Morgan Lens delivery system/IV tubing	1	
Prime tubing and lens with irrigation solution	1*	
Start minimal flow of irrigation solution	1	
Insert Lens: • Have patient look down • Insert lens under upper eyelid • Have patient look up • retract lower lid/drop lens in place • release lower lid over lens	5*	
Adjust flow to desired rate	1	
Tape tubing to patients forehead	1	
Direct and absorb outflow with fluid collection device	1	
Irrigate with amount specified in protocol or physician order	1*	
Removal of Lens: • Continue Flow • Have pt look up • Retract lower lid • Hold position and remove lid • Terminate flow	5*	
Re-assess ph of eye to assure acceptable range/comfort is maintained.	1	
Document procedure	1	
Minimum points for acceptable performance = 20 **TOTAL**	**24**	

* Critical criteria.

Recommendations/comments:

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for Paramedic

Fibrinolytic Therapy

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing a Paramedic to perform a STR [Special Training Required] skill, the Medical Director shall ensure that the EMCT has completed training specific to the skill consistent with the knowledge and competencies established according to A.R.S. 36-2204. Periodically thereafter the Medical Director shall reassess an EMCT's competency in the STR [Special Training Required] skill according to policies and procedures required in R9-25-201 (C) (3) (b) (viii).

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Course Description

This course provides the Paramedic the ability to integrate the complex knowledge of the indications, contraindications, and complications of delivering fibrinolytic therapy.

Prerequisites

Certified Paramedic under Medical Direction

Course Competencies

The student shall:

1. Describe the purpose of fibrinolytic therapy.
2. Describe integration of fibrinolytic therapy with Paramedic scope of practice.
3. Describe the parameters under which the Paramedic delivers fibrinolytic therapy.
4. Discuss use of a focused checklist that identifies patients eligible for fibrinolytic therapy.
5. List the fibrinolytic agents authorized for the Paramedic.
6. Discuss the Arizona drug profile and/or other information for each fibrinolytic agent authorized for the Paramedic.
7. Discuss how to monitor outcomes of fibrinolytic therapy.

Lesson Outline

I. The purpose of fibrinolytic therapy
   a. Treatment of patients with a new onset of acute myocardial infarction
   b. Treatment of patients with a new onset of stroke

II. Integration of fibrinolytic therapy with Paramedic scope of practice
   a. National standards for emergency cardiovascular care
   b. On-line and off-line standing orders
   c. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502.B.* Scope of Practice for EMCTs

III. Parameters under which the Paramedic administers fibrinolytic therapy
   a. Obtain a complete patient history
   b. Establish a timeline for onset of signs and symptoms
   c. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502.A.* Scope of Practice for EMCTs
   d. The focused checklist to determine eligibility for fibrinolytic therapy

IV. Use of a focused checklist that identifies patients eligible for fibrinolytic therapy
   a. Inclusion criteria for eligibility
   b. Exclusion criteria
   c. Documentation requirements for the focused checklist

V. Authorized fibrinolytic agents
   a. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502* Table 5.4
   b. Fibrinolytic agents authorized for the Paramedic listed in the *Arizona Drug Profiles* and/or other information approved by the Medical Director including
      1. generic name
      2. trade/brand/proprietary name
      3. class
      4. mechanism of action
      5. indications for field use
      6. contraindications
      7. adverse reactions
      8. notes on administration
      9. incompatibilities/drug interactions
      10. adult dosage
      11. pediatric dosage
      12. routes of administration
      13. onset of action
      14. peak effects
      15. duration of action
      16. Arizona drug box minimum supply
      17. special notes
   c. Monitoring outcomes of fibrinolytic therapy
      1. Use of the focused checklist
      2. Confirm orders received from Medical Direction
      3. Confirm calculations for delivering fibrinolytic agents
      4. Assess patient responses to fibrinolytic therapy

5. Contact Medical Direction as necessary
6. Documentation standards for administering and monitoring outcomes of fibrinolytic therapy

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for a Paramedic

Urinary Catheterization

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR [Special Training Required] skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR [Special Training Required] skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under "on-line" medical direction.

Course Description:
Learning the ability to insert, inspect, manage, and remove urinary catheters using sterile technique in a prehospital and hospital setting under medical direction

Prerequisites:
Certified Paramedic under Medical Direction

Course Competencies:

This course is designed to develop the following course competencies:

Basic review for the anatomy and physiology of the urinary system, both male and female
Basic knowledge elements for the usage of urinary catheters
Catheters types and sizes
Urinary drainages systems and bags
Identify and demonstrate proper preparation of the patient and safety techniques
Perform all catheterization adjunct techniques
Demonstrate 85% proficiency on a written examination

Focused Anatomy and Physiology

1. Male
   a. External urethral orifice
   b. Urethra
   c. Prostrate
   d. Bladder
2. Female
   a. External urethral orifice
   b. Urethra
   c. Bladder

Indications for Catheter Usage

- To relieve a physical obstruction to urine flow, such as a urinary stone, a bladder tumor or an enlarged prostrate.
- To drain urine when the bladder's muscles or nerves are not working properly. This can be cause by a spinal cord injury, multiple sclerosis or some type of nerve problem. Also, certain medications can interfere with the bladder's normal emptying.

Knowledge of Types and Sizes

Urinary catheters come in different diameters. For adult patients, catheters are generally less than one-quarter of an inch in diameter.

Preparation (Sterile Technique)

Open the kit that contains the sterile supplies and gloves beforehand.
All equipment (catheter, lubricant, urine receptacle) should be assembled beforehand
The patient should be lying supine and the clothing should be removed from the lower portion of the body.

- Female patients should have knees bent and legs spread slightly apart.
- Male patients may have knees straight or slightly bent.

The urethra should be cleaned with an antiseptic solution.
Then, a lubricating jelly should be injected into the urethra.
Once the urethra is lubricated, the tip of the urinary catheter should be inserted gently into the urethra's opening.

- Never touch the tip of the urinary catheter or allow it to come in contact with an unsterile surface.

The catheter should be slowly advanced up the urethra into the bladder.
When the catheter tip reaches the bladder, urine will begin to flow down through the catheter tube and the catheter tube should be advanced a bit further.
Just below the catheter tip, there is a balloon that has its own connecting tube. This balloon is inflated with a small amount of sterile water or saline. The inflated balloon keeps the catheter form falling out of the bladder.
Once the catheter is in place, the drainage bag will be attached. The drainage bag should remain below the level of the bladder to ensure that urine drains properly and will not backflow.

Complications/Risks

- The urethra or bladder can be damaged. Very rarely, the bladder wall is punctured.
- The catheter can be inserted into the vagina by mistake. This happens most often in infant girls.

- When catheters are inserted, the catheter balloon can be inflated inside the urethra, instead of the bladder. This complication happens more often in males than in females, because the urethra is longer in men.
- Infectious material may be introduced into the patient's body, resulting in an infection or even sepsis.

Output Measurement

Urinary output is measured in cc or ml per hour. Character and output should be measured observed and noted on the patient' chart.

URINARY CATHETER INSERTION			
COMPETENCY			
S = Satisfactory **U** = Unsatisfactory **NP** = Not Performed	**S**	**U**	**NP**
Assessed patient's general status and medical record. a. Assessed for distended bladder. b. Inspected perineal area. Determined conditions that might impair passage of catheter. c. Assessed patient's knowledge of purpose of catheterization.	☐	☐	☐
Performed hand hygiene, provided privacy, and raised bed to appropriate height.	☐	☐	☐
Positioned self correctly, and arranged equipment. a. Adjusted side rails appropriately. b. Placed waterproof pad under patient.	☐	☐	☐
MALE: Assisted patient to supine position with thighs slightly abducted. Draped upper trunk with bath blanket, and covered lower extremities with bed sheet, exposing only genitalia. **FEMALE:** Assisted patient to dorsal recumbent position or side-lying (Sims') position. Draped patient appropriately with bath blanket, in diamond fashion.	☐	☐	☐
Wearing disposable gloves cleansed and dried perineal area using clean technique.	☐	☐	☐
Positioned lamp to illuminate perineal area.	☐	☐	☐
Performed hand hygiene.	☐	☐	☐
Maintained sterile asepsis while opening catheter kit. Placed kit within reach.	☐	☐	☐
Applied sterile gloves.	☐	☐	☐

Organized supplies on sterile field.	☐	☐	☐
Checked integrity of inflatable balloon of indwelling catheter.	☐	☐	☐
Applied lubricant to catheter.	☐	☐	☐
Applied sterile drape over patient, using one of the following methods:	☐	☐	☐
Placed sterile tray in easily accessible place. Opened specimen container.	☐	☐	☐
MALE: Cleansed urethral meatus using cotton balls saturated with antiseptic solution. If patient was not circumcised, first retracted foreskin to expose urethral meatus. **FEMALE:** Cleansed urethral meatus using cotton balls saturated with antiseptic solution. With non-dominant hand, retracted labia to expose urethral meatus, and wiped from clitoris toward anus.	☐	☐	☐
Handled catheter correctly.	☐	☐	☐
Inserted catheter: **MALE:** a. Lifted penis to position perpendicular to patient's body, and applied light traction. b. Asked patient to bear down as if to void, and slowly inserted catheter through urethral meatus. c. Advanced catheter 17 to 22.5 cm or until urine flowed out catheter's end. If resistance was felt, withdrew catheter; did not force it through urethra. When urine appeared, advanced catheter to the bifurcation of the drainage and balloon inflation port. d. Lowered penis, and held catheter securely in non-dominant hand. Placed end of catheter in urine tray receptacle. e. Reduced (or repositioned) the foreskin. **FEMALE:** a. Asked patient to bear down gently as if to void and slowly inserted catheter through urethral meatus. b. Advanced catheter a total of 5 to 7.5 cm (2-3 inches) in adult or until urine flowed out of catheter's end. As soon as urine appeared, advanced catheter another 2.5 to 5 cm (1-2 inches). Did not force against resistance. Placed end of catheter in urine tray receptacle. c. Released labia, and held catheter securely with non-dominant hand.	☐	☐	☐
Collected urine specimen if needed.	☐	☐	☐

Allowed bladder to empty fully, unless institution policy restricts maximal urine volume drained per catheterization. (500 ml, then clamp and wait 30 min). If using straight, single-use catheter, withdrew it slowly and smoothly.	☐	☐	☐
If using indwelling catheter, inflated balloon correctly.	☐	☐	☐
Attached end of catheter to collecting tube.	☐	☐	☐
Secured catheter tubing properly, and allowed slack. Clipped drainage tubing to edge of mattress.	☐	☐	☐
Assisted patient to comfortable position.	☐	☐	☐
Washed and dried perineal area as needed.	☐	☐	☐
Removed gloves, disposed of equipment properly, and performed hand hygiene.	☐	☐	☐
Evaluated patient: a. Assessed patient's comfort. b. Observed character and amount of urine c. Determined that no urine was leaking from catheter or tubing connections. d. Identified unexpected outcomes, if any.	☐	☐	☐
Reported and recorded pertinent data: catheter description, assessment of urine, specimen collection, and patient's response to procedure.	☐	☐	☐
Emptied drainage bag and initiated I&O records.	☐	☐	☐

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for Paramedic

Blood Chemistry Analysis

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing a Paramedic to perform blood chemistry analysis, the Medical Director shall ensure that the EMCT has completed training specific to the skills consistent with the knowledge and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skills. Periodically thereafter the Medical Director shall reassess an EMCT's competency according to policies and procedures required in R9-25-201 (C) (3) (b) (viii).

Upon successful completion of this training, an EMCT can only use these skills under Medical Direction.

Course Description
This course provides the Paramedic the ability to integrate the complex knowledge of history taking and the secondary assessment with blood chemistry analysis to formulate a field impression.

Prerequisites
Certified Paramedic under Medical Direction

Course Competencies
The student shall:

1. Describe the purpose of blood chemistry analysis.
2. List the blood chemistry tests performed in the prehospital setting.
3. Describe the integration of history taking and the secondary assessment with blood chemistry analysis to formulate a field impression.
4. List the medical conditions for which the measure of the blood glucose level should be performed.
5. Describe the purpose of cardiac biomarker analysis.
6. Describe the purpose of a basic and complete metabolic profile (CHEM 7 and CHEM 12) analysis.
7. Describe the purpose of brain natriuretic peptide (BNP) analysis.
8. Describe the purpose of arterial blood gases analysis.
9. Explain how blood chemistry tests and analysis may be integrated into the specialty care setting.

Lesson Outline

I. **The purpose of blood chemistry analysis in the prehospital setting**

II. **Integration of history taking and the secondary assessment with blood chemistry**

III. **analysis to formulate a field impression**

IV. **Blood glucose level**

a. The measure of the blood glucose level should be performed on the patient who
   1. is diabetic or suspected of having a diabetic emergency
   2. is unresponsive for unknown reasons
   3. has generalized malaise or weakness
   4. has signs/symptoms of a stroke or a suspected stroke
   5. has an altered mental status

V. **Cardiac biomarkers**

a. Cardiac biomarkers are used to determine the presence of damage to cardiac muscle following a myocardial infraction.
b. It can take several hours following a myocardial infarction for cardiac biomarkers to become elevated
c. Testing is usually performed in a lab, but some prehospital versions are now available.
d. Testing should be performed in all cardiac patients depending on local protocol.
e. Testing should be performed in stroke patients depending on local protocol

V. **Other blood tests**

a. Basic and complete metabolic profile (CHEM 7 and CHEM 12).
   1. Can provide insight into a patient's electrolyte status and renal and liver function
b. A brain natriuretic peptide (BNP) test
   1. The BNP level is typically elevated in a patient with exacerbation of chronic heart failure
   2. Analysis can differentiate cardiac versus pulmonary causes of respiratory distress
c. Arterial blood gas analysis
   1. Testing requires the puncture of an artery to obtain a blood sample
   2. Testing is valuable for patients in respiratory distress or respiratory failure, ventilated patients, and for diagnosing respiratory and metabolic acidosis
   3. Testing is not typically performed in the prehospital setting
d. Integration
   1. The basic and complete metabolic profile, BNP, and arterial blood gas tests and analysis may be integrated into the specialty care setting

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for Paramedic

Authorized Pharmacologic Agents to Administer and Monitor during Interfacility Transports

This training is authorized by the EMCT agency Medical Director using *Title 9. Health Services Chapter 25. Department of Health Services Emergency Medical Services Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502*.

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing a Paramedic to administer a pharmacologic agent, the Medical Director shall ensure that the EMCT has completed training specific to the agents consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in administering the agents. Periodically thereafter the Medical Director shall reassess an EMCT's competency according to policies and procedures required in R9-25-201 (C) (3) (b) (viii).

Upon successful completion of this training, an EMCT can only administer pharmacologic agents under Medical Direction.

Course Description

This course provides the Paramedic the knowledge to administer and monitor pharmacologic agents during interfacility transport.

Prerequisites

Certified Paramedic under Medical Direction

Course Competencies

The student shall:

1. Describe aspects of patient care during interfacility transports.
2. Discuss how the Paramedic is authorized to administer pharmacologic agents.
3. Describe the parameters under which the Paramedic administers pharmacologic agents.
4. Describe the scope of administering and monitoring pharmacologic agents during interfacility transports.
5. List the authorized pharmacologic agents that are administered and monitored during interfacility transports.
6. Discuss the Arizona drug profile and/or other information for each pharmacologic agent administered and monitored during interfacility transports.
7. Discuss how to monitor outcomes during interfacility transports.

Lesson Outline

I. Aspects of patient care during interfacility transports

II. How the Paramedic is authorized to administer pharmacologic agents
   a. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502.B.* Scope of Practice for EMCTs

III. Parameters under which the Paramedic administers pharmacologic agents
   a. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502.A.* Scope of Practice for EMCTs

IV. Scope of administering and monitoring pharmacologic agents during interfacility transports
   a. Pharmacologic agents that are authorized for use by an EMCT with the specified certification
   b. Pharmacologic agents that are administered by an infusion pump
   c. Pharmacologic agents that are administered by small volume nebulizer

V. Authorized pharmacologic agents that are administered during interfacility transports
   a. Reference *Article 5. Medical Direction Protocols for Emergency Medical Technicians R9-25-502* Table 5.4

   b. Pharmacologic agents authorized for the Paramedic listed in the *Arizona Drug Profiles* and/or other information approved by the Medical Director including
      1. generic name
      2. trade/brand/proprietary name
      3. class
      4. mechanism of action
      5. indications for field use
      6. contraindications
      7. adverse reactions
      8. notes on administration
      9. incompatibilities/drug interactions
      10. adult dosage
      11. pediatric dosage
      12. routes of administration
      13. onset of action
      14. peak effects
      15. duration of action
      16. Arizona drug box minimum supply
      17. special notes

   c. Monitoring outcomes during interfacility transports
      1. Confirm orders received from Medical Direction
      2. Confirm calculations for delivering pharmacologic agents
      3. Assess patient responses to pharmacologic therapy
      4. Assess performance of equipment that is delivering pharmacologic agents
      5. Contact Medical Direction as necessary
      6. Documentation standards for administering and monitoring pharmacologic agents during interfacility transports

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for I-99, and Paramedic

Curriculum for Electromechanical Infusion Pump

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing an EMCT to perform an STR (Special Training Required) skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR (Special Training Required) skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Upon successful completion of this training, an EMCT can only use this skill under "on-line" medical direction.

Course Description

This course is designed to provide instruction for the use of an Infusion Pump and Monitor Authorized Agents During Inter- facility Transports by an EMT-I (99) or a Paramedic as approved by the EMT-I(99)'s or Paramedic's administrative medical director. The course meets the requirements in A.A.C. R9-25-502(A)(3)(a) for an EMT-I (99) or Paramedic, who may then be approved by an administrative medical director for the use of the device as a STR skill.

Prerequisites

The EMT-I (99) or Paramedic must have the approval of the EMCT's administrative medical director.

Methodology

This guidance document suggests the following didactic, psychomotor, written and practical evaluation, and remediation process to ensure proficiency.

The following is a breakdown of the following recommended minimum hours for training:

- 2 hour – Didactic/lecture
- 1 hour - Psychomotor/hands-on practice
- ½ hour – Written and skills evaluation
- ½ hour – Remediation

Instructor/Faculty

The instructor must be approved by the administrative medical director and meet the following requirements:

1. Would qualify, under A.A.C. R9-25-304(A), to serve as an instructor for a course at the classification level of EMT-1(99) or Paramedic; and
2. Is authorized by the applicable licensing Board under Arizona Revised Statutes Title 32 or, for an EMCT, the instructor's administrative medical director to use the device.

Equipment

The following minimum equipment should be available for the course:

- Body Substance Isolation equipment
- Infusion Pump System with proper tubing
- IV Arm (optional)

Note: Content material may vary slightly depending on the type of Infusion Pump System brand being used. The instructor will need to make necessary adjustments based on the type of equipment.

Course Competencies:

1. Describe the pharmacokinetic and pharmacodynamic properties of medications in general.
2. Identify situations where medication effects will be altered by the age, sex, weight, and other characteristics.
3. Discuss drug calculation principles used in pharmacology.
4. Discuss the drug profile listed onTable 5.4 Eligibility for Authorization to Adminiter and Monitor Transport Agents During Interfacility Transports, by EMCT Classification; Administration Requirements including indications, contraindications, dosages, adverse reactions and side effects, and interactions.
5. Describe and demonstrate the proper use of Body Substance Isolation (BSI).
6. Discuss and demonstrate assessment of the patient, documentation and transportation guidelines.
7. Describe the role of the administrative medical direction and oversight when new onset or acute emergencies occur during transport.
8. Desribe and demonstrate the assembly, programming, troubleshooting and maintenance technique of the Electromechanical Infusion Pump.
9. Complete a written and practical skills evaluation with 80% competency; no failure of critical criteria.

Course Outline

Introduction

I. Advantages

1. Medication maintenance infusion
2. Deliver IV fluid maintenance infusions in children and elderly patients to minimize the risk for "runaway IV".
3. Deliver the rate that is set by the pump without deviation.
4. Calculate the amount of fluid that has been infused and the amount of fluid remaining.
5. Alarms or alerts to the presence of occlusion.
6. Mechanically simple

II. Disadvantages

1. Lack of uniformity among manufacturers.
2. Air trapping in the line, the pump stops the infusion.

III. Features

1. Dose rate calculator (DRC), preferred.
2. Multiple chambers for multiple medications.
3. Battery charger

IV. Proper Body Substance isolation

1. Gloves
2. Mask
3. Eyewear
4. Gowns or aprons (if indicated)

V. Assembly, application techniques, efficacy of the Electromechanical Infusion Pump and troubleshooting

Note: Content material may vary slightly depending on the type of Infusion Pump System brand being used. The instructor will need to make necessary adjustments based on the type of equipment.

VI. Decontamination and Quality Control

1. Remove gross contaminated by wiping with approved disinfectant solution, wipe off with clean disposable towel.
2. Dry surface with a clean disposable towel.
3. Discard contaminated towels into a biohazard bag.
4. Inspect each component for signs of wear.

VII. Drug profiles

1. *Refer to AZDHS BEMSTS approved Drug profiles.* *http://azdhs.gov/documents/preparedness/emergency-medical-services-trauma-system/drugs/drug-profiles.pdf*

VIII. Medical Direction

1. An EMT-I(99) or a Paramedic , according to A.A.C. R9-25-502(A)(3)(a-c), only if authorized by the EMT-I(99)'s or Paramedic's administrative medical director and if the EMT-I(99) or Paramedic is able to receive on-line medical direction.

Attachment A – Skill Evaluation

STR

[Special Training Required]

State of Arizona Bureau of EMS and Trauma Systems

STR Training for EMT

Curriculum for Law Enforcement/EMT Administration of Naloxone in the Pre-Hospital Setting

This training is authorized by the EMCT agency Medical Director using the 2009 National Education Standard Curriculum:

http://www.nasemso.org/EMSEducationImplementationPlanning/documents/811077dAEMTIGs.pdf

Before authorizing a Paramedic to perform a STR [Special Training Required] skill, a Medical Director shall ensure that the EMCT has completed training specific to the skill, consistent with the knowledge, skills, and competencies established according to A.R.S. 36-2204, and demonstrates competency in the skill. Periodically thereafter the medical director shall reassess an EMCT's competency in the STR [Special Training Required] skill, according to policies and procedures required in R9-25-201 (C) (3) (b) (viii), to ensure continued competency in the skill.

Prerequisites

Upon successful completion of this training, an EMCT can only use this skill under Medical Direction.

Course Description

This course is designed to provide instruction in a procedure for the administration of Naloxone by law enforcement officers and EMTs.

Requirements for Naloxone Administration

1. Licensed physician or nurse practitioner issuance of a standing order for Naloxone
2. Completion of ADHS approved training

Prerequisites

1. Standard AZ Police Officer Standards and Training Board (POST) first aid law enforcement training or current EMT certification
2. Current CPR certification

Refresher Suggestion

1 hour of Continuing Education refresher training every two years

Methodology

1. This guidance document suggests the following minimum hours for training to ensure proficiency:
   - 1.5 hours – Didactic/lecture (Module One)
   - 0.5 to 1.0 hour – Skills practice and validation (Module Two)
2. The curriculum may be used for both law enforcement officers and EMTs.
3. Agencies utilizing Naloxone must have agency-specific guidelines regarding storage, accountability, reporting, and replacement.

Instructor/Faculty
The instructor must be approved by the administrative medical director for the organization or be an AZ POST-approved first aid instructor.

Equipment
The following minimum equipment is required for the course:

1. Naloxone auto-injector trainers (if agency will be utilizing this device)
2. Naloxone intranasal mucosal atomizer trainers

Course Competencies:
Upon completion of the course the student shall be able to:

1. Describe what opioids are and how they work on human anatomy.
2. List three common opioids that are available to the public.
3. List the common routes of administration.
4. Differentiate between an opioid overdose and an "opioid high".
5. State the signs and symptoms of an opioid overdose.
6. Describe how Naloxone works to counteract opioids.
7. List the types of overdoses that Naloxone does not reverse.
8. Describe the signs and symptoms of Opioid withdrawal.
9. State the difference between the duration of Naloxone and the duration of most opioids.
10. Describe the routes of administration of Naloxone for EMT and Law Enforcement Officers.
11. State the indications for Naloxone use.
12. State the dosages of Naloxone for both intramuscular and intranasal use.
13. Demonstrate proficiency in the administration of the medication. (Module Two)
14. List possible safety and post-administration considerations.
15. Describe the agency specific follow-up and documentation guidelines.

COURSE OUTLINE

Module One: Lecture

Approximate time: 1.5 Hours

Introduction

I. Objectives

A. Background and statutes
B. Define Naloxone
C. Routes of administration
D. Training requirements
E. Immunity

II. The Opioid Problem

A. Lethal drug overdose is the leading cause of accidental death in America.
B. Opioids include legal prescriptions and illegal drugs.

III. Use of Naloxone by Law Enforcement Officers and EMTs

A. Safe, effective, well established practice
B. Few side effects
C. First step in combating deaths from overdose
D. Time-sensitive emergency

IV. A.R.S. § 36-2228

A. Requires a standing order issued by a licensed physician or nurse practitioner
B. Mandates training on the use of Naloxone and other opioid-reversal drugs before an EMT or a law enforcement officer may administer Naloxone
C. Allows a trained EMT or law enforcement officer to administer Naloxone
C. States that Naloxone may be administered to a person if an EMT or a law enforcement officer believes that the person is suffering from an opioid-related overdose
D. Requires a uniform training module for both EMTs and law enforcement officers
    1. Help identify persons suffering from an opioid-related overdose
    2. Use of Naloxone

E. Provides immunity for:
    1. Physicians and nurse practitioners who issue the standing order
    2. Trained EMTs and law enforcement officers who administer the drug
F. Does not create a duty to act or standard of care for law enforcement officers to administer an opioid antagonist

V. Definition of Opioids/Opiates

A. Opioids – synthetic drugs
B. Opiates – naturally derived from the poppy plant
C. Central Nervous System (CNS) Depressants
    1. CNS or brain function
    2. Respiratory system
    3. Cardiovascular system

E. Abused for euphoric effects (to get high) and for pain control

VI. How Opioids Kill

A. Respiratory and CNS depression
B. "Slows" everything down
C. Decreased level of consciousness
D. Decreases respiratory drive
E. Decreases heart rate and lowers blood pressure
F. Respiratory drive is taken away
G. Lack of oxygen (hypoxia)
H. Aspiration (inhaling vomit)
I. Eventual cardiopulmonary arrest

VII. Increased Incidence of Overdose

The following substances, when combined with opioids, can increase the incidence of overdose:

1. Alcohol
2. Benzodiazepines (sedatives)
3. Other medications

VIII. Common Opioid Medications

A. Buprenorphine
B. Codeine
C. Fentanyl
D. Hydrocodone (Vicoden/Norco/Lortab)
E. Hydromorphone (Dilaudid)
F. Methadone
G. Morphine
H. Oxycodone (Percocet, Oxycontin)
I. Illegal Opioids (heroin, opium)

IX. Routes of Opioid Administration

A. Oral (pills)
B. Intravenous (IV)
C. Snorting
D. Smoking
E. Subcutaneous, e.g. under skin ("skin popping")

X. Naloxone (Narcan)

A. Developed in the 1960's
B. Opioid antagonist (reversal drug)
C. Used as an emergent overdose treatment in the hospital and in pre-hospital settings
D. Increased need for Narcan due to:
    1. Greater variety of available opioids
    2. Increased opioid use and abuse

XI. Naloxone Mechanism of Action

A. Naloxone displaces the opioid from the opioid receptor in the nervous system
B. Temporarily reverses respiratory and CNS depression
C. May result in a sudden onset of withdrawal

XII. Signs and Symptoms of Opioid Withdrawal

A. Agitation
B. Tachycardia (rapid heart rate)

C. Pulmonary edema (fluid in the lungs)
D. Nausea
E. Vomiting
F. Seizures

XIII. Overdoses that Naloxone does not work for:

A. Sedatives
   1. Valium
   2. Ativan
   3. Xanax
   4. Alcohol

B. Stimulants
   1. Cocaine
   2. Amphetamines

XIV. Routes of Administration of Naloxone

A. EMTs or law enforcement officers
   1. Intramuscular (IM)
   2. Intranasal (IN)

B. Paramedics, AEMTs, or EMT-I(99)s
   1. Intramuscular (IM)
   2. Intranasal (IN)
   3. Intravenous (IV)
   4. Intraosseous (IO)
   5. Endotracheal (ET)

XV. Benefits of Naloxone Administration by Intranasal Route or Auto-injector

A. IV access may be difficult to establish in chronic IV drug abusers
B. Decreased risk of needle-stick injury
C. Decreased risk for infectious disease exposure
D. Simple, rapid, and convenient

XVI. Benefits of Naloxone Administration

A. Intranasal
   1. Works quickly; drugs absorb into nasal mucosa
   2. Nose is an easy access point
   3. Starts working as fast as IV administration
   4. Atomizer facilitates quick administration
   5. Painless

B. Auto-injector
   1. Contains pre-measured dose, reduces medication dosing errors
   2. Designed for self-administration of medication by patients or ease of use by laypersons

XVII. Safety Considerations & Adverse Impacts

A. Use caution when administering Naloxone to narcotic-dependent patients.
B. Rapid opioid withdrawal may cause nausea/vomiting and may cause combativeness.
C. Roll patient on their side after administration to keep airway clear.
D. If patient does not respond within 3 to 5 minutes, administer second dose, if available.

E. Other disease processes may mimic opioid overdose; be aware of possible low blood sugar, head injury, stroke, shock, or hypoxia.

XVIII. Indications for Naloxone Use

A. Altered Level of Consciousness (LOC)

B. Respiratory depression or apnea (not breathing)

1. Shallow, slow respirations – less than 8 to 10 breaths per minute
2. Inadequate respirations

C. Unable to wake up with painful stimuli

D. Constricted pupils (miosis)

E. Needle track marks

F. Profuse sweating (diaphoresis)

G. Cardiac arrest

XIX. Differentiating between "High" vs. Overdose (See Appendix A)

A. High

1. Muscles become relaxed
2. Speech is slow/slurred
3. Sleepy looking
4. Responsive to stimuli
5. Normal heart rate pulse
6. Normal skin color

B. Overdose

1. Pale, clammy skin; limp
2. Very infrequent or no breathing
3. Deep snoring or gurgling
4. Not responsive to stimuli
5. Slow heart beat pulse
6. Blue lips and or fingertips

XX. Patients at Risk for Opioid Overdose

A. Chronic users, especially with recent release from jail or detox or a recent history of relapse

B. Young adults or teens experimenting with drugs

C. People with chronic illness and chronic pain; includes all ages and demographics

XXI. Naloxone Algorithm (See Appendix B)

XXII. Naloxone vs. Opioid Drug Durations (See Appendix C)

A. Naloxone has a relatively short duration compared with opioid drugs.

B. Naloxone may wear off and, dependent upon the amount of opioid in the system, signs of overdose may reappear.

XXIII. Procedure for Administration of Naloxone (See Appendix D)

A. Recognize opiate overdose

1. Decreased Level of Consciousness (LOC)
2. Decreased or no breathing
3. In setting of likely opioid ingestion

B. Give sternal rub/stimulate

C. If no response, administer Naloxone

D. Place patient on side (recovery position)

XXIV. Naloxone Dosage (Adult and Pediatric)

A. Auto-injector (IM)
   1. 0.4 mg IM dose
   2. If no response after 2 minutes, may repeat as necessary
   3. Max dose 4.0 mg

B. Intranasal (IN)
   1. 1.0 mg in each nostril using Mucosal Atomizer Device for a total of 2.0 mg
   2. If no response after 2 minutes, may repeat
   3. Max dose of 4.0 mg

XXV. Intranasal (IN) Naloxone Administration

A. Take cap off medication.
B. Remove the two caps from each end of the applicator.
C. Apply atomizer onto the end of the applicator.
D. Tightly screw the medication into the applicator.
E. Insert the atomizer into the nostril and push the syringe.
F. Apply 1.0 ml into each nostril.
G. The tip of the atomizer should be placed near or just inside the nostril:
   1. Placement of the syringe too far inside the nasal cavity may traumatize the nasal passages or cause bleeding.
   2. The use of the atomization device on the tip of the syringe prevents nasal trauma and maximizes the delivery of the medication to the patient.

XXVI. Auto-injector Intramuscular (IM) Administration (Note: There is currently only one Naloxone auto-injector available, the EVZIO. If other auto-injectors become available, the following may need to be amended to follow manufacturer's recommendations.)

A. Pull the auto-injector from the outer case.
B. Pull off the red safety guard. The red safety guard is made to fit tightly. Pull firmly to remove.
C. Do not touch the black base of the auto-injector, which is where the needle comes from.
D. Do not replace the red safety guard after it is removed.
E. Place the black end against the middle of the patient's outer thigh, through clothing if necessary.
G. Press firmly and hold in place for 5 seconds after hearing the popping sound and the hiss. For an infant less than 1 year old, pinch the middle of the outer thigh before you administer the auto-injector and continue to pinch while you give the medication.
H. The needle will inject and then retract back into the auto-injector and is not visible after use.
I. The auto-injector cannot be reused.
J. After use place the auto-injector back into its outer case.
K. Do not replace the red safety guard.

XXVII. Post Naloxone Administration

A. Place the patient in the recovery position.
B. If the patient is not breathing and/or has no pulse, begin rescue breathing/ventilations or CPR.
C. Be alert for vomiting/diarrhea and agitation (withdrawal symptoms).
D. If no response after 2 minutes, repeat dose.

E. Even if the person wakes up and starts breathing, the overdose symptoms can come back.

F. The patient should be transported to the hospital by EMS.

XXVIII. Documentation

A. EMS - Document patient encounter on a prehospital incident history report.

B. Law enforcement officer - data to collect:

1. Patient name and DOB
2. Location of incident
3. Indications for use
4. Dose, route, and time of Naloxone administration
5. Response to administration
6. Patient Disposition, i.e. EMS, DOA, Elope, etc.

Module Two: Skills Practice/Validation

Approximate time: 0.5 to 1.0 hours

I. **Provide Appropriate Equipment**
   - A. Auto-injector Trainer
   - B. Pre-filled Naloxone syringe with atomizer device
   - C. Optional – mannequins as available

II. **Instructor will demonstrate administration techniques and equipment use.**

III. **The student will demonstrate proficiency on the skills evaluation form. (See Appendix E)**

IV. **The instructor will verify, complete, and sign the skills evaluation form and will maintain the completed form in agency training files**

V. **Post-Test**

VI. **The instructor will provide remediation and retesting as necessary.**

Appendix A – "High" vs. Overdose

REALLY HIGH	OVERDOSE
Muscles become relaxed	Pale, clammy skin
Speech is slow/slurred	Very infrequent or no breathing
Sleepy looking	Deep snoring or gurgling (death rattle)
Responsive to stimuli (such as shaking, yelling, sternal rub, etc.)	Not responsive to stimuli (such as shaking, yelling, sternal rub, etc.)
Normal heart beat/pulse	Slow heart beat/pulse
Normal skin tone	Blue lips and / or fingertips

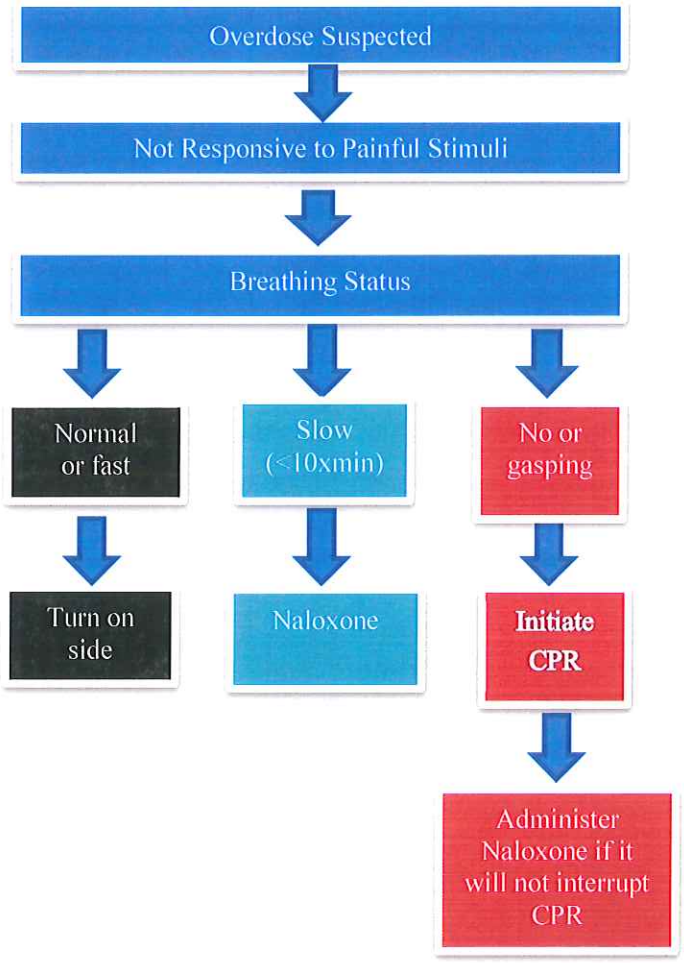
Appendix B – Naloxone Algorithm

When to Use Naloxone

Overdose Suspected

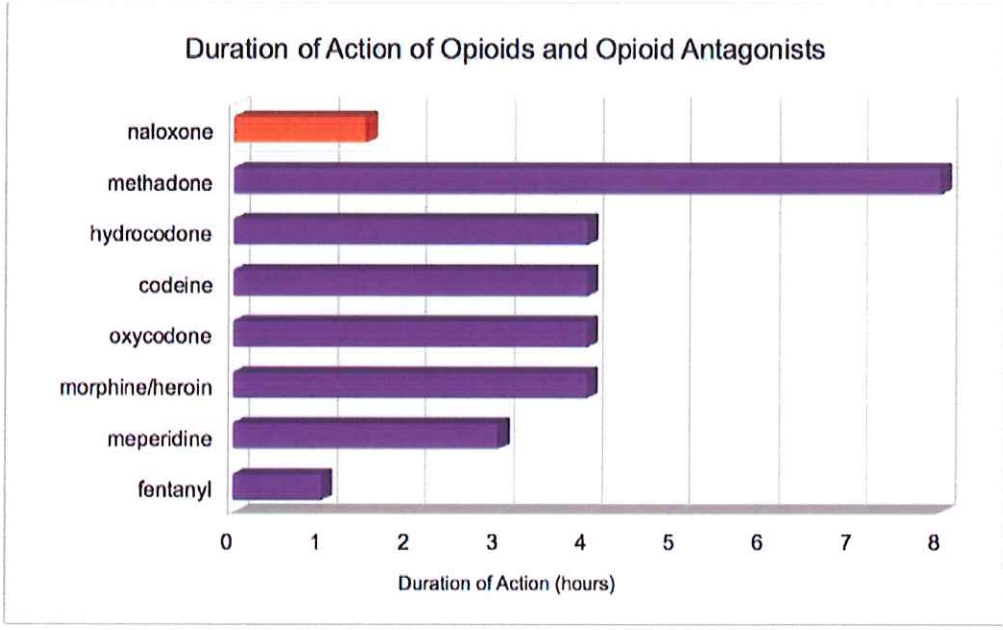
Not responsive to painful stimuli

Breathing status

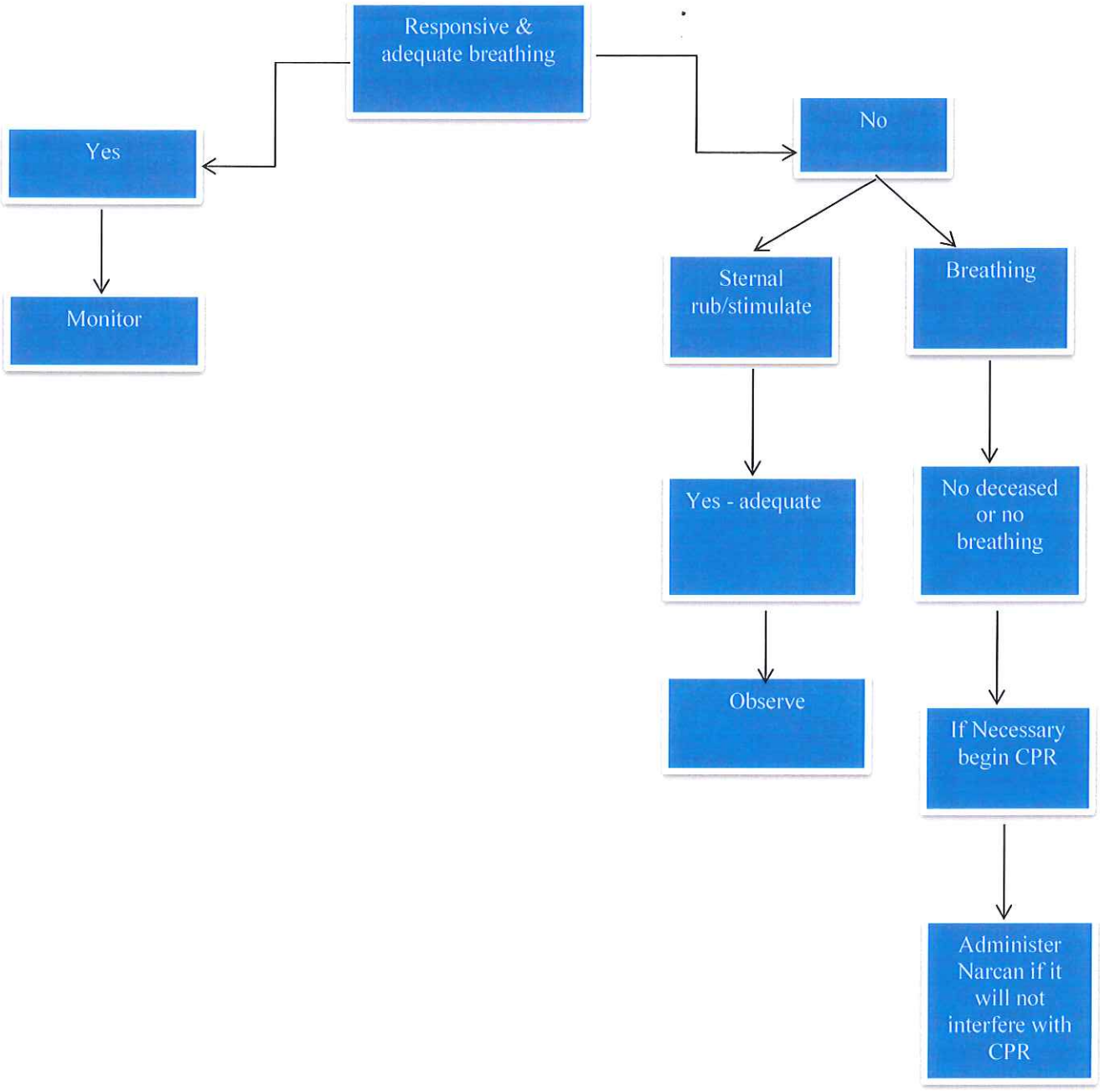


Adopted October 2015

Appendix C – Comparison of Duration of Naloxone and Opioids



Appendix D – Procedure for Naloxone Use



Proposed Skills Evaluation
Naloxone Administration Skill Sheet

Student's Name:

Date: _____ Attempt#

Evaluator: _____ Signature:_____

Start Time: End Time:

Criteria	Points Possible	Points Attained
Takes or verbalizes universal Body Substance Isolation	1	
Completes assessment(s) and determines patient needs	1	
Lists indications for intranasal Naloxone administration:		
• CNS and respiratory depression induced by narcotics suspected with at least one of		
1. Overdose History by bystanders	1	
2. Paraphernalia consistent with opiate/narcotic use	1	
3. Medical History consistent with opiate/narcotic use	1	
4. Respiratory depression with pinpoint pupils	1	
• Coma	1	
• Suspected narcotic overdose	1	
• Age of >5	1	
Checks for known allergies, contraindications or incompatibilities	1	
Checks the medication to determine:		
• Correct Medication	1	
• Expiration Date	1	
• Concentration	1	
• Clarity	1	
Lists the appropriate dosage for the medication: (Use applicable	1	
• For Intranasal: >5 years old to adult: 2.0 mg; may repeat dose of 2.0 mg if no response after 2 minutes		
• For Auto-injector: >5 years old to adult: 0.4 mg; may repeat dose after 2 minutes, up to 4.0 mg (10 times total),		
Properly administers the medication: (Use applicable list of	3 (1 point for each	
• Intranasal:		
1. Assembles Mucosal Atomization Device (MAD) to syringe		
2. Inserts MAD into the nostril		
3. Administers the medication in a fast push manner		
• Auto-injector:		
1. Prepares the auto-injector for use		
2. Places the black end against the outer thigh		
3. Holds in place for 5 seconds		
Verbalizes the need for ongoing assessments, including	1	
Verbalizes the indications for an additional dose	1	
Verbalizes the need for transport	1	
Voices proper documentation of medication administration	1	
Total	22	

Critical Criteria

_____ Fails to take or verbalize Body Substance Isolation precautions.

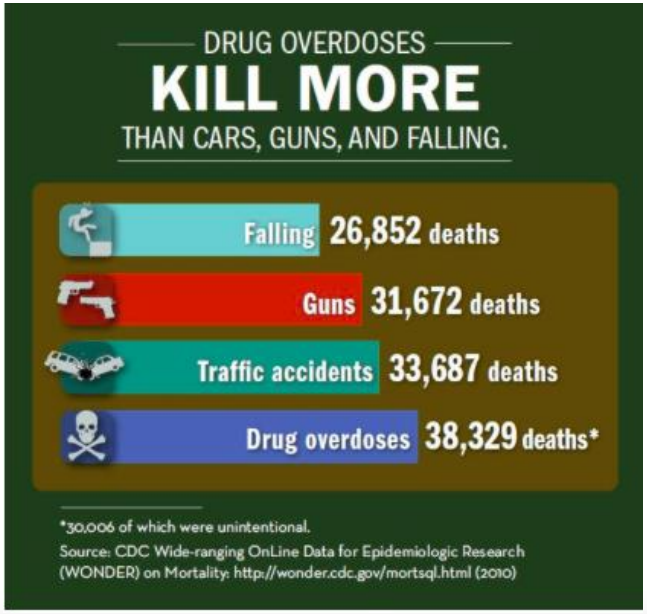
_____ Fails to complete, or verbalize completion of, patient assessment.

_____ Fails to verbalize the indications for medication administration.

_____ Fails to reassess the patient.

(Failure to meet any of the critical criteria constitutes failure. The student must be remediated prior to retesting.) The student has three (3) opportunities to successfully complete the test. If a student fails to achieve a passing grade after three (3) opportunities, the student must repeat the entire course

USE OF NALOXONE BY LAW ENFORCEMENT FOR OPIOID OVERDOSE



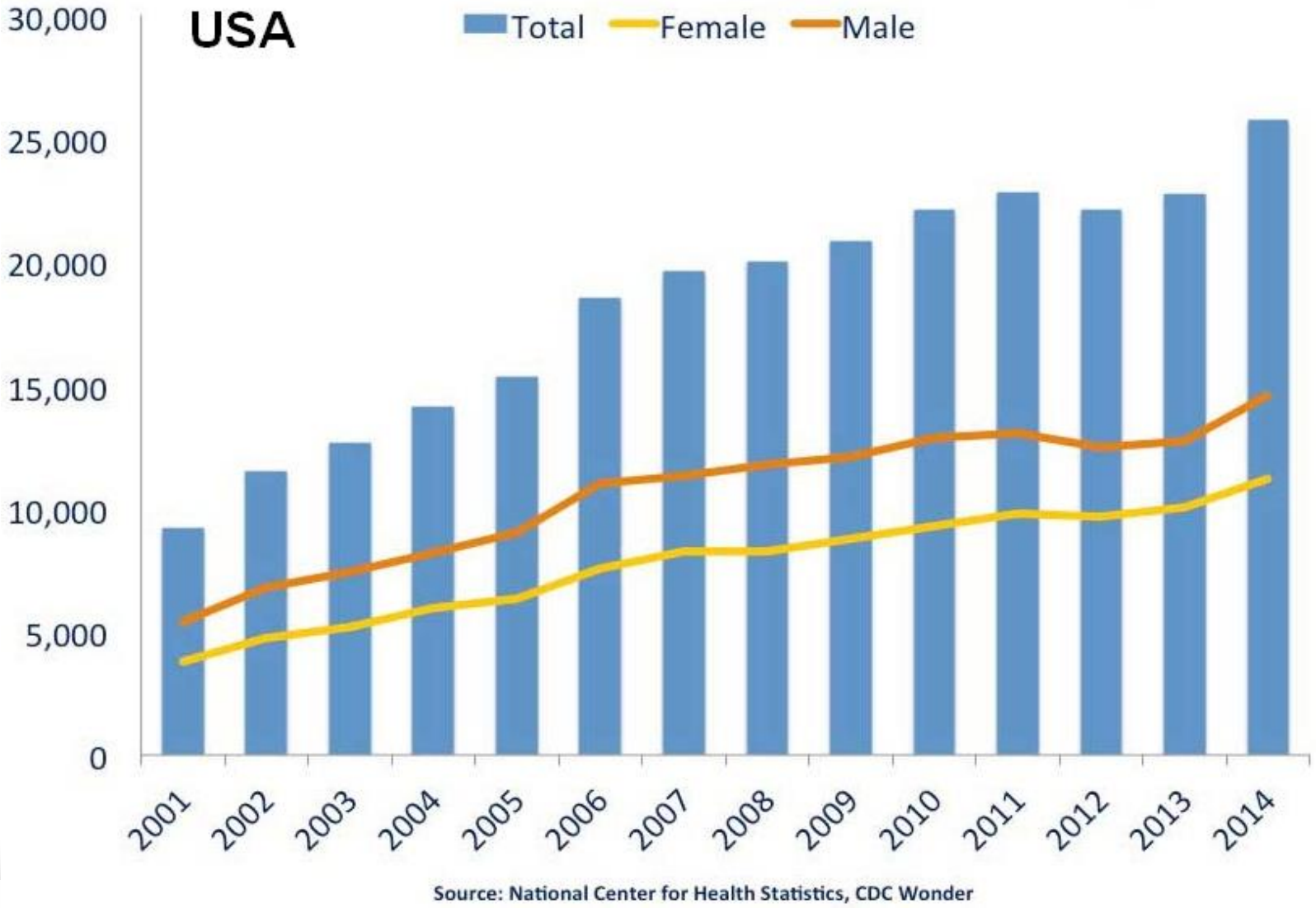
Objectives

- Background and statutes
- Define Naloxone
- Routes of administration
- Training requirements
- Immunity

The Opioid Epidemic

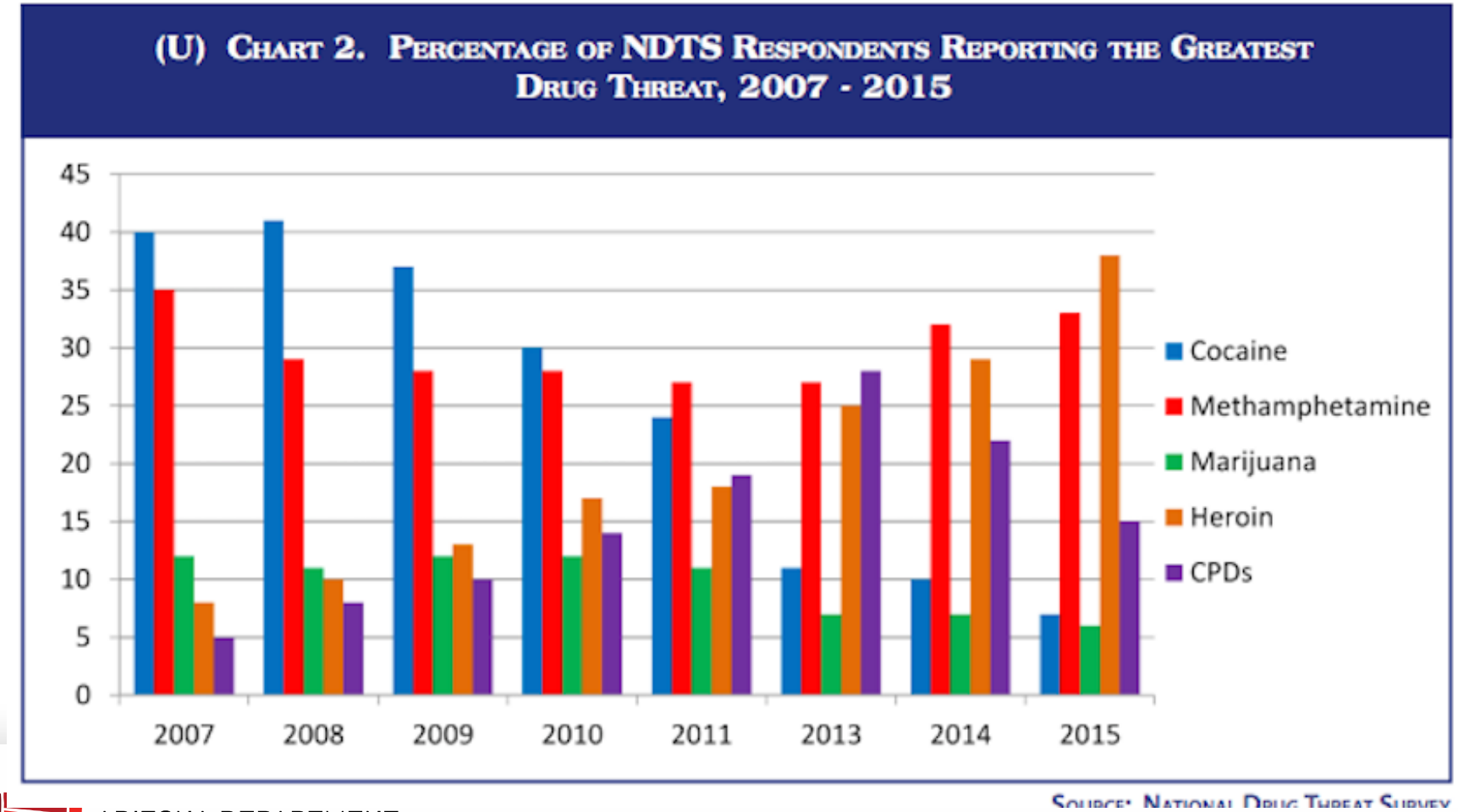
- Drug overdose is the leading cause of unintentional injury death in America.
- Opioids include legal prescriptions and illegal drugs.
- More young adults and teens in AZ are using Heroin more than ever.
- 41,502 fatal overdoses in 2012
  - 39% due to opioids

Number of Deaths from Prescription Drugs



Source: National Center for Health Statistics, CDC Wonder

Note the increasing Heroin trend



Use of Naloxone by L.E. and EMTs

- Safe, effective, well established practice
- Few side effects
- First step in combating deaths from OD
- Time-sensitive emergency

A.R.S. 36-2228

A. Requires a standing order issued by physician or nurse practitioner.

B. Mandates training on proper administration of Naloxone before LE or EMT may administer Naloxone.

C. Allows LE officer or EMT to administer naloxone.

D. States that LE or EMT may administer to a person if officer believes that the person is suffering from opioid-related overdose

A.R.S. 36-2228 con't.

E. Requires uniform training for both LE and EMT

1. Identify person suffering form opioid-related OD.
2. Use of Naloxone.

F. Provides immunity for:

1. Physicians and nurse practitioners who issue standing order
2. **Trained LE or EMTs who administer the drug.**

G. Does NOT create a duty or standard of care for LE to administer an opioid antagonist.

ARS 36-2228: Training

- Requires uniform training module for both EMTs and Peace Officers
- Helps providers identify persons suffering from an opioid-related overdose
- Training on use of Naloxone

ARS 36-2228: Immunity

- Physicians or Nurse practitioners who issue a standing order and EMTs and Peace Officers who administer Naloxone pursuant to this training ***ARE IMMUNE FROM CIVIL, PROFESSIONAL AND CRIMINAL LIABILITY***
- This includes any decision made, action taken, and injury that may result from the administration
- ***As long as those persons acted with reasonable care and in good faith***
- ***Exceptions are wanton or willful neglect***

What are Opioids/Opiates:

- Opioids – synthetic drugs
- Opiates – naturally derived from poppy plants
- Act as Depressants
    - Central Nervous System (CNS) or brain function
    - Respiratory system
    - Cardiovascular system
- Why are they abused?
    - Euphoria (to “get high”) and pain control

Use of Opioids/Opiates:

Appropriate Use

- Normally used for pain control
- Codeine and diphenoxylate (Lomotil) can be used to relieve coughs and severe diarrhea

Inappropriate Use

- Sharing
- Not completing & saving for later
- Diverted
- Abused for euphoric effects

Patients at Risk for Opioid Overdose

- Young adults experimenting with drugs
- Opiate naive
- Chronic users recently released form jail or detox or recent history of relapse
- People with chronic illness and chronic pain; includes all ages and demographics
- The “Accidental Addict”

How Opioids Kill:

- Respiratory and CNS depression
- “Slows” everything down
- Decreases level of consciousness
- Decreases respiratory drive
- Decreases heart rate and blood pressure

Effect of Opioid Overdose

- Respiratory drive is taken away or aspiration (inhaling vomit)
- Lack of oxygen (hypoxia)
- Cardiopulmonary arrest (“code”)
- Increased incidence when combined with alcohol, benzodiazepines, or other medications

Most commonly used opioids

- Heroin
- Oxycodone (Percocet, Oxycontin)
- Hydrocodone (Vicodin, Norco, Lortab)
- Hydromorphone (Dilaudid)
- Methadone
- Morphine
- Fentanyl
- Codeine
- Buprenorphone (Subutex)
- Carfentanil & Sufentanil

Methods of Opioid Administration:

- Oral (pills)
- Intravenous (IV)
- Snorting
- Smoking
- Subcutaneous, e.g. under skin (skin popping)
- Per rectum (PR) – “boofing”
- Transcutaneous (ie. Fentanyl patches)

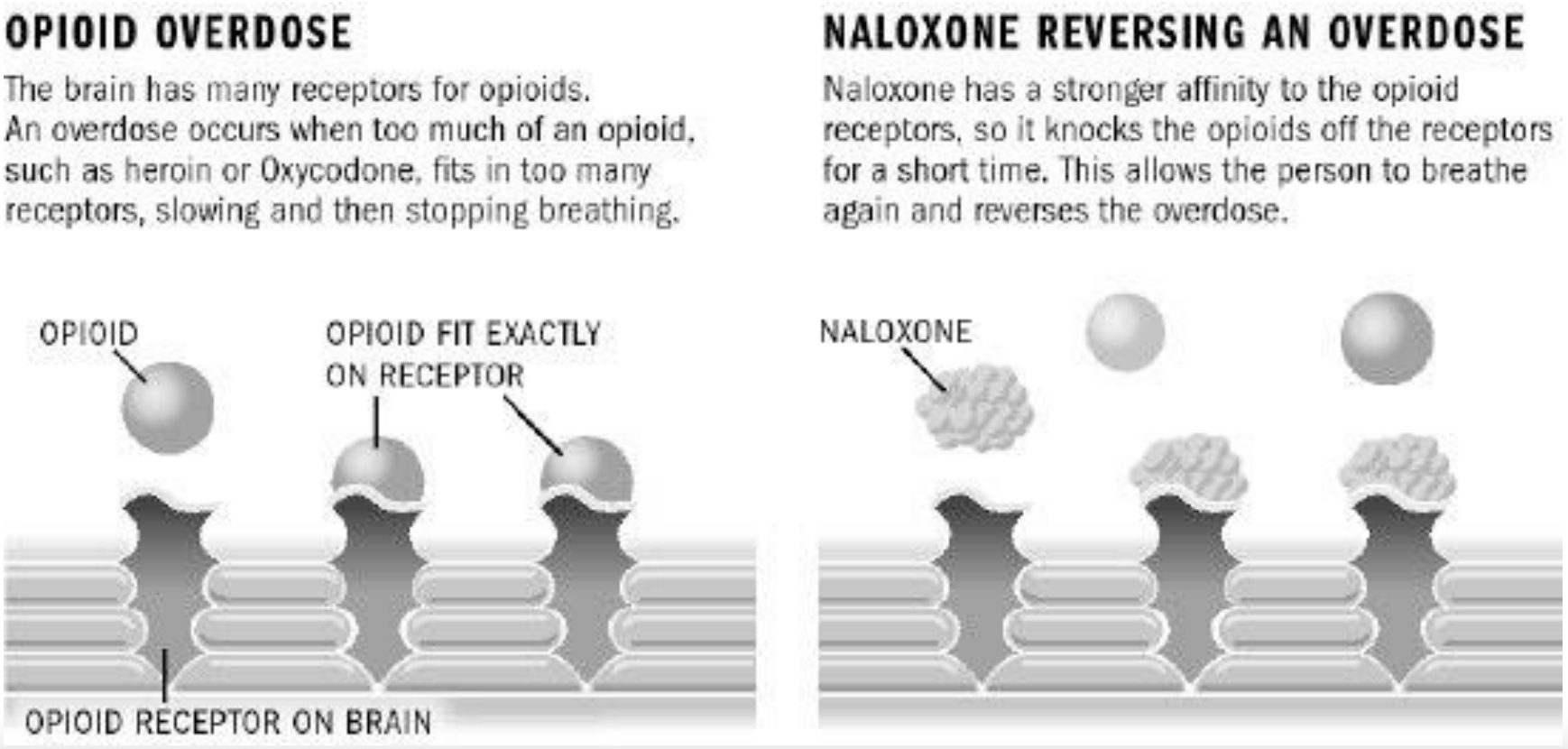
Why Naloxone (Narcan)?

- Developed in the 1960's
- Opioid antagonist (reversal drug)
- Used as an emergent OD treatment in hospital and pre-hospital settings
- Increased need for Narcan due to:
  - Greater variety of available opioids
  - Increased opioid use and abuse

Naloxone Mechanism of Action: How it works

- Safe medication
- Blocks effects of opioids on brain
- Helps OD victim breathe again by **temporarily** reversing respiratory and CNS depression
- Should improve breathing in two to eight minutes
- May result in sudden onset of withdrawal symptoms

Naloxone Mechanism of Action



Things to know about Naloxone

- Does not reverse other ODs
  - cocaine, methamphetamines, benzodiazepines (e.g., Xanax, Klonopin and Valium), alcohol, etc.
- In a person dependent on opioids may produce withdrawal symptoms.

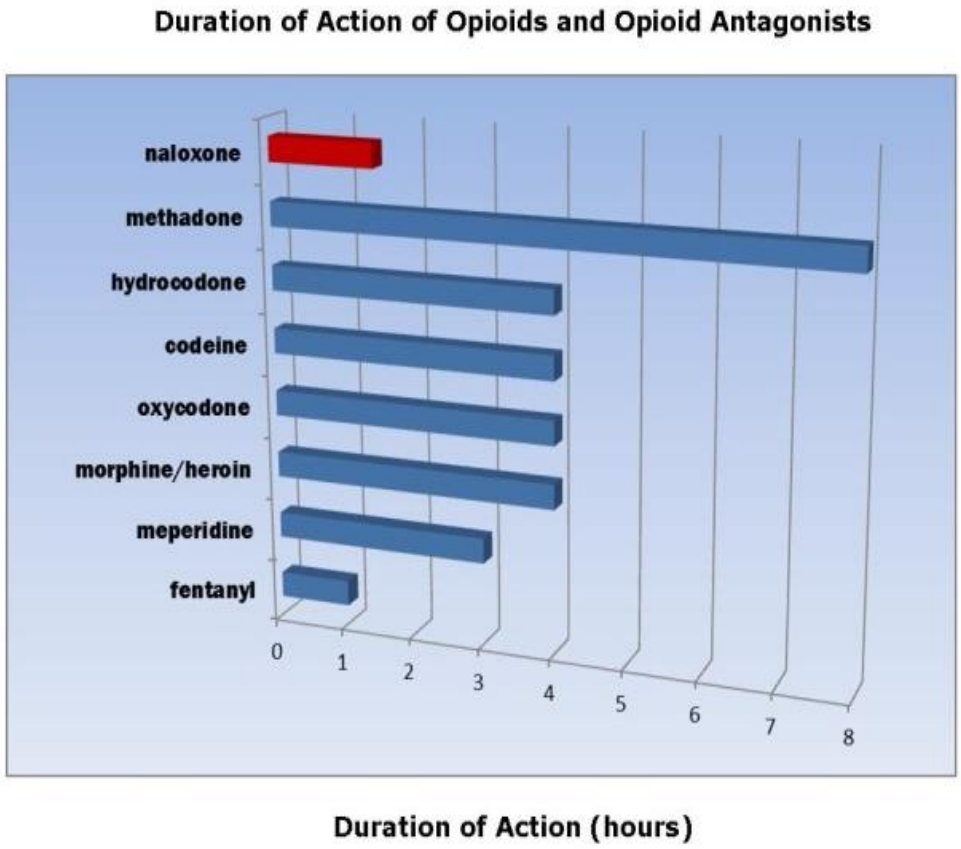
Naloxone does NOT reverse overdoses due to:

- **Sedatives**
  - Valium
  - Ativan
  - Xanax
  - Alcohol
- **Stimulants**
  - Cocaine
  - Amphetamines

Symptoms of Opioid Withdrawal

- Agitation
- Tachycardia (rapid heart rate)
- Pulmonary edema (fluid in lungs)
- Nausea
- Vomiting
- Diarrhea
- Seizures (?)

Naloxone vs Opioid Drug Duration



- Naloxone relatively short duration compared to opioid.
- Naloxone may wear off and, dependent upon amount of opioid, signs of OD may reappear.

Routes of Administration:

- LE or EMT's:
  - Intramuscular (IM)
  - *Intranasal (IN)
- Paramedics, AEMTs, EMT-I
  - Intramuscular (IM)
  - Intranasal (IN)
  - Intravenous (IV)
  - Intraosseous (IO)
  - Endotracheal (ET)

Benefits of Intranasal or Auto-Injector

- IV access may be difficult to establish in chronic IV drug abusers
- Decreased risk of **needle stick injury**
- Decreased risk for **infectious disease exposure**
- Simple, fast and convenient

Benefits of Intranasal Administration:

- Works quickly
  - Nasal mucosa has a large absorptive area
  - Drug goes directly into the bloodstream
- Nose is an easy access point
- Starts working as fast as IV administration
- Atomizer facilitates quick administration
- Painless

Benefits of Prepackaged Nasal Spray:

- Contains pre-measured dose, reduces medication dosing errors.
- Designed for self or peer-administration of medication
- Ease of use

When to use Naloxone

- Altered level of consciousness
- Respiratory depression or apnea
  - Slow, shallow breathing (< 10 breaths/minute)
  - Apnea (not breathing)
- Unable to wake up with painful stimuli
- With Associated:
  - Constricted (pinpoint) pupils, Profuse sweating (diaphoresis), Pale or cyanotic (blue), Needle/track marks

High versus Overdose

REALLY HIGH	OVERDOSE
Muscles become relaxed	Pale, clammy skin
Speech is slow/slurred	Very infrequent or no breathing
Sleepy looking	Deep snoring or gurgling (death rattle)
Responsive to stimuli (such as shaking, yelling, sternal rub, etc.)	Not responsive to stimuli (such as shaking, yelling, sternal rub, etc.)
Normal heart beat/pulse	Slow heart beat/pulse
Normal skin tone	Blue lips and / or fingertips

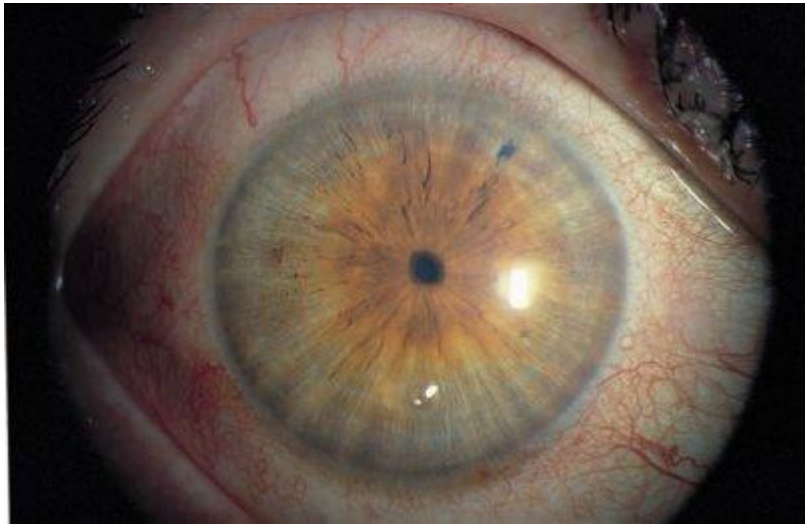
Reasons to suspect opiod overdose

- When informed by the dispatcher
- Opioid drugs found on scene
- Opioid drug paraphernalia found on scene (needles, syringes, chore boy, a burnt or charred spoon)
- Witnesses state victim was taking some sort of opioid prior to OD
- Known heroin user location

Paraphernalia commonly found on scene of overdose

Fentanyl-related Issues

Constricted Pupil



Look for pupils <3mm

1mm = about the width of the side of a dime

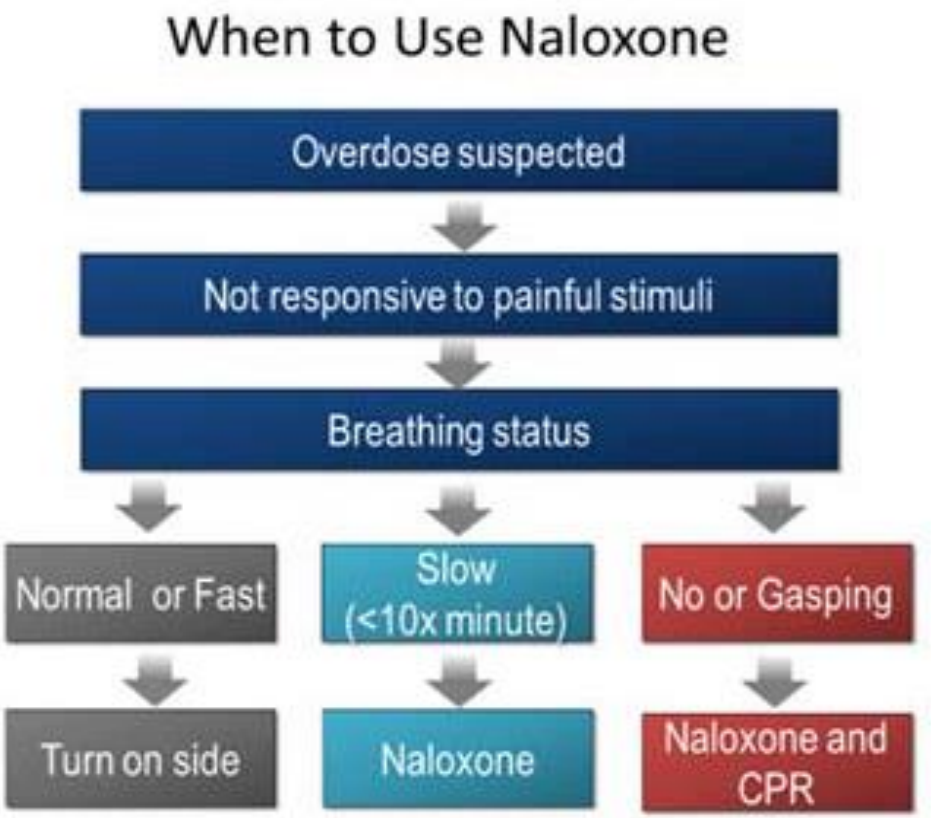
Mimics of Opioid Overdose

- Cardiac Arrest
- Low blood sugar
- Head injury
- Stroke
- Shock
- Hypoxia (low oxygen)

When should I give Naloxone?

- If you suspect an opioid overdose and the patient has signs/symptoms of an opioid overdose → give Naloxone
- Only give Naloxone if opioid OD is suspected & the person is unconscious
- Not every unconscious person is an opioid OD
- The dose of Naloxone may not be enough to reverse the effects of the opioid

Simple Naloxone Algorithm



Safety Considerations & Adverse Effects

- **Dispatch EMS**
- **Use caution**:
  - Rapid opioid withdrawal may cause nausea, vomiting, diarrhea, and combativeness
  - **Roll patient on their side to keep airway clear**
- If no response within 3-5 min, administer 2nd dose, if available
- Naloxone has a short duration of action
- Patients may develop recurrent respiratory and/or CNS depression

Scene Safety is your #1 Priority

- *Stay aware of surroundings* during victim evaluation, setup, and administration of Narcan especially if by yourself
- You may lose tactical advantage quickly due to most victims being on the ground and in close quarters with awkward access to the victim and difficult egress from the victim etc.
- You will generally be in a crouched or kneeling position with your hands full if an outside influence engages you, or your victim turns violent during the treatment
- If alone, request backup prior to administration of Narcan due to potential for violence from victim. OD victims *do not react the same*, the unpredictable nature of the victims requires intense situational awareness at all times

Body Substance Isolation

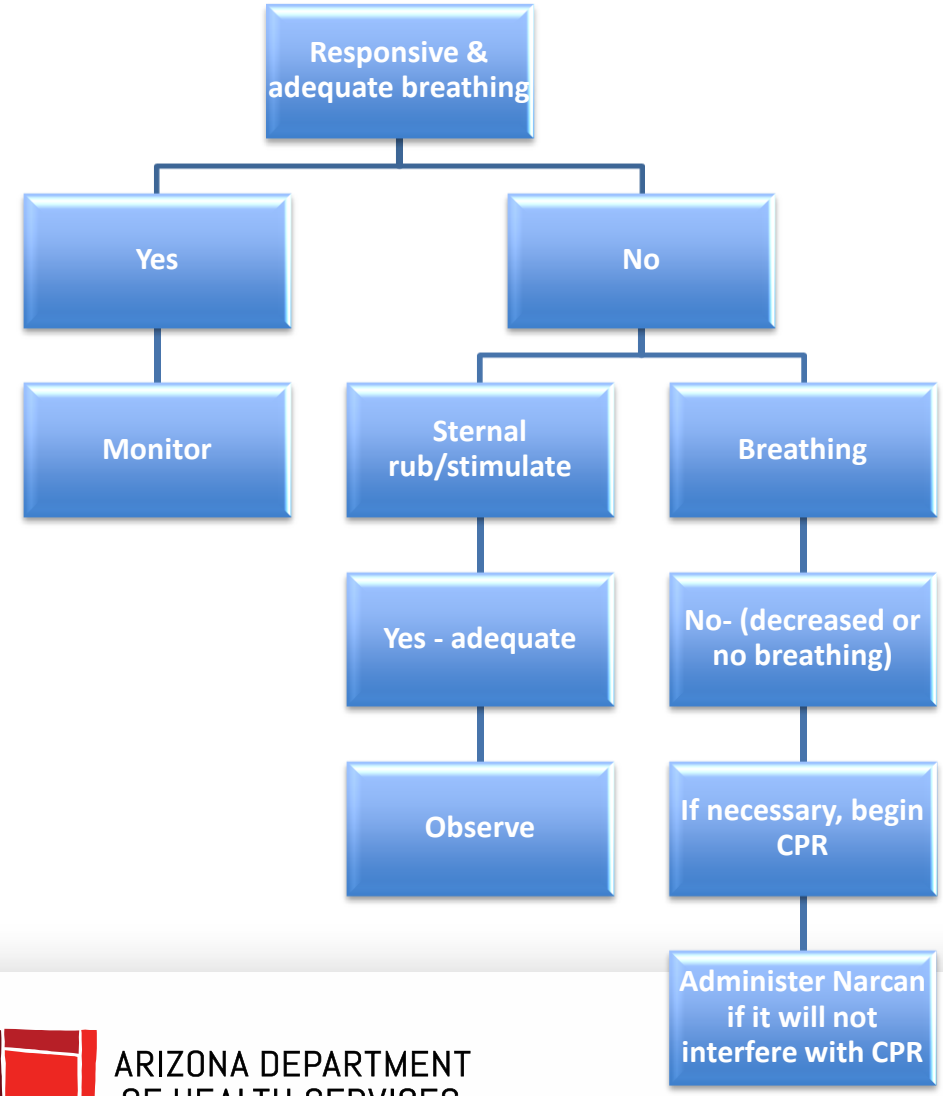
Use body substance isolation (BSI/PPE) prior to any direct victim treatment.

- Drug addicts, especially intravenous users, are at high risk for communicable diseases such as Hepatitis B, C, or HIV
- Bodily fluids will commonly be present, and the risk of you coming in contact with them will be extremely high
- Blood, vomit, saliva, urine, and feces are all capable of transmitting different diseases. Protect yourself!

Needles

- Be aware of any exposed needles or other paraphernalia that you may potentially come in contact with
  - **Under no circumstance should you try and recap a needle.**
- EMS can safely dispose of needles for you
- If drug paraphernalia is kept as evidence, consider placing in puncture-resistant containers, e.g., paint cans

Procedure for Naloxone Administration

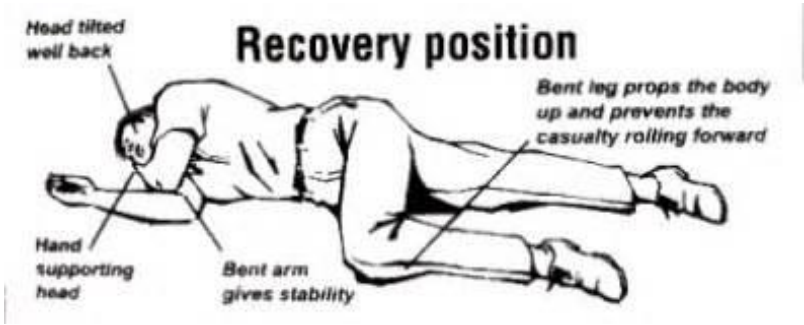


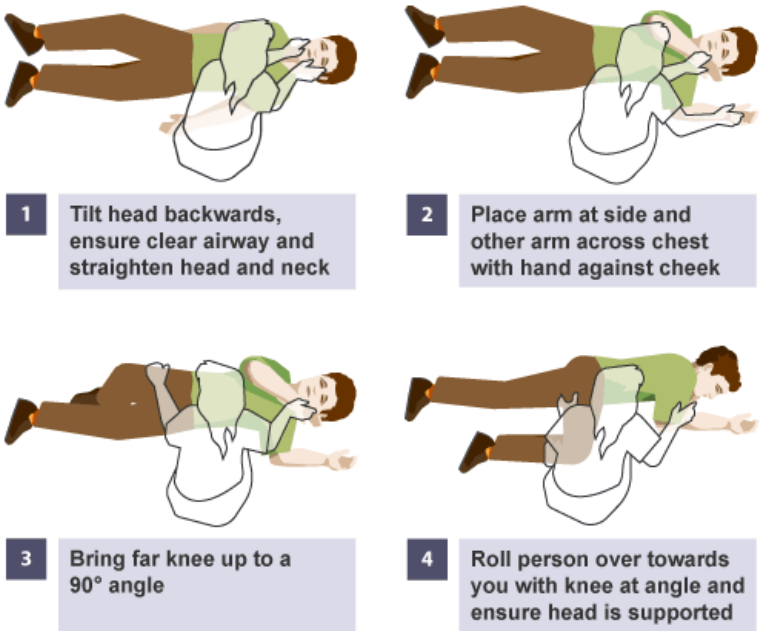
- **Recognize opiate OD**
  - Decreased LOC
  - Decreased/No Breathing
  - Opioid OD setting
- **Give sternal rub/stim**
- **If no – Administer Naloxone**
- **Recovery Position**

Sternal Rub

Sternum - bone in center of chest that joins ribs on either side

Recovery Position

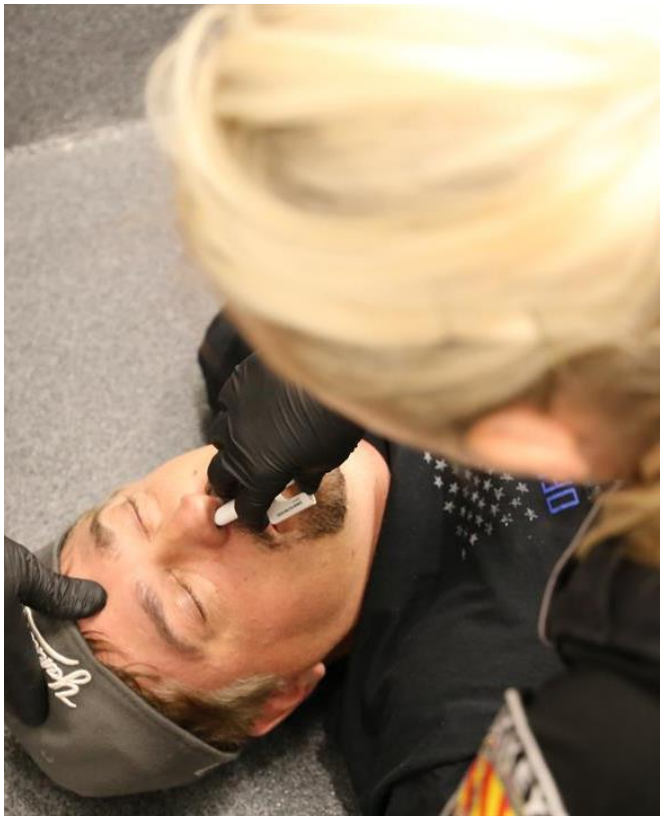




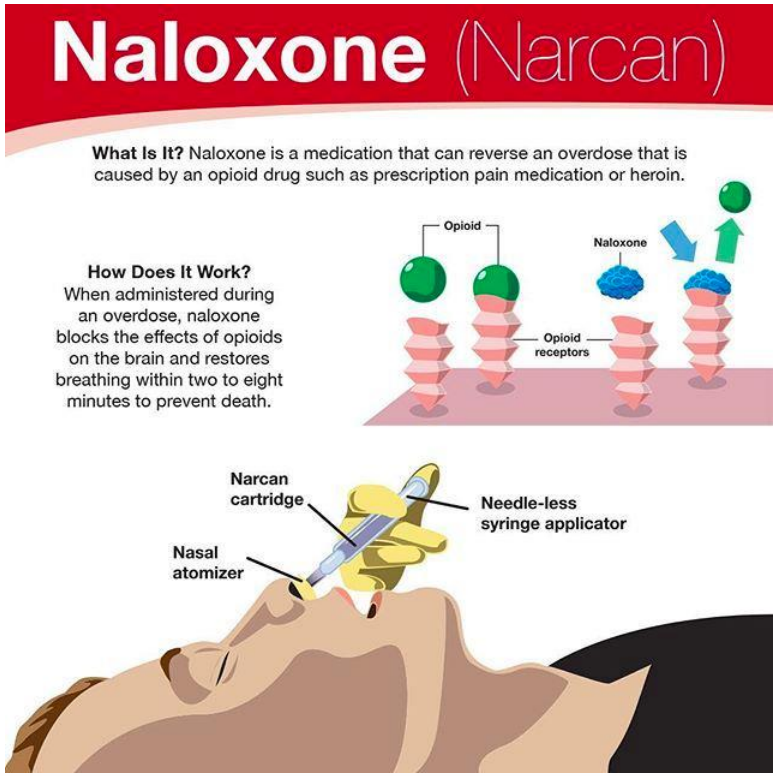
Naloxone Dose (Adult & Pediatric)

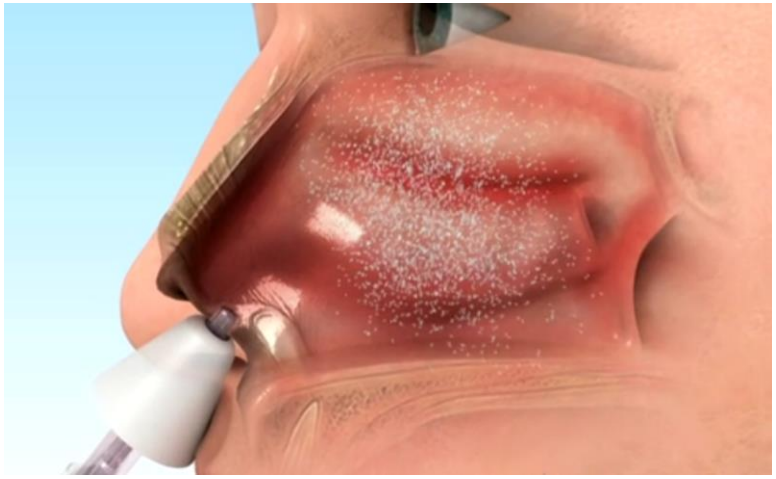
- **Auto-injector (IM)**
  - 0.4 mg IM dose
  - If no response >2min, may repeat as necessary
  - **Max dose 4 mg**
- **Intranasal (IN)**
  - 1 mg in each nostril using Mucosal Atomizer Device (total of 2 mg)
  - 4mg if using prepackaged dose
  - If no response >2min, may repeat
  - **Max dose of 4 mg.**

Two Intranasal Options



Nasal Passages





Prepackaged Intranasal (IN) Naloxone Administration

- Open package
- Remove foil backing
- Insert in patients nose
- Depress the plunger on the underside

Prepackaged Intranasal (IN) Naloxone Administration

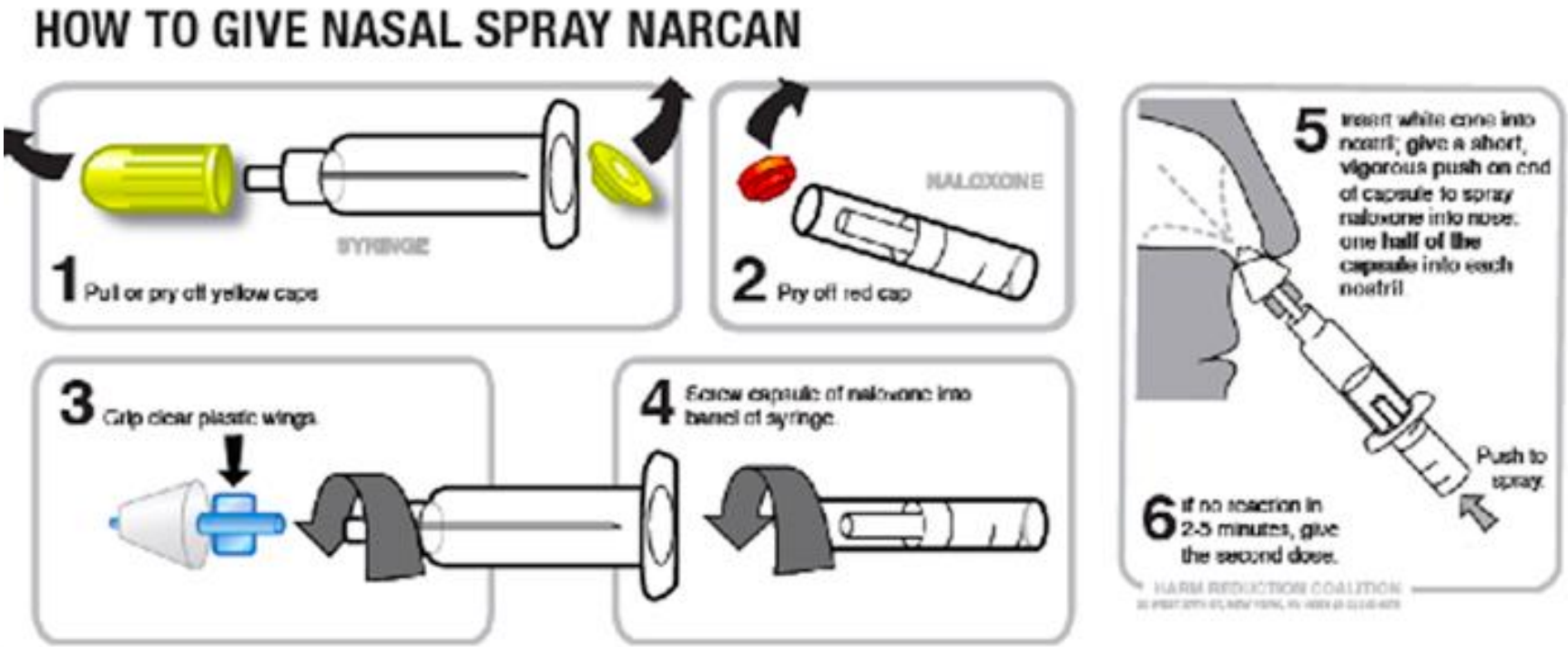
Intranasal dose with Mucosal Atomizer

- Take the cap off the medication
- Remove the 2 caps from each end of the applicator
- Apply the atomizer onto the end of the applicator
- Tightly screw the medication into the applicator
- Insert the atomizer into the nostril
- Push the syringe
- Administer 1 mL into each nostril

Intranasal dose with Mucosal Atomizer

- The tip of the atomizer should be placed near or just inside the nostril:
  - Placement of the syringe too far inside the nasal cavity may traumatize the nasal passages or cause bleeding.
  - The use of the atomization device on the tip of the syringe prevents nasal trauma and maximizes the delivery of the medication to the patient.

Intranasal dose with Mucosal Atomizer

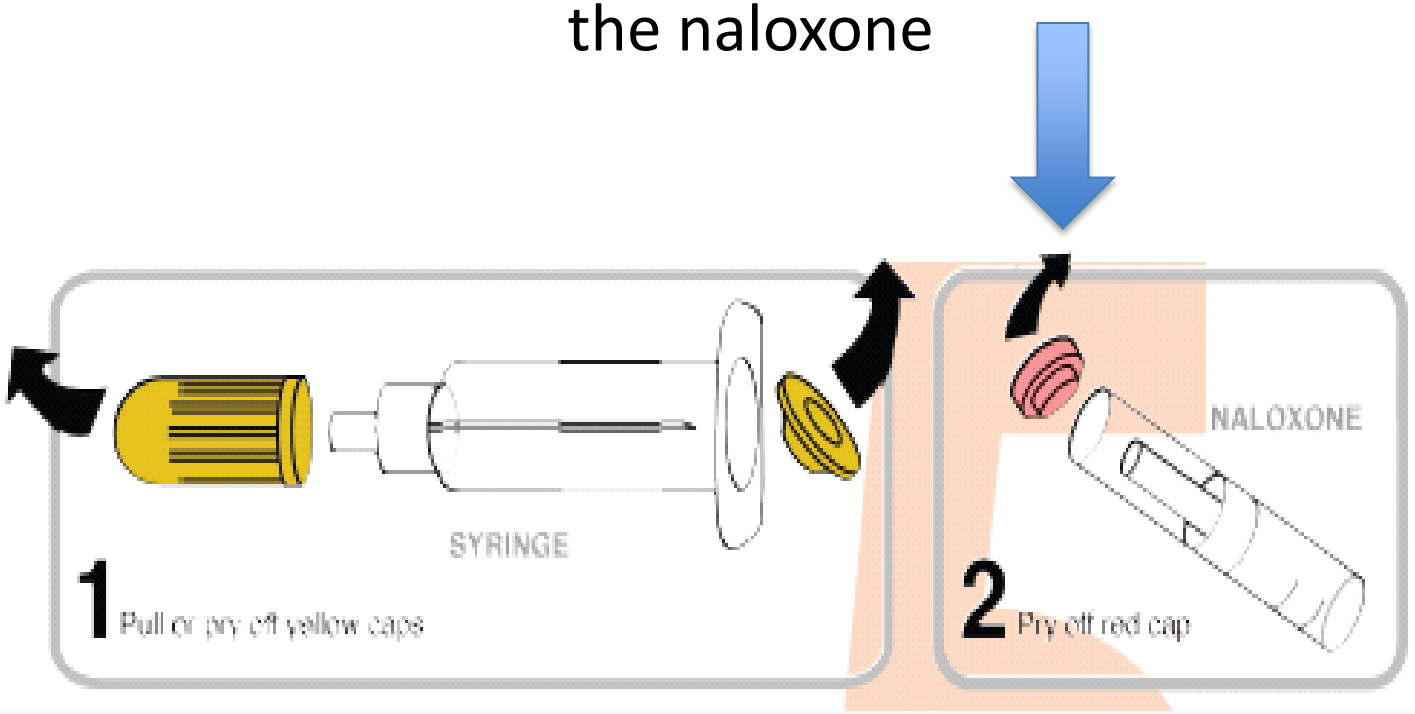


Intranasal dose with Mucosal Atomizer

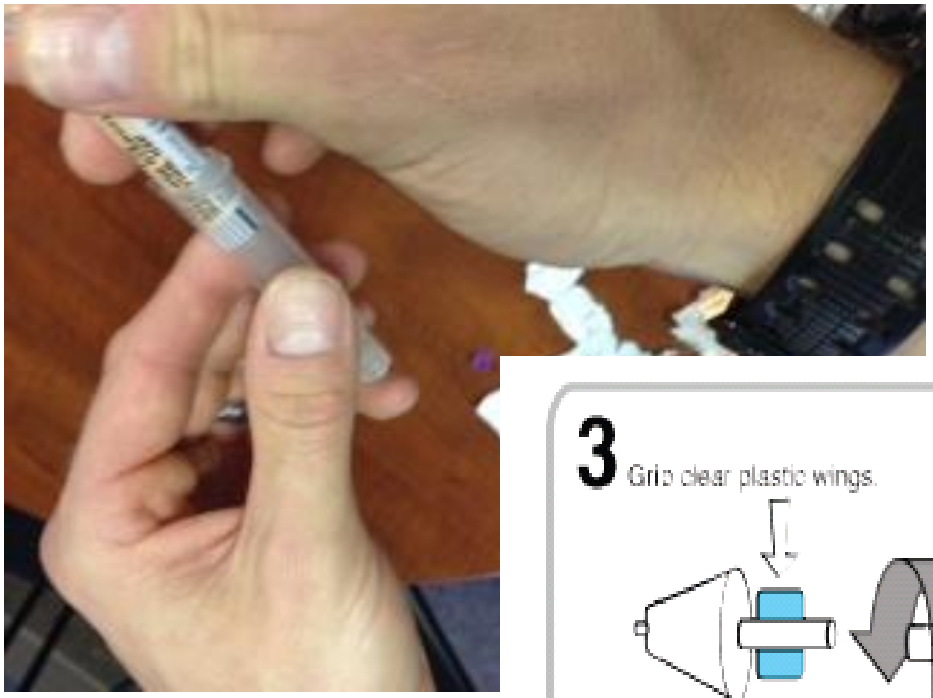
Remove both yellow caps from syringe

Intranasal dose with Mucosal Atomizer

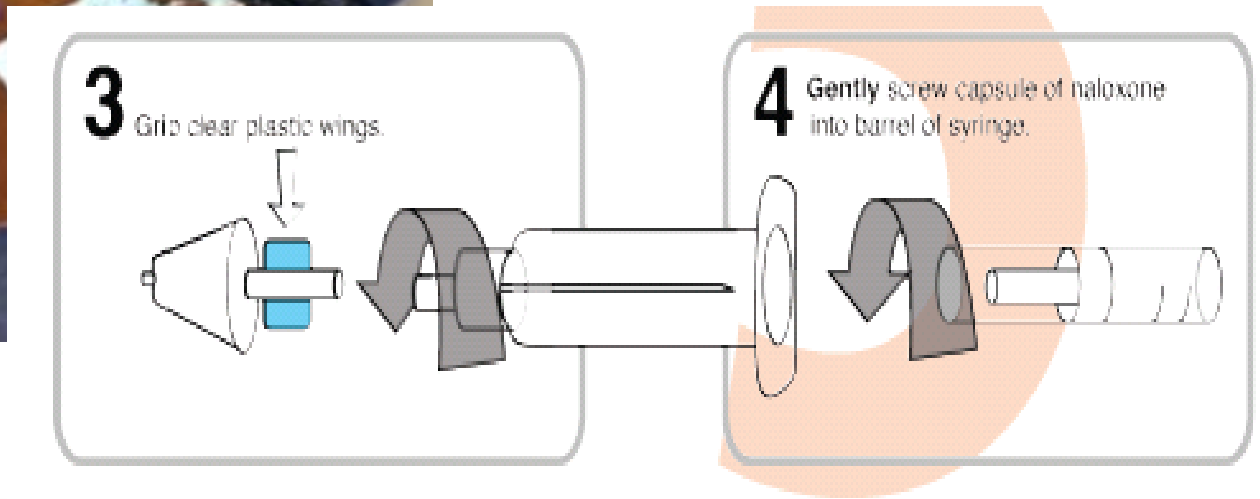
Remove the red cap from the naloxone



Intranasal dose with Mucosal Atomizer



Insert the naloxone into the syringe



Intranasal dose with Mucosal Atomizer

Attach the mucosal atomizer device to tip of syringe

Card which could be printed, laminated and carried as a reference for

Administration for Naloxone

NARCOTIC OVERDOSE SIGNS AND SYMPTOMS

*BLUE LIPS AND FINGERS
*DROWSY/UNRESPONSIVE
*FAST/SLOW/ABSENT PULSE
*SHALLOW/SLOW OR ABSENT RESPIRATIONS

INTERVENTION

1. Assure the scene is safe for bystanders and yourself.
2. Medically assess the patient.
3. If you note a pulse but few or no respirations, assist with the breathing.
4. If you suspect narcotics are involved, administer the nasal naloxone after at least 2 rescue breaths.

NO PULSE AND NOT BREATHING:

1. If no pulse and no respirations, begin CPR and assist with the breathing.
2. If appropriate and available, Apply AED.
3. If you suspect narcotics are involved, administer the nasal naloxone.

NALOXONE ADMINISTRATION

1. Take the cap off the medication.

2. Remove the two caps from each end of the applicator.

3. If not previously done, apply the atomizer onto the end of the applicator.

4. Screw the medication into the applicator. There is a needle within the applicator that bevels into the syringe and will release the medication when the syringe is pushed.

5. Insert the atomizer into the nostril and push the syringe.

6. Apply one milliliter (ml) into each nostril. The amount is measured on the side of the syringe.

Date: ___ / ____ / ________
Patient Care Report Number: ____________________
(eRecord.01)

Location: _________________
Gender: M or F or U
Indicators of Use: [LOC] [Respiratory depression] [No response]
[Miosis] [Needle Track Marks] [Diaphoresis] [Cardiac Arrest]

Dose: ______ mg Route: Leg Nose Time: ___________
Dose: ______ mg Route: Leg Nose Time: ___________
Dose: ______ mg Route: Leg Nose Time: ___________
Response to Administration: __________________________
Police Agency: _______________________________
Officer Last Name: _____________________

Date: ___ / ____ / ________
Patient Care Report Number: ____________________
(eRecord.01)

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