STATE OF ARIZONA • EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM

Curriculum
For
EMT-I and EMT-P Use of an EZ-IO Drill Device

Course Description
This course is designed to provide instruction in a procedure for the use of an EZ-IO drill device by the EMT-I or EMT-P who is approved by an administrative medical director to perform the procedure.

Methodology
The student shall receive at least 1 hour of lecture, skill practice, written and practical skills evaluation

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

a. Would qualify, under A.A.C. R9-25-312(D), to serve as a preceptor for a course at the level of EMT-I and EMT-P certification held by the EMT; and
b. Is authorized to perform the supplemental skill.

Equipment
The following equipment is required for the course:

1 • IO manikin
2 • Body substance isolation (BSI) equipment
3 • EZ IO driver
4 • EZ-IO cartridge
5 • Alcohol prep pads and/or Betadine
6 • 10 cc syringe
7 • NS flush
8 • Sharps container
9 • Luer lock extension set
10 • IV tubing/fluids (NS, LR)
11 • Pressure infuser
12 • Tape and/or gauze
13 • Skill Evaluation Forms

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

1. List three primary indications and six contraindications for EZ-IO insertion.

2. Describe the “non-collapsible vein” principle as it relates to intraosseous use.

3. Identify the equipment required for insertion of an EZ-IO.

4. Describe and demonstrate body substance isolation (BSI) procedures required for use with an EZ-IO device.

5. Describe and demonstrate the proper steps for EZ-IO insertion.

6. Describe and demonstrate procedures, including positioning the patient, for insertion of an EZ-IO.

7. Discuss drugs and fluids acceptable for intraosseous use.

8. List four aspects of proper patient care after EZ-IO insertion.

9. List eight possible complications of intraosseous use.

10. List the specific steps needed to clean and disinfect the EZ-IO driver.

11. Discuss trouble shooting for the EZ-IO

12. Describe and demonstrate documentation of EZ-IO procedures and patient assessment.

13. Discuss the role of medical direction and oversight in the use of the EZ-IO.

14. Complete a practical skills evaluation with 80% competency.

15. Complete a written evaluation with a score of at lease 80%.

COURSE OUTLINE

Module One: Lecture

I. Anatomy and Physiology of bone, the bone marrow

- A. Bone Internal Anatomy
  - 1. Bone
    - a. epiphyses
    - b. cancellous bone
    - c. cortex
    - d. diaphysis
    - e. medullary cavity
    - f. epiphyseal plate

B. Physiology
   1. Vascular system
   2. Non-collapsible vein
      a. Intraosseous pressure
      b. Venous pressure
      c. Arterial pressure
   3. Drugs and medications

II. Purpose and Description of EZ-IO

A. The EZ-IO device is designed for Adult and Pediatric use in emergency situations, when unable to obtain a peripheral IV. Can be used to deliver life-saving fluids and drugs through the intraosseous space.
B. There are three anatomical landmarks for the insertion site that the EZ-IO user must be familiar with before using the device. The first landmark is the patella or kneecap. To locate it, feel the front surface of the leg just below the femur or thigh bone for a "floating" bony structure. The second landmark is approximately 2 finger widths below the patella. It is the tibial tuberosity, a round oval elevation or "bump" on the front surface of the tibia or lower leg. The last site is 1 finger width medial (toward the inside) of the tibial tuberosity.
C. The resting pressures within the IO space are between 25/35 mm/Hg. This intrinsic pressure, combined with the thick marrow found in the medullary cavity, causes a higher resistance to rapid fluid infusion than is typically found in veins. To overcome this resistance, it is necessary to flush the IO space with a rapid 10 ml bolus of fluid with a syringe before beginning any infusion. Once the IO "flush" has been pushed, a pressure bag or infusion pump is recommended to maximize continuous infusion flow rates.

III. Indication:
   A. Adult and Pediatric unconscious patient
   B. Altered level of consciousness
   C. Respiratory compromise
   D. Hemodynamic instability

IV. Contraindications
   A. Fracture of the tibia or femur
   B. Previous orthopedic procedures. (Example – knee replacement)
   C. An extremity that is compromised by a pre-existing medical condition (Example-tumor or peripheral vascular disease).
   D. Any infection over the insertion site.
   E. The inability to locate the 3 anatomical landmarks.
   F. Excessive tissue over the insertion site

V. Advantages
   A. Peripheral veins often flatten or collapse when the body goes into shock. IO

vessels do not.
- B. Same absorption rate as a peripheral vein
- C. Easy access when peripheral veins are not obtainable
- D. Any solution or drug that can be administered intravenously, either bolus or infusion, can be administered by the IO route.

VI. Potential Complications
- A. Extravasation
- B. Dislodgment
- C. Compartment Syndrome
- D. Fracture
- E. Pain
- F. Reduced Flow Rate
- G. Infection

VII. Available Sizes
- A. 15 gauge needle

VIII. Insertion Procedure
- A. Determine if EZ-IO is indicated. Ensure that no contraindications are present.
- B. Observe BSI precautions.
- C. Maintain aseptic technique during usage.
- D. Locate insertion site, per medical direction
- E. Prepare insertion site using betadine and or alcohol to clean the site prior to powering the EZ-IO into position.
- F. Prepare the EZ-IO Driver and Needle Set
- G. Insert the EZ-IO needle.
    1. Holding the driver in one hand, stabilize the leg near the insertion site with the opposite hand. Make sure your hands and fingers are a safe distance from the path of insertion. Be cautious of sudden patient movements.
    2. Position the driver at the insertion site with the needle at a 90 degree angle to the surface of the bone. Power the needle set through the skin at the insertion site until you feel the needle set tip encounter the bone itself. Ensure that the needle set is long enough, verify that you can see the 5 mm marking on the catheter itself (this is the mark closest to the flange). If this mark is not visible, you should abandon the procedure as the needle set may not be long enough to penetrate the IO space.
    3. Continue to insert the EZ-IO by applying firm and steady pressure on the driver and power through the cortex (hard, outer surface) of the bone, ensuring the driver is maintained at a 90 degree angle at all times.
    4. Stop when the needle flange touches the skin or a sudden decrease in resistance is felt. This indicates entry into the bone marrow cavity (intramedullary space).
    5. Remove driver from the needle set. While supporting the needle set in one hand, gently pull straight up on the driver and lift away.
    6. Remove the stylet from the catheter. While grasping the hub firmly with

one hand, rotate the stylet counter clockwise. Pull the stylet out of the catheter and consider placing it into the empty cartridge and place in a biohazard container.

H. Confirm proper EZ-IO catheter tip position. Proper placement of the IO catheter tip can be confirmed through any of the following.
   1. The IO catheter stands straight up at a 90-degree angle and is firmly seated in the bone.
   2. Blood at tip of the stylet.
   3. Aspiration of a small amount of bone marrow with a syringe.
   4. A free-flow of drugs or fluids without difficulty and with no evidence of leakage (extravagation) underneath the skin.

I. Attach any standard luer lock extension set to the EZ-IO hub and then syringe flush the IO space with 10 cc NS.

J. Initiate the infusion following medical direction for fluids and drugs.

K. DO NOT LEAVE EZ-IO IN FOR MORE THE 24 HOURS.

L. Document placement of IO or any complications.

M. Removing the EZ-IO catheter from your patient (if necessary) You may either grasp the hub directly or attach a sterile syringe. (The syringe will serve as a larger handle for the catheter hub and is preferred). Support the patient's leg while rotating the catheter (clockwise-if you are using a syringe) and gently pull the catheter out. Maintaining a 90 degree angle while rotating the catheter will ensure proper removal without complications. If hub-catheter separation occurs use an appropriate hemostat to grasp and gently remove the catheter in the same manner as suggested above. Once the catheter has been removed dispose of the catheter in a biohazard container. Dress the insertion site.

Module Two: Skills Practice/Validation

I. Provided models manikins and equipment necessary to insert the EZ-IO administration, the student shall:
   A. List the indications, contraindications and side effects of the EZ-IO
   B. Identify the equipment required
   C. Describe and demonstrate body substance isolation (BSI) procedures required
   D. Describe and demonstrate aseptic technique
   E. Describe and demonstrate insertion techniques
   F. Describe and demonstrate documentation procedures
   G. Identify common problems, probable cause and corrective action for each identified problem

II. The student shall demonstrate minimum score accuracy on a skills evaluation form completed by the instructor.

III. The student shall complete a written evaluation with a score of at lease 80%.

IV. An instructor shall provide remediation and retesting as necessary.

EZ-IO

DATE:_____ PROVIDER'S NAME:_____

Action	Possible Points	Points Awarded
Takes or verbalizes body substance isolation precautions.	1	
States primary indications for EZ-IO.	1	
States contraindications for EZ-IO use.	1	
Identifies anatomy and correctly locates target site.	1	
Cleans site according to local protocol.	1	
Correctly assembles EZ-IO driver and needle set.	1	
Stabilizes extremity inserts EZ-IO needle set, removes stylet and confirms placement.	1	
Demonstrates safe stylet disposal.	1	
Connects primed extension set and flushes EZ-IO.	1	
Connects appropriate fluid with pressure infuser and adjust flow as instructed.	1	
Verbalizes possible complications of IO use.	1	
States maximum time EZ-IO should remain in place.	1	
States removal procedures and post EZ-IO care.	1	
Total- may not miss more than 2 points unless area meets critical criteria	13	

CRITICAL CRITERIA- Failure in any area constitutes failure of the station

_____ Failure to take or verbalize body substance isolation precautions
_____ Failure to voice primary indications of EZ-IO
_____ Failure to locate primary sites
_____ Failure to flush EZ-IO with 10 cc NS with a syringe

EVALUATOR'S NAME: _____

EVALUATOR'S SIGNATURE: _____