

ARROW®



Arrow®
EZ-IO®
Intraosseous Vascular Access System

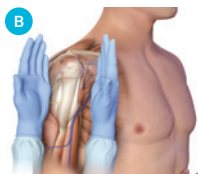
Pocket Guide

Teleflex®

Proximal Humerus Insertion Site Identification



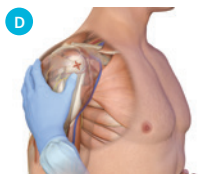
A: Place the patient's hand over the abdomen (elbow adducted and humerus internally rotated). Place your palm on the patient's shoulder anteriorly. The area that feels like a "ball" under your palm is the general target area. You should be able to feel this ball, even on obese patients, by pushing deeply.



B: 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.



C: Place your thumbs together over the arm. This identifies the vertical line of insertion on the proximal humerus.



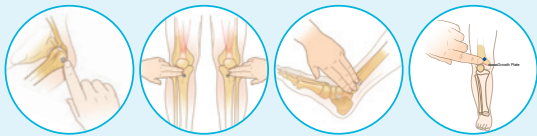
D: Palpate deeply up the humerus to the surgical neck. This may feel like a golf ball on a tee – the spot where the "ball" meets the "tee" is the surgical neck. The insertion site is 1 to 2 cm above the surgical neck, on the most prominent aspect of the greater tubercle.



E: Point the needle set tip at a 45-degree angle to the anterior plane and posteromedial.

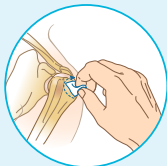
Insertion Technique and Removal

Step 1: Locate the insertion site.



Pediatrics only

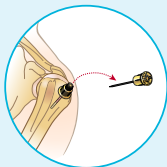
Step 2: Clean insertion site per institutional protocol. Stabilize extremity.



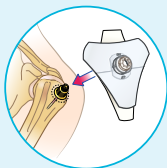
Step 3: Gently press needle through the skin until the tip touches the bone. The 5 mm black mark on the needle set must be visible above the skin prior to insertion. Squeeze the trigger, apply gentle steady pressure. In the event of Driver failure, disconnect the Power Driver, grasp the Needle Set Hub by hand and advance into the medullary space while twisting.



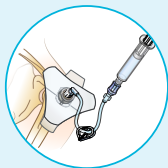
Step 4: Stabilize hub and remove driver and stylet. Place stylet in an appropriate sharps container.



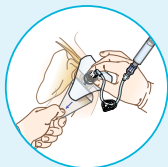
Step 5: Place the EZ-Stabilizer® Dressing over the catheter hub.



Step 6: Attach primed extension set, firmly secure to catheter hub with clamp open.

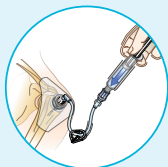


Step 7: Remove adhesive from back of EZ-Stabilizer Dressing and apply dressing to skin.



Step 8: Confirm placement. Flush the EZ-IO Catheter with normal saline (5-10 mL for adults; 2-5 mL for infants/children).

Prior to flush, consider IO 2% preservative-free and epinephrine-free lidocaine IO for institutional protocols/policy.

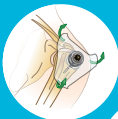


Step 9: Deliver medication and fluids as ordered. Administer medications in same dose, rate and concentration as given via peripheral IV. For optimal flow infuse with pressure.



Removal

Using a sterile luer-lock syringe as a handle, attach to hub of catheter, maintain alignment and rotate clockwise while pulling straight up. Avoid rocking the catheter on removal. Dispose of catheter with syringe attached in an approved sharps container.



EZ-IO® System Components



EZ-IO Power Driver

ORDER NO.	DESCRIPTION	QTY
9058	EZ-IO Power Driver	1



EZ-IO Needle+Stabilizer Kits

ORDER NO.	DESCRIPTION	QTY
9079P	45 mm Needle	5
9001P	25 mm Needle	5
9018P	15 mm Needle	5



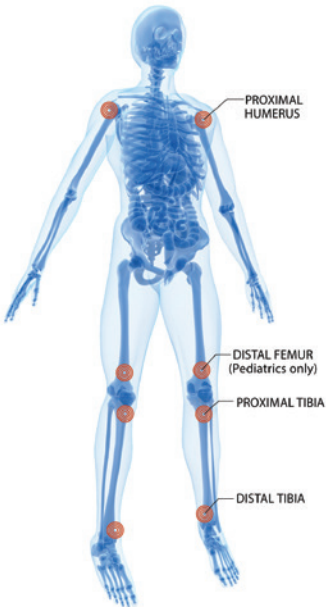
Each set includes a 15 Ga. sterile EZ-IO Needle Set, EZ-Stabilizer Dressing, EZ-Connect Extension Set, EZ-IO Patient Wrist Band and NeedleWISE® 1 Port Sharps Block.

Additional considerations regarding the EZ-IO Power Driver:

- As with any emergency medical device carrying a backup is a strongly advised protocol.
- The life expectancy and approximate number of insertions will depend on multiple factors: actual usage, bone density, insertion time, storage conditions, and frequency of driver testing.
- Do not use excessive force during insertion. Let the EZ-IO Power Driver do the work.
- EZ-IO Power Driver LED appears solid green when trigger is activated and Driver has sufficient power.
- EZ-IO Power Driver LED blinks red when the trigger is activated and Driver has only 10% of battery life remaining.
- Replace the EZ-IO Power Driver when the LED begins blinking red.
- In the event of a driver failure, disconnect the EZ-IO Power Driver, grasp the EZ-IO Needle Set Hub by hand and advance into the medullary space while twisting.

Insertion Sites

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



Advantages of proximal humerus site include:

- Average flow rate of 5 L/hour¹
- Medication and fluid reach the heart in 3 seconds³
- Lower insertion and infusion pain^{1,*,**}
- Less medication required for patient pain management^{1,*,**}

* Compared to EZ-IO tibial insertions

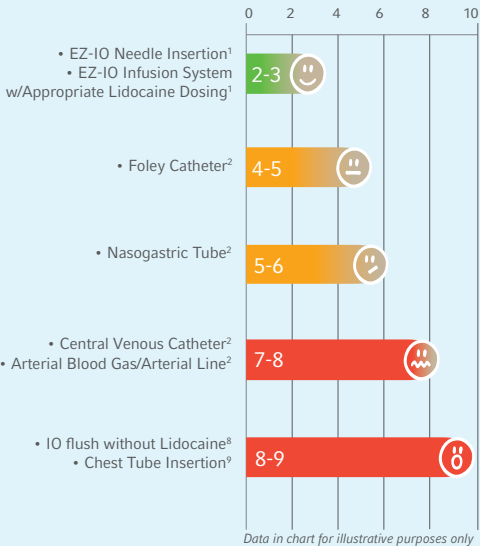
** Based on EZ-IO Adult Proximal Humerus insertion data

Do not use the Arrow EZ-IO System in the sternum!

Pain Management Guide

Pain Comparisons on Conscious & Alert Patients

Many medically necessary procedures involve pain and may cause anxiety.

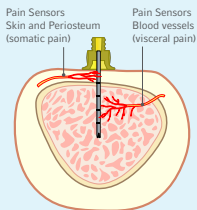
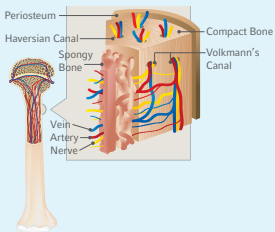


Insertion

Arrow EZ-IO Needle Set insertion pain is quick. Insertion pain rates as a 3 on a 0-10 pain scale.^{1,**}

Infusion

The pain associated with IO infusion can be manageable with correct dosing and application of 2% preservative-free and epinephrine-free lidocaine IO (per institutional protocol). Arrow EZ-IO System infusion pain is rated up to a 3 on a 0-10 pain scale with lidocaine use.¹



The intraosseous (IO) space contains a matrix of blood vessels and nerves. This structure provides rapid distribution of fluids and medications, and also contains numerous sensory receptors that register pressure variations. This pressure can be very uncomfortable or painful for a responsive patient.

Consider Using Anesthetic For Patients Responsive to Pain:

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).

The following recommendations are based on published IO clinical literature:

1. Confirm lidocaine dose per institutional protocol.
2. Prime extension set with lidocaine.
Note that the priming volume of the EZ-Connect® extension set is approximately 1.0 mL
3. Slowly infuse lidocaine over 120 seconds.
 - Adults: Typical initial dose is 40 mg.
 - Infant/Child: Typical initial dose is 0.5 mg/kg, NOT to exceed 40 mg.
4. Allow the lidocaine to dwell in IO space 60 seconds.

Disclaimer: Selection and use of any medication, including lidocaine, given IV or IO is the responsibility of the treating physician, medical director, or qualified prescriber and is not an official recommendation of Teleflex Incorporated. This information is not intended to be a substitute for sound clinical judgment or your institution's treatment protocols. Teleflex Incorporated is not the manufacturer of lidocaine. Users should review the manufacturer's instructions or directions for use and be familiar with all indications, side effects, contraindications, precautions and warnings prior to administration of lidocaine or any other medication. Teleflex Incorporated disclaims all liability for the application or interpretation of this information in the medical treatment of any patient. For additional information please visit EZIOComfort.com.

4. Flush with normal saline.
 - Adults: 5 to 10 mL
 - Infant/Child: 2 to 5 mL
6. Slowly administer an additional lidocaine IO over 60 seconds. Repeat additional PRN.
 - Adults: Typical dose of 20 mg.
 - Infant/Child: Typical additional dose is half the initial dose.

Consider systemic pain control for patients not responding to IO lidocaine.

For more information visit EZIOComfort.com.

Laboratory Analysis/Blood Sampling

Based on preclinical and clinical evidence comparing IO and venous or arterial blood specimens a number of common laboratory values correlate well; other values show clinical similarity without statistically significant correlation, therefore caution should be exercised with their interpretation.

Certain point of care analyzers have been studied with acceptable results. Check with your laboratory for IO blood specimen processing capabilities.

For more information regarding IO lab analysis, refer to the publication *Science and Fundamentals of Intraosseous Vascular Access*, available at: teleflex.com/ezioeducation.

The following recommendations have been developed based on research done by Teleflex; study data was based on IO blood specimens obtained prior to any infusions or flush:

- Connect a syringe directly to the EZ-IO Catheter hub.
- The first 2 mL of IO blood aspirate may either be discarded or considered for point of care testing.
- For other than point of care testing, consult with the laboratory to determine acceptability of IO blood specimens for analysis.
- Specimens must be identified as IO blood.

Fluids and Medications

Many fluids and medications that can be given via a peripheral IV can be given via the intraosseous (IO) route using the same dose, rate, and concentration.^{4,5,6,7} Deliver medication and fluids as ordered. Administer medications in the same dose, rate, and concentration as given via peripheral IV. For optimal flow infuse with pressure.

The following fluids and medications were delivered via the intraosseous (IO) route as referenced in clinical literature. The clinical literature is available on request through Teleflex Incorporated.

- Adenosine
- Albumin
- Alfentanil
- Alteplase
- Aminophylline
- Amiodarone
- Ampicillin
- Anascorp
- Anesthetic agents
- Antibiotics
- Antitoxins
- Anti-meningococcal antitoxin
- Anti-pneumococcus serum
- Atracurium besylate
- Atropine
- Astreonam
- Blood and blood products
- Bretylium
- Calcium chloride
- Calcium gluconate
- Cefazolin
- Ceftriaxone
- Contrast media
- Dexamethasone
- Dextran-40
- D5W
- D5 ½ NS
- Dextrose 10%
- Dextrose 25%
- Dextrose 50%
- Diazepam
- Diazoxide
- Digoxin
- Diltiazem
- Diphenhydramine
- Dobutamine hydrochloride
- Dopamine
- Ephedrine
- Epinephrine
- Etomidate
- Fentanyl
- Fluconazole
- Flumazenil
- Fosphenytoin
- Furosemide
- Gentamicin
- Haloperidol
- Hartmann's Solution (Compound Sodium Lactate Solution)
- Heparin
- Hydroxocobalamin
- Hydrocortisone
- Hydromorphone
- Hypertonic saline/dextran (7.5% NaCl/6% dextran)
- Insulin
- Isoprenaline
- Ketamine
- Labetalol
- Levetiracetam
- Lidocaine
- Linezolid
- Lorazepam

- Magnesium sulfate
- Mannitol
- Methylprednisolone
- Midazolam
- Mivacurium
- Morphine sulfate
- Nalbuphine
- Naloxone
- Neostigmine
- Nitroglycerin
- Norepinephrine
- Normal saline
- Ondansetron
- Pancuronium
- Paracetamol
- Penicillin
- Phenobarbital
- Phenylephrine
- Phenytoin
- Piperacillin
- Potassium chloride
- Promethazine
- Propofol
- Remifentanyl
- Rocuronium
- Sodium bicarbonate
- Standard IV solutions
- Succinylated gelatin solution 4%
- Succinylcholine
- Sufentanyl
- Tenecteplase
- Thiamine
- Thiopental
- Tobramycin sulfate
- Tranexamic acid
- Vancomycin
- Vasopressin
- Vecuronium
- Vitamin K

References:

1. Philbeck TE, Miller LJ, Montez D, Puga T. Hurts so good; easing IO pain and pressure. *JEMS* 2010;35(9):58-69. Research sponsored by Teleflex Incorporated.
2. Morrison RS, Ahronheim, JC, Morrison, GR. Pain and Discomfort Associated with Common Hospital Procedures and Experiences. *Journal of Pain and Symptom Management*; Vol. 15 No. 2 February 1998.
3. Montez D, Puga T, Miller LJ, et al. Intraosseous Infusions from the Proximal Humerus Reach the Heart in Less Than 3 Seconds in Human Volunteers. *Annals of Emergency Medicine* 2015;66(4S):S47. Research sponsored by Teleflex Incorporated.
4. Voigt J, Waltzman M, Lottenberg L. Intraosseous vascular access for in-hospital emergency use: A systematic clinical review of the literature and analysis. *Pediatr Emerg Care* 2012;28(2):185-998. Research sponsored by Teleflex Incorporated.
5. Von Hoff DD, Kuhn JG, Burriss HA, Miller LJ. Does intraosseous equal intravenous? A pharmacokinetic study. *Am J Emerg Med* 2008; 26: 31-8.
6. Neumar RW, Otto CW, Link MS, et al. Adult advanced cardiovascular life support. 2010 American heart association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation* 2010;122(suppl 3):S729-67. doi:10.1161/CIRCULATIONAHA.110.
7. Monsieurs KG, Nolan JP, Bossaert LL et al. European Resuscitation Council Guidelines for Resuscitation 2015 Section 1. Executive summary. *Resuscitation* 2015;95: 1-80
8. Davidoff J, Fowler R, Gordon D, et al. Clinical evaluation of a novel intraosseous device for adults: prospective, 250-patient, multi-center trial. *JEMS* 2005;30(10):s20-3.
9. Luketich JD, Kiss M, Hershey J, et al. chest tube insertion: a prospective evaluation of pain management. *Clin J Pain* 1998;14(2):152-4.

Rx only

Potential complications may include local or systemic infection, hematoma, extravasations, or other complications associated with percutaneous insertion of sterile devices.

Regional Offices

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