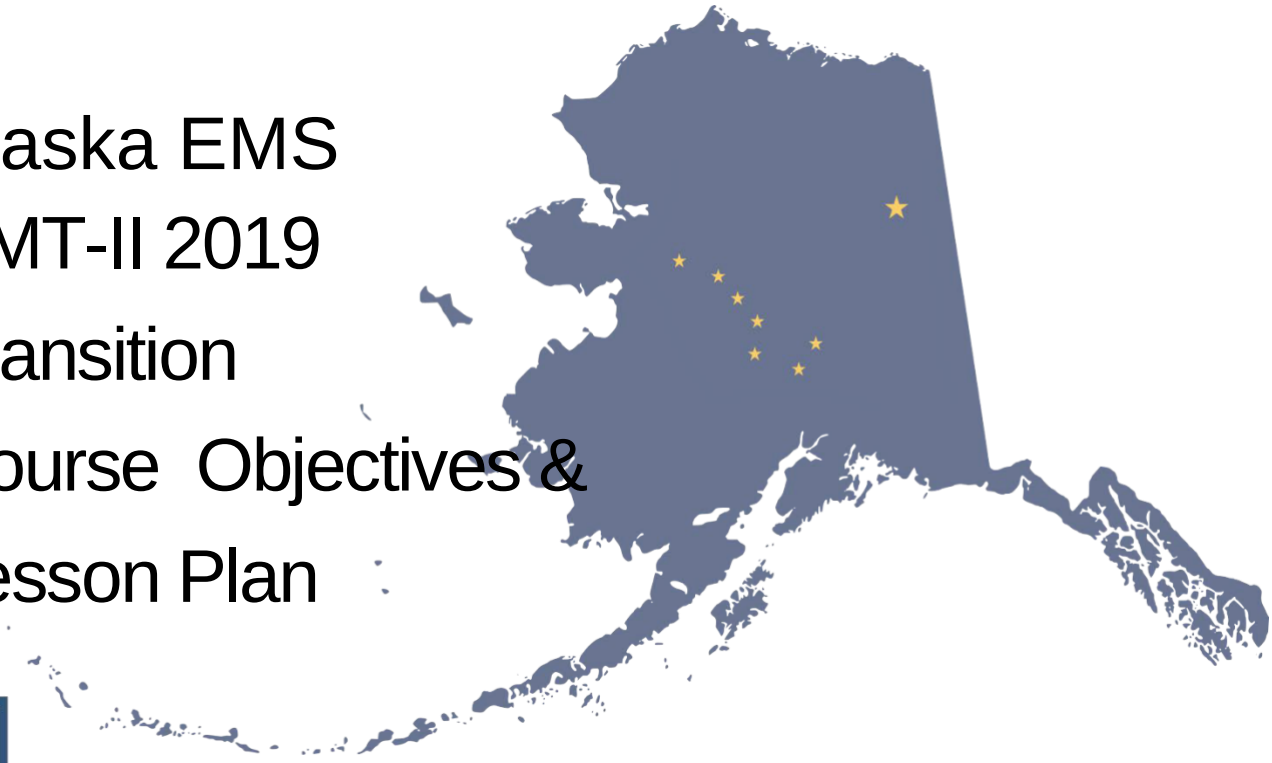
Alaska EMS EMT-II 2019 Transition Course Objectives & Lesson Plan



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Revised October 2020

PREFACE

The purpose of this outline is to present a framework for the instruction of Alaska Emergency Medical Technician-2 transition training program approved by the Alaska Department of Health and Social Services to qualified students. This supports those who are currently certified and in good standing as an EMT-II and are transitioning to the 2019 Scope of Practice.

Before the course, students should spend time focusing on the areas of medical terminology, Alaska-adopted skill sheets, and anatomy/physiology. Students can draw the information to study these areas from the Alaska EMT-I and EMT-II Curricula, ***Alaska EMS Psychomotor Portfolio***, ***Alaska Certification and Licensure Manual***, and ***Cold Injury Guidelines***.

This curriculum is designed to be consistent with the version of American Heart Association's Guidelines for CPR and Emergency Cardiovascular Care in effect at the time of writing. In the event that the contents of the curriculum deviate from current BLS or ACLS standards, the BLS or ACLS standards will take precedence, except if specific protocols exist for the area of conflict, such as in the ***Cold Injuries Guidelines*** exist. Patient assessment and care objectives are intended to reflect patients of any age, unless specifically noted otherwise.

This curriculum is designed to build upon the EMT-I and EMT-II knowledge and skills contained in the 2019 Alaska EMT-I and 2002 EMT-II curricula. It outlines what knowledge and skills are expected of an Alaska EMT-II performing under the 2019 Scope of Practice. It does not prohibit the physician sponsor from specifying the scope of activities, whether that be limiting practice to a subset of the EMT-II skills or expanding the EMT-II's skills in accordance with 7 AAC 26.670. Evolving issues should be covered thoroughly by the instructor.

The EMT-II curriculum builds on a presumed shared base of knowledge, skills, and proficiency prior to course start, including:

- All 2019 Scope of Practice (or more recent) EMT-I skills and content*, including intramuscular injections and inserting supraglottic advanced airway devices;
- All Alaska-specific content required for Alaska reciprocity;
- And, all EMT-II (2002 curriculum) knowledge and competencies

*This may require successful completion of a 2019 Scope of Practice transition course.

Proficiency in the below skills are required for completion of the EMT-II course. This may be recorded on the *Alaska EMS Psychomotor Portfolio*:

- Initiating, maintaining, and discontinuing intravenous lines containing therapeutic crystalloid solutions;
- Initiating, maintaining, and discontinuing intraosseous lines;
- Obtain blood for laboratory analysis;
- Storing and properly administering dextrose-containing solutions, diphenhydramine, epinephrine (0.1mg/ ml concentration), glucagon, lidocaine

for intraosseous infusion analgesia, naloxone HCl (other than intranasal), ondansetron, and tranexamic acid; and,
- Capnography waveform monitoring and interpretation.

Note: ALL punctures performed on people SHALL be performed with a needle manufactured with a “safer medical devices” or engineering and work-practice control such as sharps with an engineered sharps injury protection and/ or needleless system design. Accidental needlestick injuries with a risk for biohazard/ infectious disease transmission must be filed with the course medical director and sponsoring entity’s protocols, with correlating actions and response.

TABLE OF CONTENTS

Lesson 1: **PREPARATORY**

The EMT-II has a variety of duties and is imperative they understand their legal, moral and ethical responsibilities. These responsibilities occur during training and in the practice of patient care. At the completion of this section, the student will be able to:

ROLES AND RESPONSIBILITIES

Objectives:

1.1 List current state requirements for enrollment in, and completion of, a 2019 EMT-II training program.
1.2 Identify and describe those activities performed by a 2019 EMT-II in the field.
1.3 Discuss methods to optimize personal and team performance

Psychomotor objectives: none

Lesson Content:

A. Review course requirements: state and department specific.
   1. State requirements for and EMT-II course are located in the 2019 Guide for EMS Certifications and Licensure, Appendix A: Personnel, Section 2.3

B. Optimizing Personal and Team Performance (Dynamics)
   1. The EMT-II may find themself in a role of leadership based on their certification level or otherwise.
      a) Titles and ranks are bestowed, but becoming a trustworthy leader is hard-earned.
   2. Act on behalf of the patient- differences or friction can be sorted out after patient care
      a) Courtesy is inferred in radio traffic, but not on scene. Competence doesn't require dictatorship. Be attentive to your facial expressions- others certainly are.
   3. Good followership is as important as good leadership
   4. Use communication techniques discussed in: Communication/ Documentation
   5. Assure shared vision or shared mental model of next steps
   6. Situational awareness is an individual and group responsibility
   7. Promote knowledge sharing
      a) Safety culture that allows for speaking up
      b) Contribute ideas in a respectful way
      c) Receive ideas in a respectful way
      d) Display mutual respect among team members regardless of training level or experience
   8. Encourage cognitive offloading (e.g., using protocols, checklists, and resources)

EMS SYSTEMS

Cognitive objectives:

1.4 Discuss prehospital care as an extension of hospital care including transition of patient care from the EMT-II, including:
   a. Transfer of responsibility (legal and medical).
   b. Reporting of patient status to physician, midlevel provider, nurse, or ALS responder.

Lesson Content:

A. Patient Care and Transfer of Care
   1. Discuss the EMT-II's initial responsibilities when arriving on scene.
   2. Transfer of Care
      a) EMS crews delivering a patient to the Emergency Department have the following responsibilities:
         1) Continue all necessary patient care until a full transfer of care has been made to a Nurse, Physician, or APP. This ensures patient safety and continuity of care.
         2) Do not leave the patient until transfer of care occurs face to face with a Nurse, Physician, or APP who will accept and continue care.
   3. Other responsibilities
      a) Leave copy of field notes, 12-lead ECG, or other paperwork with the patient's chart in the receiving facility.
      b) If your agency performs electronic charting, make sure the report is complete within the allotted timeframe.
      c) Return the ambulance to response-ready condition as soon as possible after completing necessary patient care and verbal reporting duties.

MEDICAL/LEGAL CONSIDERATIONS

Cognitive objectives: none

Psychomotor objectives: none

COMMUNICATIONS/ DOCUMENTATION

Note: Communications/ Documentation content does not have to be delivered in one block, may be inserted as appropriate with other topics.

Cognitive objectives:

1.5 Review the components of a legally defensible EMS report that includes interventions from the EMT-II.

Psychomotor objectives:

1.6 Demonstrate proper use of a mobile or portable transmitter in a real or simulated patient situation to transmit patient assessment and treatment information, placing emphasis on medications administered (e.g., TXA).
1.7 Properly complete an EMS patient care report, including a narrative in a standardized format, based on a real or simulated patient situation.
1.8 Demonstrate effective team communication, to include closed-loop communication.

Lesson Content

A. Documentation
   1. Principles of accurate, defensible medical document and report writing now include additional content from pharmacology, medication administration, and other EMT-II interventions (e.g., intravenous/ intraosseous procedures)

B. Communicating with Other Health Care Professionals
   1. Communication with Medical Control
      a) EMT-IIs may need to contact medical control for consultation and to get orders for administration of medications
      b) EMT-IIs must be accurate
      c) After receiving an order for a medication or procedure—repeat the order back word for word
      d) Orders that are unclear or appear to be inappropriate should be questioned or clarified by the EMT-II
   2. Communication among EMS Professionals (Team Communications and Dynamics)
      a) Act on behalf of the patient- differences or friction can be sorted out after patient care
      b) Use closed- loop communication
      c) Be mindful of tone. There is a targeted goal that balances competence, control of a scene, and calm composure without being condescending or commandeering.
      d) Assure shared vision or shared mental model of next steps
      e) Situational awareness is an individual and group responsibility
      f) Promote knowledge sharing
         1) Safety culture that allows for speaking up
         2) Contribute ideas in a respectful way
         3) Receive ideas in a respectful way
         4) Display mutual respect among team members regardless of training level or experience
      g) Encourage cognitive offloading (e.g., using protocols, checklists, and resources)

C. Communication with Receiving Facilities
   1. Report from the EMT-II supports having the right room, equipment and personnel prepared, or allow the facility to plan for the patient
   2. Promote standardized approach to verbal reports to limit opportunity for omission (E.g., SBAR, SOAP, department template.

Lesson 2: **BASIC ANATOMY, PHYSIOLOGY, AND PATHOPHSYIOLOGY**

Cognitive objectives: none

Psychomotor objectives: none

Lesson 3: **PHARMACOLOGY**

PRINCIPLES OF PHARMACOLOGY

Cognitive objectives:

3.1 Demonstrate functional use of the metric system as it applies to medication administration

Psychomotor objectives:

3.2 Demonstrate bolus drug dose calculations, including volume to be administered, confirming with a double-check system (preferably by a second provider).

3.3 Demonstrate calculation and preparation of a pediatric medication dose, using a length-based measuring device or weight-based calculation.

Lesson 4: **MEDICATIONS**

Cognitive objectives:

4.1 For each of the following medications give the following: 1) state the generic and trade names, 2) classification, 3) indications, 4) contraindications, 5) precautions including compatibility, 6) medication form(s), 7) dose, 8) route of administration, 9) action,10) side effects and 11) re-assessment strategies:

a. Dextrose in Water (5%, 10%, 25%, 50%)
b. Diphenhydramine
c. Epinephrine 1mg/10ml (100mcg/ml) IV (cardiac arrest only)
d. Glucagon
e. Lidocaine (analgesic) for IO flush
f. Nitrous Oxide (NO2)
g. Ondansetron
h. Nitroglycerin (sublingual) (NTG)
i. Tranexamic Acid (TXA)

4.2 Describe reconstitution (e.g. Glucagon) or admixture (e.g. TXA) of medications for administrations

Psychomotor objectives:

4.3 Given a patient scenario, state and/ or demonstrate the correct drug, dosage, and administration route(s) for:

a. Dextrose- containing fluids- specifically Dextrose 10%
b. Diphenhydramine
c. Epinephrine 1mg/ 10ml IV
d. Glucagon
e. Lidocaine for IO flush
f. Nitrous Oxide (*Optional due to availability*)
g. Ondansetron
h. Nitroglycerin (Sublingual)
i. Tranexamic Acid
    1. Verbalize and demonstrate safe hand-off report procedure after TXA administration to assure ongoing care, to include patient marking or wristband.

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Lesson Content

Sample drug information cards and other supporting materials are available in the Alaska EMS instructor reference repository

Lesson 5: INTRAVENOUS/ INTRAOSSEOUS ACCESS AND THERAPY

Cognitive objectives:

5.1 Given a scenario, list current intravenous/ intraosseous solutions used in practice in EMS and advantages or disadvantages or each, including for pediatric care.
5.2 Discuss adult and pediatric insertion sites for both IV and IO, and the advantages and disadvantages of each.
5.3 Use an approved burn fluid resuscitation formula (or approved Alaska reference) to determine fluid replacement dose when given a patient scenario for an infant, child, and adult.
5.4 Recognize patients who require IV/IO access and/or fluid replacement when given several patient presentations, including pediatric patients.

Psychomotor objectives:

5.5 Demonstrate access and fluid therapy equipment including:
    a. Saline locks (including needle-less system)
5.6 Demonstrate the successful establishment of an intraosseous line, using proper aseptic technique, in an IO mannequin (or similar set up).
5.7 Demonstrate fluid infusion techniques for both IV and IO therapy.

Lesson Content

A. Special Considerations in Fluid Resuscitation
    1. Permissive Hypotension
        a) Many protocols guide IV fluid resuscitation amounts by targeted blood pressure (for example, achieving a SBP of 100 and then keeping IV fluids at KVO) or by decreasing tachycardia. Follow local protocols.
    2. Reperfusion Injury

3. Burn Patients- *(Below content is based on Alaska burn care guidelines which are currently being revised and updated by the Alaska Trauma System Review Committee*.)
    a) Start at least one large bore IV in patients meeting any of the burn criteria in the beginning of this document.
    b) A second IV should be placed for large burns (>20%) or those presenting with altered mentation or other signs of shock.
    c) If accessible, a longer length catheter will tolerate swelling associated with burn edema. IVs may be inserted through burned area, if necessary.
    d) IO may be considered and, as with IV placement, a longer IO needle will be more likely to tolerate swelling.
    e) Humoral IO in adults is preferred.
    f) Frequent reassessment of patency is recommended.
    g) For obvious large burns, begin age-appropriate burn fluid administration during the initial prehospital ALS care (until a formal TBSA can be calculated).
    h) Fluid administration guidelines:
        1) For the first hour of initial stabilization, use an hourly rate:
            (a) Adults: 500ml/hour for those ≥ 14 years old, until an accurate assessment of burn injury may be performed
            (b) Age ≤ 5 yo: 125ml /hr for children less than 5 years;
            (c) Age 6-13: 250ml/hour
        2) If transport will be greater than one hour, perform an initial assessment of TBSA using the Rule of 9's and begin initial fluid resuscitation based on the American Burn Association Consensus Formula:
            (a) 2-4ml/kg/% TBSA Burn (LR preferred) in the 1st 24 hours
            (b) Give ½ in the first 8 hours post-burn
            (c) Give ½ in the next 16 hours post-burn
            (d) Adults: 2ml/kg/TBSA%
            (e) Children: 3ml/kg/TBSA%
            (f) Electrical: 4ml/kg/TBSA%

B. Pediatrics
1. Temperature control is critical in maintaining perfusion
2. Use of IV is for known required fluid replacement
3. Lower extremities are safe options for IV access and sites around the ankle or foot may be easier to find in infants, relative to upper extremity sites.
4. Consider use of IO if peripheral vein is not accessible and patient is in
5. immediate need of fluid
    a) Keep normal vital signs by age on hand
    b) Infuse up to 20ml/kg of warmed isotonic solution
        1) the exception to this is some cases of cardiogenic shock, as guided by local protocol or medical direction.
    c) Consider a second infusion of 20ml/kg if there is no response to first
    d) Second infusion should be done keeping in mind that the trauma patient needs rapid restoration of red blood cells while awaiting definitive care, if shock is due to non-compressible hemorrhage
    e) A third infusion of 20ml/kg may be considered in patients with controlled hemorrhage, sepsis, or profound dehydration
    f) The use of continuous infusion in uncontrolled hemorrhage should be done to maintain adequate perfusion levels of critical organs

enroute to the hospital.

C. Geriatrics
   1. Patients with chronic hypertension may have higher blood pressure value needs to achieve the same level of end organ perfusion than other patients
      a) Patient may be in shock with SBP >100mmHg
      b) Modest amounts of blood loss can lead to shock
         1) i. reduced blood volume
         2) ii. possible anemia
      c) Patient is less able to tolerate excessive fluids
         1) possible anemia
         2) possible electrolyte alterations
   2. IV fluid therapy may lead to hypothermia; maintain normothermia

D. Obstetrical Patients (see also: Medicine)
   1. Shock states lead to shunting of blood away from fetus
   2. The closer the maternal blood pressure is to normal, the better the fetal perfusion

E. Intraosseous Line Placement and Infusion
   1. The chief indications for intraosseous line insertion are:
      a) Compensated and Uncompensated Shock
         1) Shock is usually the result of:
            (a) Hypovolemia
            (b) Sepsis
            (c) Cardiac problems
      b) Cardiac Arrest:
         1) A protocol for obtaining vascular access is helpful in making a decision about the use of an intraosseous line when venous access cannot be obtained rapidly.
            (a) Peripheral intravenous access often requires more time to insert than an intraosseous line. A median time of 10 minutes is required to achieve peripheral vascular access during cardiac arrests; only 18% of these attempts are successful within 90 seconds.
            (b) If peripheral access is not achieved within 90 seconds, or at provider discretion, attempts to insert an intraosseous line should be initiated.
            (c) The intraosseous route delivers fluids and medications into the bone marrow cavity, which acts as a non-collapsible vein and permits access to the central circulation.
         2) All fluids and medications that are administered through a peripheral IV can be administered through an intraosseous line.
   2. Contraindications for insertion of an intraosseous line
      a) An intraosseous line should not be inserted when there is a known fracture of the bone chosen for line placement, or significant trauma proximal to the site.
      b) An intraosseous line should not be inserted when there is infection present in the leg chosen for line placement.
      c) Insertion of an intraosseous needle should not be attempted on the same site two times, as the hole made by the attempted insertion does not close rapidly and fluid will extravasate. However, a missed IO in the proximal tibia does not preclude an attempt for an IO in the distal femur of the ipsilateral side.
   3. Common Sites for Intraosseous Needle Insertion
      a) Proximal Tibia

1) The site is easily identified.
2) A large marrow cavity exists with no adjacent structures that are likely to be damaged.
3) The site of insertion is on the flat medial surface of the anterior tibia, one to two finger breadths below and medial to the tibial tuberosity.

b) Distal Femur
1) The site of insertion is midline or slightly medial to midline, approximately two centimeters above the superior to the patella.
2) This site avoids epiphyseal plate (growth plate) involvement
3) May be preferred in young infants whose tibias are too narrow for an IO

c) Distal Tibia
1) The site of insertion is just above the medial malleolus.

d) Proximal Humerus
1) Greater than 10 years old
2) Internally rotate arm prior to placement
3) The ideal insertion site is 1cm above surgical neck
4) IO should be placed at a 45- degree angle with the humeral head
5) Secure arm in order to limit potential for dislodgement

4. Equipment for Intraosseous Infusion
a) Needles:
1) Either an intraosseous or bone marrow aspiration needle may be used. They are preferable because of the following:
(a) They may contain a trocar or stylet, which minimizes the risk of occlusion from bone marrow.
(b) They are shorter, sturdier and less flexible.
(c) They are less likely to be dislodged in transport because they are threaded and shorter.
(d) Some of these needles have side infusion ports within the threads so a stylet or trocar is not necessary.
(e) Some needle lengths can be adjusted.

b) Other Equipment:
1) Placement device (this may be a powered drill or other injection aid)
2) Prefer Chlorhexidine or Iodine solution - for cleaning insertion site
3) 4x4 gauze pads - for cleaning and for use in applying pressure if needle is withdrawn
4) Two 5 or 10 cc syringes - to aspirate bone marrow and to infuse saline
5) IV solution and tubing or saline lock
6) Towel (if needed) for stabilizing extremity during and after insertion of the intraosseous needle
7) Commercial device to secure IO or bulky dressings and tape
8) Pressure infusion bag
9) Volume limiting device
10) Consider lidocaine for anesthetic after placement

5. Four steps for intraosseous needle insertion
a) Step one - Stabilize the insertion site using roll of towels for support or to prevent movement as needed
b) Step two - Prepare the insertion site
1) Clean the skin with chlorhexidine or iodine solution and 4x4 gauze pads.
2) Wipe in a circular motion starting at the planned insertion site and moving outward.

3) Wipe the area dry with a sterile 4x4 gauze pad.

c) Step three - Insert the needle
   1) Check the needle packaging and manufacturer for additional instructions. Some needles require back and forth or a clockwise motion. Some needles require a motorized driver device.
      (a) Use aseptic technique.
      (b) The needle should be directed in a manner that decreases the risk of insertion into the growth plate.
      (c) Apply pressure to the top of the needle in order to push through the cortex of bone.
      (d) A slight give or lack of resistance ("pop")will be felt as the tip enters the marrow cavity.
      (e) If the needle is properly inserted, it will stand without support.
   2) Caution: If too much pressure is applied, the needle may exit through the bone on the other side. If this occurs:
      (a) Fluid will infiltrate into the tissue and compartment syndrome may develop.
      (b) Remove the needle
      (c) A site on the other leg or proximal to the missed site must be chosen for the next insertion attempt.

d) Step four - Confirm needle placement
   1) Remove the stylet from the needle.
   2) Connect a syringe to the hub of the needle.
   3) Aspirate approximately 1ml of bone marrow. Marrow may not always be aspirated.
   4) Bone marrow aspirate can be used for various lab studies such as glucose
   5) 5 – 10ml of normal saline may be used to initially flush the syringe and intraosseous needle while observing for extravasation. This fluid should flush easily. If no extravasation occurs, placement is confirmed.
   6) For the patent IO, consider lidocaine for anaesthetic effects.
   7) If the needle placement cannot be confirmed, remove the needle.
   8) Do not attempt to re-insert the needle on the same site, as this will cause leakage of fluids from the insertion site into the surrounding tissue.
   9) If the needle is removed, apply pressure for 5 minutes and cover the insertion site with a sterile dressing.

6. Securing the intraosseous needle
   a) Connect the IV tubing to the hub of the correctly placed needle.
      1) IV fluid should flow without obstruction when the needle is correctly positioned.
      2) IF the IV fluid is not flowing and correct insertion cannot be verified, remove the intraosseous needle and attempt insertion at another location.
      3) When correct insertion is confirmed, tape the tubing or use a commercial device to prevent dislodgment.
7. Carefully monitor the insertion site for signs of infiltration.
   a) Remove the needle if infiltration is observed.
   b) The needle should not be left in place for over 24 hours.
8. Adjusting the Rate of Infusion
   a) IO flow rate is often slower than through an IV. Two methods may be used to increase the flow rate:
      1) Pressure bag inflated to 300 torr.

2) A syringe with a three-way stopcock directly attached to the IV line flowing to the intraosseous needle will allow administration of fluid boluses.
   (a) Attach an empty 30 or 60ml Luer-Lok™ syringe (with the plunger depressed) to the three-way stopcock.
   (b) Close the stopcock valve allowing IV flow to the patient and open the valve from the IV bag to the syringe.
   (c) Withdraw the plunger to fill the syringe with the desired amount of IV fluid from the IV bag.
   (d) Close off the flow to the IV bag and open the valve allowing fluid to flow from the syringe to the patient.
   (e) Depress the plunger of the syringe to administer the desired amount of IV fluid to the patient.
   (f) Repeat steps (b)-(e) above as necessary until the full amount of fluid bolus has been administered.
   (g) Reopen the valve to the patient so that the IV continues to flow; check flow rate.
   (h) Reassess the patient to determine need for additional fluid, repeating steps (b)-(f) above, if appropriate.

b) Carefully monitor the amount of fluid administered to the pediatric patient to prevent fluid overload. The use of small volume IV bags (i.e., 250-500ml bags) may be helpful in this monitoring process.

c) A child in shock may require several 20ml/kg boluses of fluid (there may be indications for less fluid for the pediatric patient in cardiogenic shock, follow local protocols). Frequent reassessments are necessary.

9. Potential Complications
   a) Potential complications from intraosseous insertion and infusion include:
      1) Extravasation of fluid:
         (a) This is generally the result of improper needle placement or multiple insertion attempts.
         (b) Collection of fluid in the tissue can lead to compartment syndrome.
      2) Skin infection:
         (a) The infection rate for intraosseous is lower than that found with intravenous cannulation.
         (b) Osteomyelitis (very rare).
   b) Overall, complications from intraosseous insertion and infusion are rare.

Lesson 6: **PATIENT ASSESSMENT**

Upon the completion of this section, the student will be able to:

Cognitive objectives:

6.1 Discuss the methods/techniques listed below for assessing placement of an advanced airway device and the limitations of each:
   a. Auscultation of lung sounds and gastric sounds
   b. End-tidal CO2, particularly waveform capnography
   c. Chest rise; and Clinical change in condition.

6.2 Correlate waveform capnogram components to the respiratory cycle

6.3 Affiliate capnography waveform morphology with underlying patient pathophysiology

6.4 Address possible therapies for concerning waveform morphologies representative of hypoperfusion/ shock, bronchoconstriction, hypothermia, and poor airway seal

6.5 Discuss important components that must be identified by the EMT-II while taking an appropriate history from a patient, including SAMPLE and OPQRST.

Psychomotor objectives: No Transition Objectives

Lesson Content

Patient assessment is performed much in same manner by an EMT-II as it would be by an EMT-I. The EMT-II will incorporate experiences gained as an EMT-I and apply those to help form general impressions, identify trends, and recognize relative urgency of changes presenting during care.

Additionally, EMT-II assessment may include assessment of waveform capnography and morphology. Additional resources regarding waveform components and morphology may be found in the instructor repository.

A. Definitions:
   1. Capnography
   2. Capnometer
   3. Capnogram
   4. End Tidal CO_2 ($EtCO_2$ or $PetCO_2$)

B. Oxygenations versus ventilation

C. Capnography versus pulse oximetry

D. Circulation and metabolism

E. $PaCO_2$ vs. $PetCO_2$
   1. Do not correlate in many pathologies

F. Normal capnography values
   1. $EtCO_2$ 35-45 mmHg

G. Abnormal values and wave forms
   1. $EtCO_2$ less than 35mmHg
   2. $EtCO_2$ greater than 45mmHg

H. Capnography wave form
   1. Post inspiration/dead space exhalation
   2. Start of alveolar exhalation
   3. Exhalation upstroke where dead space gas mixes with lung gas
   4. Continuation of exhalation or plateau

5. End tidal value
6. Inspiration washout

I. Clinical uses of capnography
   1. Monitoring ventilation
      a) Hyperventilation
      b) Hypoventilation
   2. Confirming, maintaining, and assisting advanced airway placement
      a) Continuous wave form capnography versus colorimetric capnography
   3. Measuring cardiac output during CPR
      a) Return of Spontaneous Circulation (ROSC)
      b) Loss of spontaneous circulation
   4. End Tidal CO_2 as predictor of resuscitation outcomes
   5. Monitoring sedated patients
   6. $EtCO_2$ in Asthma, COPD and CHF
      a) "Sharkfin" morphology representative of bronchospasm
   7. Ventilation of head-injured patients may be guided by $EtCO_2$ values
   8. Perfusion warning sign
      a) The patient with poor perfusion will have poor blood return to the lungs and correlating low $EtCO_2$ values
   9. Other issues
      a) DKA
      b) Alveolar compromise (collapse, overdistended, fluid accumulation)
      c) Pulmonary embolus
      d) Hyperthermia
      e) Trauma
      f) Disaster triage
      g) Hyperventilation
      h) Anaphylaxis
      i) Accurate respiratory rate (less accurate when the patient is talking)
   10. Using the equipment
      a) In-line versus sidestream analyzers
      b) Monitor/ analyzer-specific orientation required
      c) Analyzers are susceptible to moisture in the line
      d) Nasal cannulas with integrated capnography may not be able to perform high flow oxygen delivery. Confirm with manufacturer product insert.

Lesson 7: **MEDICINE/ MEDICAL EMERGENCIES**

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

Cognitive objectives:

7.1 Differentiate conditions in which the EMT-II should provide treatment on scene, versus prioritizing limited scene times.

Psychomotor objectives:

7.2 Demonstrate assessment and appropriate management for an adult or pediatric patient experiencing a medical emergency, when given a scenario, using an integrated assessment and care approach.

7.3 Demonstrate assessment and appropriate management for a patient experiencing a cardiac arrest emergency, when given a scenario, using an integrated assessment and care approach.

Lesson Content

Note: Supplement this material with additional documents such as the *Cold Injuries Guidelines.*

A. Transport Decision Making: Will the patient benefit the most from scene stabilization or urgent transport?
   1. It must be considered that urgent (Lights and Sirens) transport creates significantly increased risk. (There are more than 6000 ambulance crashes every year) Often, only little time is gained, which does not justify the risk.
   2. When considering mode of transport, the needs of the patient should take precedent. Only in cases where a clear benefit to the patient is evident should this mode of transport be employed. Examples: Uncontrolled bleeding, unexplained altered mental status, or obstetric event with known complications.
   3. The EMT-II should consider the risks versus the benefits in each case.

Lesson 8: **SHOCK AND RESUSCITATION**

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

Cognitive objectives:

8.1 Define and explore etiologies of shock with greater depth and breadth than EMT-I knowledge and understanding, including pediatric and geriatric presentations.

8.2 Discuss management of a shock patient by the EMT-II, including treating the cause, oxygenation, administration of IV/IO fluids, and warmth.

Psychomotor objectives:

8.3 Demonstrate management of a shock patient by the EMT-II, including treating the cause, and providing oxygenation, administration of IV/IO fluids, and warmth as needed.

Lesson Content

A. Shock
   1. Definitions
      a) Perfusion is the passage of blood and oxygen and other essential nutrients to the body's cells
         1) While delivering these essentials to the body's cells, the circulatory system is also removing waste such as carbon dioxide from the cells
      b) Shock is a state of systemic hypoperfusion, or inadequate perfusion of blood through body tissues which leads to anaerobic metabolism, hypothermia, and acidosis.
         1) Hypoperfusion can lead to death if not corrected
   2. Tissue Hypoperfusion
      a) Inadequate fluid volume
      b) Inadequate pump
      c) Inadequate container size
   3. Physiologic Response to Shock
      a) Cellular
         1) Fick principle
         2) Waste removal
         3) Aerobic metabolism/glycolysis
         4) Anaerobic metabolism
      b) Sympathetic nervous system and endocrine implications

B. Specific Types of Shock
   1. Hypovolemic
      a) Hemorrhage
         1) Classifications
            (a) hemostasis
            (b) vascular phase
            (c) platelet phase
            (d) coagulation phase
            (e) tension lines
            (f) factors affecting clotting/coagulation
      b) Non-hemorrhagic fluid loss
         1) dehydration
         2) third spacing
         3) insensible loss (E.g., dehydration)
         4) large burns
   2. Distributive
      a) Neurogenic
         1) High spinal cord injury will be accompanied by paralysis/paresis and or dysesthesia.
      b) Anaphylactic
      c) Septic
         1) search for sources of infection e.g. UTI, skin, lungs
      d) Psychogenic (vasovagal)
   3. Cardiogenic
      a) Intrinsic causes -- heart muscle damage
         1) physiology
         2) signs/symptoms
         3) assessment

4) management
b) Extrinsic causes
1) cardiac tamponade
2) tension pneumothorax
3) Pulmonary embolism

C. Complications of Shock
1. Multiple Organ Dysfunction Syndrome (MODS)
a) Sepsis
b) Death of organs
c) Death of organism
2. Acute Respiratory Distress Syndrome (ARDS)
3. Trauma mortality triad (acidosis, coagulopathy, hypothermia)

D. Patient Assessment
1. Scene size-up
2. Perform a primary assessment
3. Obtains a relevant history
4. Perform a secondary assessment
5. Perform a reassessment
6. Shock index
a) heart rate divided by systolic blood pressure. Values over 0.7 should prompt a suspicion for shock though may be due to pain, anxiety or fever.

E. Management
1. Control external bleeding and/ or consider pelvic wrap
2. Provide spinal motion restriction if indicated
3. Comfort, calm, and reassure the patient
4. Do not give food or drink
5. Provide airway control as indicated
6. Breathing
a) Assist ventilation, as needed
b) Oxygen administration
7. Circulation
a) Attempt to control obvious external bleeding.
b) Apply pelvic binder or splint long bones as indicated
c) Patient positioning
d) Keep patient warm - attempt to maintain normal body temperature.
8. Begin transport at the earliest possible moment. Trauma patients cannot be treated in the field.
9. Do not stay on-scene to start IVs in a case of hemorrhage or surgical emergency; this can be done *en route*
10. Fluid resuscitation including permissive hypotension
11. Administer TXA as indicated, *en route* preferred
12. Treat or stabilize any additional injuries that might be present
13. Passive leg raise to determine need for additional fluid resuscitation, if not contraindicated by mechanism (I.e., head trauma, significant chest trauma)

F. Age-Related Variations
1. Pediatrics
a) Common causes of shock
1) Trauma
2) Fluid loss
3) Neurological injury

4) Anaphylaxis
5) Heart disease
6) Infection

b) Presentation
1) Mental status
2) Skin signs
3) Cardiovascular
4) Decreased fluid output
5) Vital signs

c) Anatomic and physiologic implications
1) Unreliable indicators
2) Indicators of shock
(a) tachycardia for age
(b) weak distal pulses
3) delayed capillary refill time
4) cool mottled extremities
5) altered mental status

d) Management
1) Control bleeding
2) Provide spinal motion restriction
3) Suction, as needed
4) Oxygen therapy
5) Positioning
6) Maintain body temperature
7) Fluid replacement
8) Transport

2. Geriatrics
a) Assessment
1) Body system changes affecting presentation of shock
(a) nervous system
(b) cardiovascular
(1) difficulty tolerating hypotension from hemorrhage
(2) beta-blocker and calcium channel blockers can alter physiologic response to shock
(c) respiratory
(d) integumentary
(e) renal
(f) gastrointestinal
2) Vital sign variations
(a) altered mental status
(b) sudden onset
(c) other causes
(d) hypoxia
3) Airway
(a) decreased cough reflex
(b) cervical arthritis
(c) loose dentures
4) Breathing
(a) higher resting respiratory rate
(b) lower tidal volume

(c) less elasticity/compliance of chest wall

5) Circulation
   (a) Higher resting heart rate
   (b) Irregular pulses
6) Skin
   (a) dry, less elastic
   (b) cold
   (c) fever, not common
   (d) hot

b) Management
1) Control bleeding
2) Provide spinal motion restriction
3) Suction, as needed
4) Oxygen therapy
5) Positioning
6) Maintain body temperature
7) Suspect sepsis or non-hemorrhagic fluid loss in the geriatric patient with undifferentiated shock.

c) Transport

Lesson 9: **TRAUMA**

Cognitive objectives:

9.1 Describe the signs, symptoms, and management of a patient with head trauma.

Psychomotor objectives:

9.2 Demonstrate assessment and integrated EMT-II level management of a simulated or hypothetical multi-system trauma patient.

Lesson Content

A. References: current NASEMSO National Model EMS Clinical Guidelines; Tranexamic Acid Medication Reference

B. Appropriate care will reflect recommendations in the current NASEMSO National Model EMS Clinical Guidelines
   1. With the addition of tranexamic acid for noncompressible hemorrhage with indication of shock:
      a) If safely indicated by mechanism and presentation
      b) Dose and delivery route may differ based on local protocols
      c) TXA administration is also covered in SHOCK AND RESUSCITATION

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