Based on relevant research and clinical practice, any medication that can be safely delivered via peripheral IV can be safely administered via the IO route, such as antiarrhythmics, paralytics, pressors, and antibiotics, as well as blood and blood products. (Use caution with chemotherapeutic agents.) Clinical validation has shown that drug delivery times via the IO and central venous routes are essentially equivalent.¹ Also, the 2010 American Heart Association and European Resuscitation Council both recognize IO=IV for advanced cardiac life support guidelines in both adults and pediatrics.²,³

**Equal Time with IO and IV**

In 2008, a 25-patient clinical study was conducted that compared the pharmacokinetics of intraosseous access vs. intravenous administration using morphine sulfate in adults.¹ Results were statistically significant, showing NO difference between IO and IV administration of morphine for most pharmacokinetic parameters, including:

- maximum plasma concentration
- time to maximum plasma concentration
- area under plasma concentration-time curve.

**CONCLUSION:** Results support the bioequivalence of IO and IV administration of morphine in adults.

According to published literature, the following medications and fluids have been administered via the IO route:¹,²,³,⁴,⁵,⁶,⁷,⁸,⁹,¹⁰,¹¹,¹²,¹³

**Medications**
- adenosine
- alfentanil
- aminophylline
- amiodarone
- anesthetic agents
- antibiotics
- antitoxins
- atracurium besylate
- atropine
- calcium chloride
- calcium gluconate
- contrast media
- dexamethasone
- dextrose 50%
- diazepam
- diazoxide
- digoxin
- dobutamine
- dopamine
- ephedrine
- epinephrine
- etomidate
- fentanyl
- furosemide
- haloperidol
- heparin
- insulin
- isoprenaline
- ketamine
- labetalol
- levarterenol
- lidocaine
- lorazepam
- magnesium sulfate
- mannitol
- methylprednisolone
- midazolam
- mivacurium
- morphine
- nalbuphine
- naloxone
- neostigmine
- nitroglycerin
- norepinephrine
- pancuronium
- paracetamol
- phenobarbital
- phenytoin
- potassium chloride
- promethazine
- propofol
- propranolol
- remifentanil
- rocuronium
- sodium bicarbonate
- succinylcholine
- tenectaplas
- thiamine
- thiopental
- vasopressin
- vecuronium

**Fluids**
- Blood and blood products
- Colloids
- Crystalloids
- Dextrose solutions
- Lactated Ringer’s solutions
- Sodium chloride solutions

**Insertion Points for the EZ-Io**

**Proximal Humerus**

**Proximal Tibia**

**Distal Tibia**
Proven, Effective Transport

The vasculature of bone marrow is a very dynamic part of the vascular system, even for patients in physiologic shock. A common misperception regarding the intraosseous space is that it is a sluggish part of the venous system, and medications are sequestered or metabolized differently from those administered via the intravenous route. This is not the case. The dynamic nature of bone marrow vasculature has been validated by research, confirming that bone marrow architecture facilitates rapid transport of drugs to the central venous system and heart.7

RELEVANT FINDINGS SUPPORT EZ-IO

A number of research studies and other articles on IO access have been published in recent years. Each provides key insights that support and validate IO, and EZ-IO, as a viable alternative for medication administration.

2008: Von Hoff study key findings1

- Pharmacokinetic study of IO vs. IV administration of morphine sulfate
- No statistical differences were observed between IO and IV administration of morphine sulfate for time to maximum concentration and maximum plasma concentration
- Results support bioequivalence of IO and IV administration of morphine sulfate in adults

2005: Hoskins study key findings7

- Attempting vascular access can adversely delay drug therapy during CPR
- The IO route provides rapid access via non-collapsible vessels in bone marrow
- IO infusions effectively deliver drugs during CPR

2009: Wright study key findings8

- Research study of IO infusion of rFVIIa during hemorrhagic shock
- Systemic blood levels of rFVIIa increased rapidly following IO administration
- There was NO evidence of local or systemic toxicity following IO infusion
- The blood concentration of rFVIIa peaked immediately after end of IO infusion

REFERENCES

11 Cooper BR, Mahoney PF, Hodgetts TJ, Mellor A. Intra-osseous access (EZ-10®) for resuscitation: UK Military combat experience. JR Army Med Corps. 153:314-16.

In the images above, a fluoroscopy video of an infusion at the proximal humerus clearly shows the effective drug delivery of EZ-IO to the heart in 2.25 seconds. (Images visually enhanced; contrast used in a caprine model for illustration. Results in humans may vary.) Please visit Vidacare.com to view the actual video.