

# Arrow EZ-IO Intraosseous Vascular Access System

## Procedure Template

### PURPOSE

To provide procedural guidance for establishment of intraosseous vascular access using the Arrow EZ-IO Intraosseous Vascular Access System.

### DEFINITION

Intraosseous (IO): situated within, occurring within, or administered by entering a bone.

### INDICATIONS FOR USE

The Arrow EZ-IO Intraosseous Vascular Access System provides intraosseous access anytime in which vascular access is difficult to obtain in emergent, urgent, or medically necessary cases for up to 24 hours.

#### Adults

- Proximal humerus
- Proximal tibia
- Distal tibia

#### Pediatrics

- Distal Femur
- Proximal humerus
- Proximal tibia
- Distal tibia

### CONTRAINDICATIONS

- Fracture in target bone
- Infection at area of insertion
- Excessive tissue (severe obesity) and/or absence of adequate anatomical landmarks
- IO access or attempted IO access in target bone within previous 48 hours
- Previous, significant orthopedic procedure at the site, prosthetic limb or joint

### EQUIPMENT/SUPPLIES

- EZ-IO Power Driver
- EZ-IO Needle Set
- EZ-Connect Extension Set
- EZ-Stabilizer Dressing (included in Plus Packs or available separately)
- Non-sterile gloves\*
- Cleansing agent of choice\*
- Luer lock syringe with sterile Normal Saline flush (5-10 mL for adults, 2-5 mL for infant/child)
- NeedleWISE Sharps Block

\*indicate supplies that are not included in all EZ-IO kits

### ADDITIONAL EQUIPMENT/SUPPLIES IF INDICATED/ORDERED

- 2% preservative & epinephrine-free lidocaine (intravenous lidocaine)
- Intravenous fluid
- Infusion pressure pump or pressure bag, tubing, 3-way stop cock
- Supplies for lab sample

## PROCEDURE

Explain procedure to patient/family when possible

Obtain assistance as needed

Wash hands

## INSERTION SITE IDENTIFICATION

Palpate site to locate appropriate anatomical landmarks for needle set placement and to estimate soft tissue depth overlying the insertion site. Utilize the correct technique below based on patient and site selected:

### ADULT INSERTION SITE IDENTIFICATION

#### Proximal Humerus (Adult)

1. Using either method below, adduct elbow, rotate humerus internally:
  - Place the patient's hand over the abdomen with arm tight to the body.
  - Place the arm tight against the body, rotate the hand so the palm is facing outward, thumb pointing down
2. 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
3. Place the ulnar aspect of your hand vertically over the axilla. Place the ulnar aspect of your other hand along the midline of the upper arm laterally
4. Place your thumbs together over the arm; this identifies the vertical line of insertion on the proximal humerus
5. Palpate deeply up the humerus to the surgical neck
  - This may feel like a golf ball on a tee – the spot where the "ball" meets the "tee" is the surgical neck
  - The insertion site is 1 to 2 cm above the surgical neck, on the most prominent aspect of the greater tubercle

#### Proximal Tibia (Adult)

1. Extend the leg
2. Insertion site is approximately 2 cm medial to the tibial tuberosity, or approximately 3 cm below the patella and approximately 2 cm medial, along the flat aspect of the tibia

#### Distal Tibia (Adult)

1. Insertion site is located approximately 3 cm proximal to the most prominent aspect of the medial malleolus
2. Palpate the anterior and posterior borders of the tibia to assure insertion site is on the flat center aspect of the bone

## INFANT/CHILD INSERTION SITE IDENTIFICATION

### Distal Femur (Infant/Child)

1. Secure the leg out-stretched to ensure the knee does not bend
2. Identify the patella by palpation. The insertion site is just proximal to the patella (maximum 1 cm) and approximately 1-2 cm medial to midline

### Proximal Humerus (Infant/Child)

1. Using either method below, adduct elbow, rotate humerus internally:
  - Place the patient's hand over the abdomen with arm tight to the body.
  - Place the arm tight against the body, rotate the hand so the palm is facing outward, thumb pointing down
2. 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
3. Place the ulnar aspect of your hand vertically over the axilla. Place the ulnar aspect of your other hand along the midline of the upper arm laterally
4. Place your thumbs together over the arm; this identifies the vertical line of insertion on the proximal humerus
5. Palpate deeply up the humerus to the surgical neck
  - This may feel like a golf ball on a tee – the spot where the "ball" meets the "tee" is the surgical neck
  - The insertion site is 1 to 2 cm above the surgical neck, on the most prominent aspect of the greater tubercle

### Proximal Tibia (Infant/Child)

1. Extend the leg.
2. Insertion site is approximately 1 cm medial to the tibial tuberosity, or just below the patella (approximately 1 cm) and slightly medial (approximately 1 cm), along the flat aspect of the tibia
3. Pinch the tibia between your fingers to identify the medial and lateral borders of the tibia

### Distal Tibia (Infant/Child)

1. Insertion site is located approximately 1-2 cm proximal to the most prominent aspect of the medial malleolus
2. Palpate the anterior and posterior borders of the tibia to assure insertion site is on the flat center aspect of the bone

## NEEDLE SET SELECTION

Select EZ-IO Needle Set based on patient weight, anatomy and clinical judgment. The EZ-IO Catheter is marked with a black line 5 mm proximal to the hub. Prior to drilling, with the EZ-IO Needle Set inserted through the soft tissue and the needle tip touching bone, adequate needle length is determined by the ability to see the 5 mm black line above the skin.

- EZ-IO 45 mm Needle Set (yellow hub) should be considered for proximal humerus insertion in patients 40 kg and greater and patients with excessive tissue over any insertion site
- EZ-IO 25 mm Needle Set (blue hub) should be considered for patients 3 kg and greater
- EZ-IO 15 mm Needle Set (pink hub) should be considered for patients approximately 3-39 kg

## INSERTION

- Use aseptic technique
- Prepare supplies:
  - Prime EZ-Connect Extension Set: unlock clamp, prime set and purge air

**Adult responsive to pain:** Prime EZ-Connect Extension Set with lidocaine. Note that the priming volume of the EZ-Connect Extension Set is approximately 1.0 mL

**Infant/child responsive to pain:** Prime EZ-Connect Extension Set with lidocaine; priming volume of the EZ-Connect Extension Set is approximately 1.0 mL. For small doses of lidocaine, consider administering by carefully attaching syringe directly to needle hub (prime EZ-Connect Extension Set with normal saline)

**Adult or infant/child unresponsive to pain:** Prime EZ-Connect Extension Set with normal saline

- Open EZ-Stabilizer package
- Locate the insertion site
- Clean insertion site by per protocol; stabilize the extremity for insertion
- Attach Needle Set to EZ-IO Power Driver and remove Safety Cap from Catheter

## ADULT INSERTION TECHNIQUE

### Proximal Humerus - Adult

1. Point the needle tip at a 45-degree angle to the anterior plane and posteromedially
2. Gently press needle through the skin until the tip touches the bone.  
**The 5 mm black mark must be visible above the skin prior to insertion**
3. Squeeze the trigger and apply gentle steady pressure. In the event of Driver failure, disconnect the Power Driver, grasp the Needle Hub by hand and advance into the medullary space while twisting back and forth

### Tibia - Adult

1. Aim the Needle Set at a 90-degree angle to the bone
2. Gently press needle through the skin until the tip touches the bone.  
**The 5 mm black mark must be visible above the skin prior to insertion**
3. Squeeze the trigger and apply gentle steady pressure. In the event of Driver failure, disconnect the Power Driver, grasp the Needle Hub by hand and advance into the medullary space while twisting back and forth

## INFANT/CHILD INSERTION TECHNIQUE

### Proximal Humerus – Infant/Child

1. Aim the Needle Set tip at a 45-degree angle to the anterior plane and posteromedially
2. Gently press needle through the skin until the tip touches the bone.

**The 5 mm black mark must be visible above the skin prior to insertion**

3. Squeeze the trigger and apply gentle steady pressure. In the event of Driver failure, disconnect the Power Driver, grasp the Needle Hub by hand and advance into the medullary space while twisting back and forth

### Femur and Tibia – Infant/Child

1. Aim the Needle Set at a 90-degree angle to the bone
2. Gently press needle through the skin until the tip touches the bone.

**The 5 mm black mark must be visible above the skin prior to insertion**

3. Squeeze the trigger and apply gentle steady pressure. In the event of Driver failure, disconnect the Power Driver, grasp the Needle Hub by hand and advance into the medullary space while twisting back and forth

## INSERTION COMPLETION

1. Stabilize hub and remove Driver and Stylet. Place Stylet in an appropriate sharps container
2. Place the EZ-Stabilizer Dressing over the Catheter hub
3. Attach primed extension set, firmly secure to Catheter hub with clamp open
4. Remove adhesive from back of EZ-Stabilizer Dressing and apply dressing to skin
5. Confirm placement. Flush the EZ-IO Catheter with normal saline (5-10 mL for adults; 2-5 mL for infants/children).  
May require multiple flushes
6. Prior to flush, consider 2% preservative-free and epinephrine-free lidocaine IO for patients responsive to pain  
– follow institutional protocols/policy

<p><b>Adult responsive to pain – recommended anaesthetic</b></p>	<p><b>Consider using anaesthetic for adult patients responsive to pain:</b> Review manufacturer’s lidocaine instructions for use prior to administration and observe recommended cautions/contraindications to using 2% preservative free and epinephrine free lidocaine (intravenous lidocaine):</p> <p><b>The following recommendations are based on published intraosseous clinical literature:</b></p> <ol style="list-style-type: none"> <li>1. Confirm lidocaine dose per institutional protocol</li> <li>2. Prime Extension Set with lidocaine. Note that the priming volume of the EZ-Connect Extension Set is approximately 1.0 mL</li> <li>3. Slowly infuse lidocaine (typically 40 mg) IO over 120 seconds</li> <li>4. Allow the lidocaine to dwell in IO space 60 seconds</li> <li>5. Flush with 5-10 mL normal saline</li> <li>6. Slowly administer an additional dose of lidocaine IO (typically 20 mg) over 60 seconds. Repeat PRN</li> </ol> <p>Consider systemic pain control for patients not responding to IO lidocaine. <b>For more information visit <a href="http://www.EZIOComfort.com">www.EZIOComfort.com</a></b></p>
<p><b>Adult unresponsive to pain</b></p>	<p>Flush the IO catheter with 5-10 mL of normal saline. If patient develops signs indicating responsiveness to pain, refer to adult recommended anaesthetic technique</p>

<p><b>Infant/child responsive to pain – recommended anaesthetic</b></p>	<p><b>Consider using anaesthetic for patients responsive to pain:</b> Review manufacturer’s lidocaine instructions for use prior to administration and observe recommended cautions/contraindications to using 2% preservative free and epinephrine free lidocaine (intravenous lidocaine):</p> <p><b>The following recommendations are based on published intraosseous clinical literature:</b></p> <ol style="list-style-type: none"> <li>1. Confirm lidocaine dose per institutional protocol</li> <li>2. Prime Extension Set with lidocaine <ul style="list-style-type: none"> <li>– Note that the priming volume of the EZ-Connect Extension Set is approximately 1.0 mL.</li> <li>– For small doses of lidocaine, consider administering by carefully attaching syringe directly to Catheter hub (prime extension set with normal saline).</li> </ul> </li> <li>3. Slowly infuse lidocaine IO over 120 seconds. Typical initial dose is 0.5 mg/kg, <b>NOT</b> to exceed 40 mg</li> <li>4. Allow lidocaine to dwell in IO space 60 seconds</li> <li>5. Flush with 2-5 mL of normal saline</li> <li>6. Slowly administer subsequent lidocaine (half the initial dose) IO over 60 seconds. Repeat PRN</li> </ol> <p>Consider systemic pain control for patients not responding to IO lidocaine. <b>For more information visit: <a href="http://www.EZIOComfort.com">www.EZIOComfort.com</a></b></p>
<p><b>Infant/child unresponsive to pain</b></p>	<p>Flush the IO catheter with 2-5 mL of normal saline. If patient develops signs indicating responsiveness to pain, refer to infant/child recommended anaesthetic technique</p>

7. Deliver medication and fluids as ordered. Administer medications in same dose, rate, and concentration as given via peripheral IV. For optimal flow infuse with pressure. Verify placement/patency prior to all infusions. Use caution when infusing hypertonic solutions, chemotherapeutic agents, or vesicant drugs
8. Stabilize and monitor site and limb for extravasation or other complications
  - For **proximal humerus insertions**, secure arm in place across the abdomen, or in adducted position (with the patient’s arm close to body) using immobilizer or alternate method
  - For **distal femur insertions**, stabilize extremity and secure site with leg outstretched to ensure knee does not bend using leg board or alternate method
  - For **proximal and distal tibia insertions**, minimize potential for catheter movement when necessary with use of leg board in pediatric patients; use caution in moving patients
9. Document date and time on wristband and place on patient

## REMOVAL TECHNIQUE

1. Remove EZ-Connect
2. Lift and remove EZ-Stabilizer adhesive dressing
3. Using a sterile luer-lock syringe as a handle, attach to hub of catheter, maintain alignment and rotate clockwise while pulling straight up. Do NOT rock or bend the catheter on removal
4. Dispose of catheter with syringe attached in an approved sharps container
5. Dress site per institutional protocol/policy

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