



Figure 1

The ARROW® EZ-IO® Intraosseous Vascular Access System is designed to offer rapid peripheral venous access with central venous catheter performance.¹ The intraosseous space functions as a large non-collapsible vein. The ARROW® EZ-IO® Needle Set has a uniquely designed needle tip that drills a hole in the bone the same size as the needle, minimizing risk of infiltration/extravasation or dislodgement. Insertion is gentle, fast and relatively painless.^{2,3,4,5}

Who supports IO access?

Intraosseous access is globally supported by many major medical societies and professional nursing organizations

What is the preferred site for insertion?

Humeral insertion (Figure 1) provides the following benefits:

- Average flow rate of 5 L/hour⁵
- Medication and fluid reach the heart in 3 seconds⁶
- Lower insertion and infusion pain⁵
- Less medication required for patient pain management⁵

Proximal and distal tibia are alternate insertion sites in adults. Distal femur, proximal and distal tibia, and proximal humerus are insertion sites in pediatric patients.

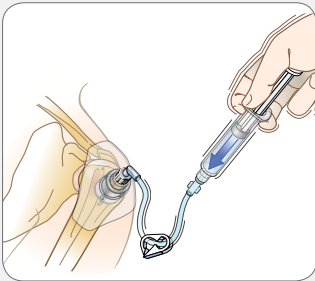


Figure 2

Why does my patient need intraosseous access?

- The patient needed vascular access and had limited or no venous access
- There may have been limited time and/or resources
- To prevent multiple peripheral IV attempts, minimize patient pain/anxiety
- To minimize vascular access related complications and facilitate vein preservation

What does it look like?

The needle sets are 15 gauge surgical stainless steel. The color of the catheter hub correlates to the catheter length; pink=15 mm, blue=25 mm, yellow=45 mm. The site should be dressed with an EZ-Stabilizer® Dressing and an EZ-Connect® extension set should be attached to the catheter hub.

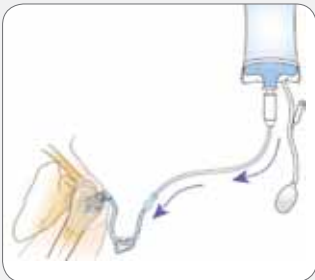


Figure 3

What medications and fluids can be infused via the catheter?

Virtually any fluid and medication that can be safely infused via peripheral IV route may be safely infused through the IO route using the same dosage, rate and concentration.^{1,7,8,9} Adequate flow rates are dependent on periodically performing a syringe flush (Figure 2) and infusing fluids and medications under pressure via infusion pump, pressure bag (Figure 3) or syringe boluses.

Prior to administration of medications or fluids, confirm catheter placement:

- Ability to aspirate blood
- Stability of catheter in the bone

My patient states the IO is causing pain. What can I do?

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)

1. Confirm lidocaine dose per institutional protocol
2. Prime EZ-Connect® 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.
 - a. Adults: Typical initial dose is 40 mg
 - b. Infant/Child: Typical initial dose is 0.5 mg/kg, not to exceed 40 mg
4. Allow lidocaine to dwell in IO space 60 seconds
5. Flush with normal saline
 - a. Adults: 5 to 10 mL
 - b. Infant/Child: 2 to 5 mL
6. Slowly administer an additional dose of lidocaine IO over 60 seconds. Repeat PRN
 - a. Adults: Typical dose is 20 mg
 - b. Infant/Child: Half the initial dose
7. Consider systemic pain control for patients not responding to IO lidocaine

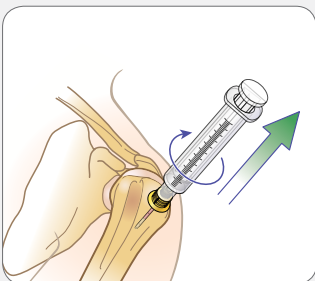
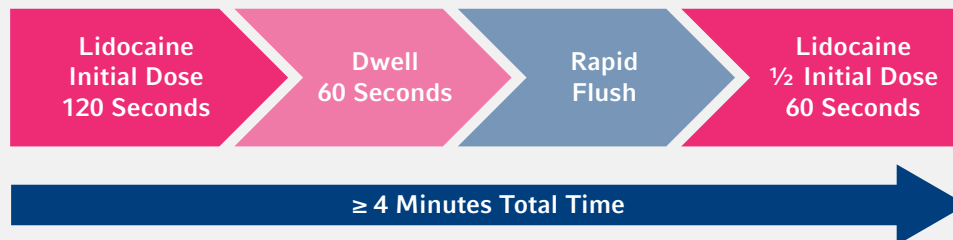


Figure 4

2% Preservative-Free and Epinephrine-Free Lidocaine

Adults: Typically 40 mg

Infant/Child: Typically 0.5 mg/kg (NOT to exceed 40 mg)



For more information visit: www.EZIOComfort.com

What if I feel resistance on the line, obtain low infusion rates or the IV pump alarms?

Assess the IO site for patency. If there is no evidence of complications such as infiltration/extravasation, perform a rapid syringe flush of normal saline into the catheter (5-10 mL adult, 2-5 mL infant/small child). This helps clear the intraosseous marrow and fibrin allowing for effective infusion rates. Periodic flushes may be necessary.

What things do I need to assess and document?

Frequent assessment is essential for safe vascular access management. Verify placement prior to each infusion and assess frequently for complications including infiltration/extravasation which can lead to compartment syndrome. Assess for flow rates and physiologic or pharmacological effects of infusions. While IO access is in place in the humerus, movement of the affected arm should be minimized and the arm should not be abducted past 90 degrees i.e. elevated above shoulder level. For pediatric patient with IO access in the distal femur, the extremity should remain stabilized in the extended position. Patients should not have MRI procedures with IO access in place; this should be part of your MRI Checklist.

How is the catheter removed? Are there aftercare instructions?

The catheter must be removed within 24 hours from the time of insertion. Remove any extension set and dressing and attach a luer-lock syringe to the hub. While maintaining axial alignment, twist the syringe and catheter clockwise while pulling straight out (Figure 4). *Do not rock or bend during removal.* Place the catheter into a designated sharps container. Apply gentle pressure as needed and apply a clean dressing to site. There are no activity restrictions after catheter removal.

More Info

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

See the Instructions For Use included with each product for further information. This material is not intended to replace standard clinical education and training by Teleflex, Incorporated and should be utilized as an adjunct to more detailed information which is available about the proper use of the product.

View educational resources at www.Teleflex.com/ezioeducation or contact a Teleflex clinical professional for any detailed questions related to product insertion, maintenance, removal and other clinical education information.

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. This information is not intended to be a substitute for sound clinical judgment or your institution's treatment protocols. Teleflex 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 disclaims all liability for the application or interpretation of this information in the medical treatment of any patient. For additional information please visit www.EZIOComfort.com.

1. Von Hoff DD, Kuhn JG, Burris HA, Miller LJ. Does intraosseous equal intravenous? A pharmacokinetic study. *Amer J Emerg Med* 2008;26:31-8
2. Miller L, Philbeck T, Bolleter S, Garcia G. Tactile feedback comparison of three types of intraosseous access devices for needle insertion accuracy. *Ann Emerg Med* 2010;56(3):S133.
3. Paxton JH, Knuth TE, Klausner HA. Proximal humerus intraosseous infusion: a preferred emergency venous access. *J Trauma*. 2009;67(3):1-7.
4. Fowler RL, Pierce A, Nazeer S et al. 1,199 case series: Powered intraosseous insertion provides safe and effective vascular access for emergency patients. *Ann Emerg Med* 2008;52(4):S152.
5. Philbeck TE, Miller LJ, Montez D, Puga T. Hurts so good; easing IO pain and pressure. *JEMS* 2010;35(9):58-69.
6. Data on file. 2013 Vidacare Internal Studies.
7. Hoskins SL, Kramer GC, Stephens CT, Zachariah BS. Efficacy of epinephrine delivery via the intraosseous humeral head route during CPR. *Circulation* 2006;114:II_1204.
8. Hoskins S, Nascimento P, Espana J, Kramer G. Pharmacokinetics of intraosseous drug delivery during CPR. *Shock* 2005;23:35.
9. Hoskins SL, Nascimento P Jr., Lima RM, Espana-Tenorio, JM, Kramer GC. Pharmacokinetics of intraosseous and central venous drug delivery during cardiopulmonary resuscitation. *Resuscitation* 2012;83(1):107-12.

* Teleflex Incorporated (Vidacare LLC) Sponsored Research