

## EZ-IO Insertion Tips

The EZ-IO is a drill that allows intraosseous needle placement into adults and children. Here are some key concepts that apply to its use.

- Have a low threshold for using this when IV access is delayed or difficult.
- The recommended insertion site in trauma is the PROXIMAL HUMERUS in preference to the PROXIMAL TIBIA. Many trauma patients have lower limb injuries or unrecognised abdominal or pelvis trauma, which may threaten the continuity of the venous drainage from the lower limb bones to the heart.
- All drugs and fluids can be infused through it, although there is a theoretical risk of causing myonecrosis with hypertonic saline
- [the manufacturer's appraisal](#) states: a "*preclinical study in swine reported marrow damage after multiple infusions of hypertonic saline. Any drug with the potential to cause sclerosis or damage to veins has the potential to damage intraosseous vessels. As such, the risk vs. benefit of administering these drugs via the IO route should be carefully evaluated prior to use.*" So evaluate risk vs benefit. If a patient has cerebral herniation signs and there is no venous access, you may conclude the the potential benefits of intraosseous hypertonic saline outweigh the risks.



### Contra-indications:



Prosthesis



Trauma to bone



No Anatomical Landmarks



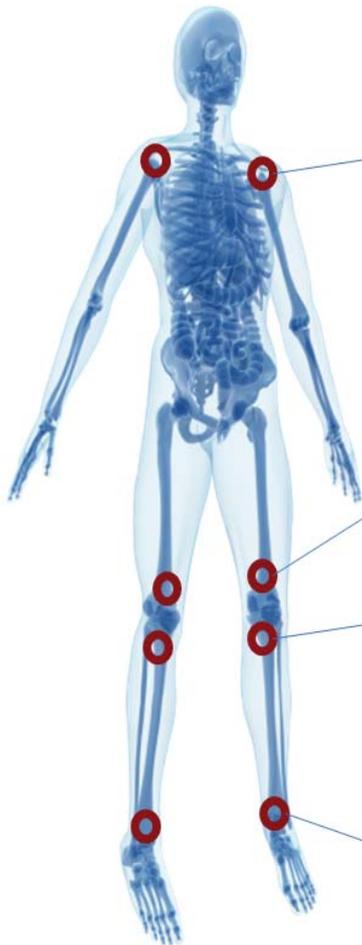
Local Infection



Recent IO in same bone (48 hrs)

**Insertion Sites:**

Have a look at this video on YouTube:  
[https://  
www.youtube.com/](https://www.youtube.com/)



**8 Sites**

**Proximal Humerus**

Preferred site for adults  
 Optimal site for high flow and quick drug uptake  
 Awake, responsive patients  
 Less painful

**Distal Femur**

Under 6 years

**Proximal Tibia**

Unresponsive  
 Unfamiliarity with other sites  
 Unable to landmark

**Distal Tibia**

Larger patient  
 Unable to access other sites

**Site selection**

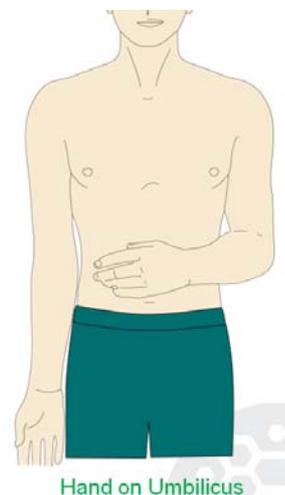
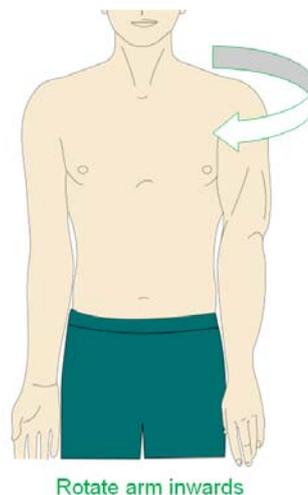
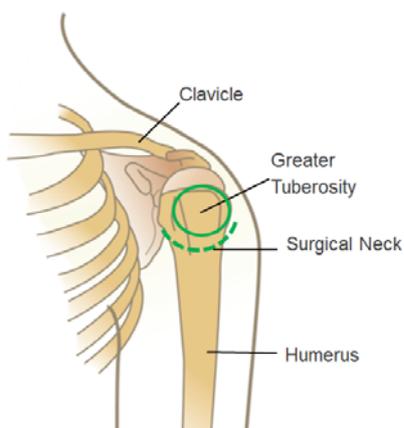
Dependent upon:

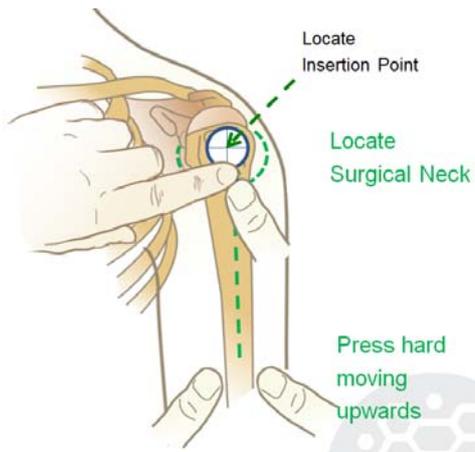
- No previous IO in 48 hours
- Absence of contraindications
- Accessibility
- Ability to secure & monitor

**Insertion method:**

For proximal humeral insertion, adduct and internally rotate the shoulder (by putting the patient's hand on their opposite hip).

**Proximal humerus**

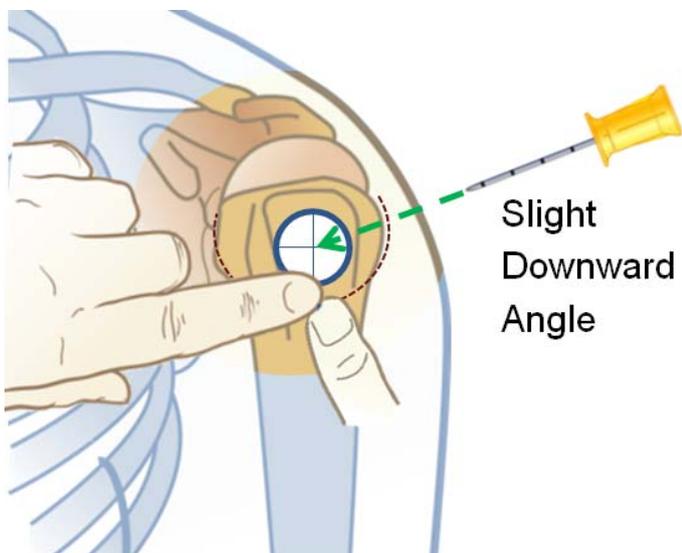




Insert from an anterolateral approach into the head of the humerus.

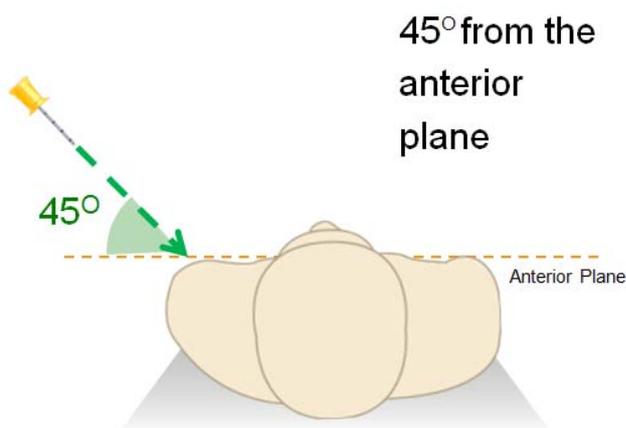
This video will help you get your head around locating the correct insertion site on someone's proximal humerus:

<https://www.youtube.com/watch?v=4BHfKHKe53Q>



Identify insertion point

Angle of needle insertion

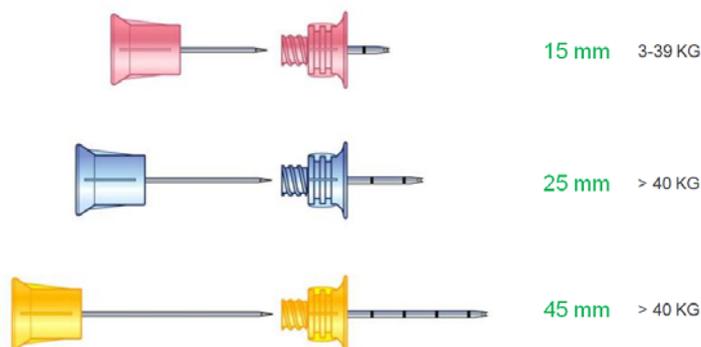


This video shows multiple insertions of the yellow needle into the humerus:

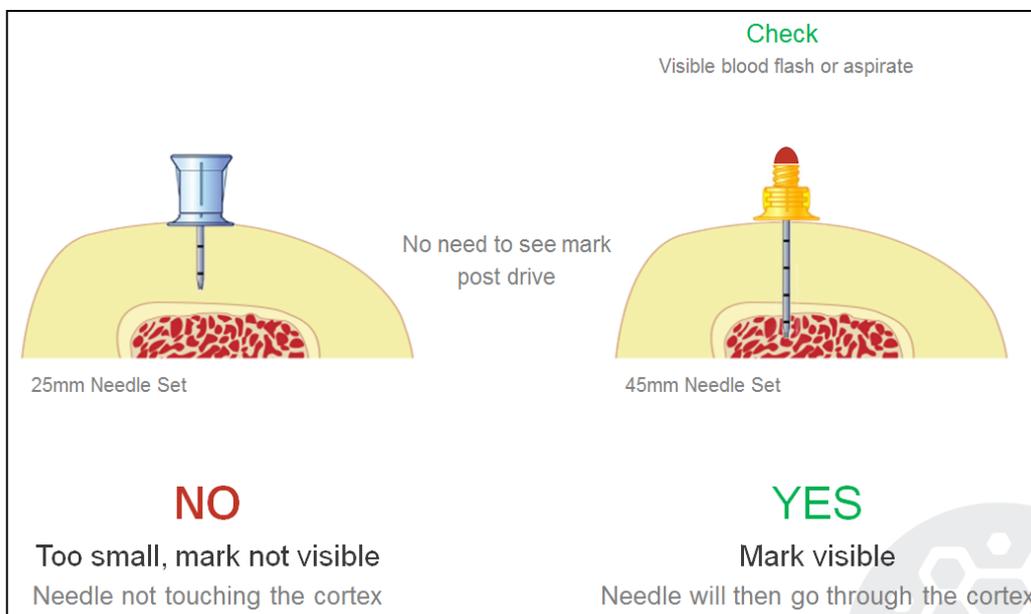
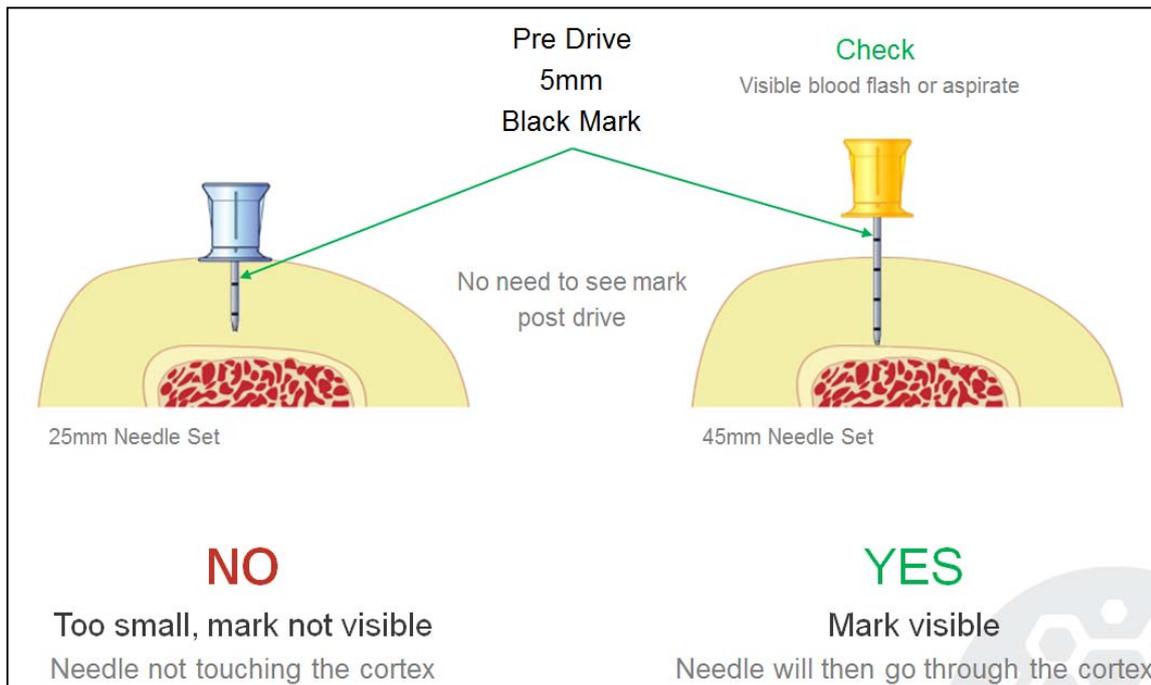
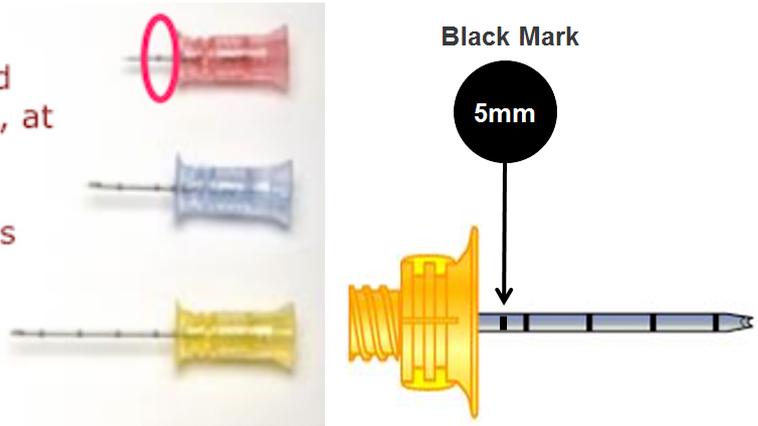
[www.youtube.com/watch?v=Wu-KVibUGNM](http://www.youtube.com/watch?v=Wu-KVibUGNM)

Choosing a slightly large needle is better than one that is too small to reach the intraosseous space, and there is generally more soft tissue to traverse at the humerus compared with the tibia. Most adults therefore require a yellow (large) needle and most children a blue (standard adult) needle with small children & babies only warranting the red (paediatric needle).

3 Needles



After the skin has been penetrated and the needle tip is against bone, at least one black bar on the needle should be visible prior to drilling bone. Otherwise, a larger needle is required.



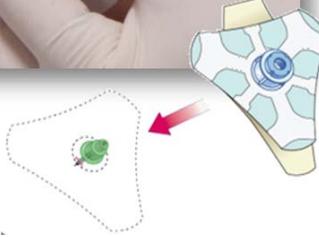


After insertion, check...

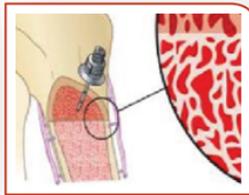
- Firmly seated needle
- Flash of blood
- No leaking around site
- No sign of extravasation
- Secure using EZ Stabilizer
- Use EZ Connector
- EZ-IO wrist band placed

This animation nicely demonstrates the landmarks, insertion technique, flushing and fluid connection, and how to remove an IO needle using a luer lock syringe:

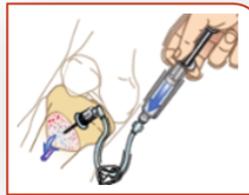
<https://www.youtube.com/watch?v=kU8BrFd6Qgo>



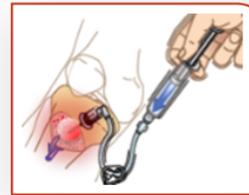
Flush for flow



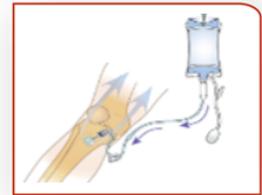
IO space filled with thick fibrin mesh



Pressure flush to open mesh

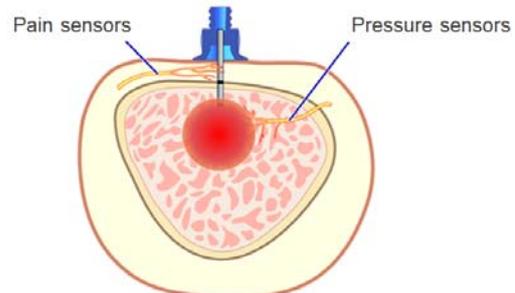


Flush can be painful



Pressurised flow needed

Rapid infusion of fluid into the intraosseous space can be very painful, and is often not helped by injecting lignocaine. Patients may require ketamine analgesia to tolerate it.



Two causes of pain



Insertion specific short duration



Flush, Aspiration & Infusion general diffuse protracted

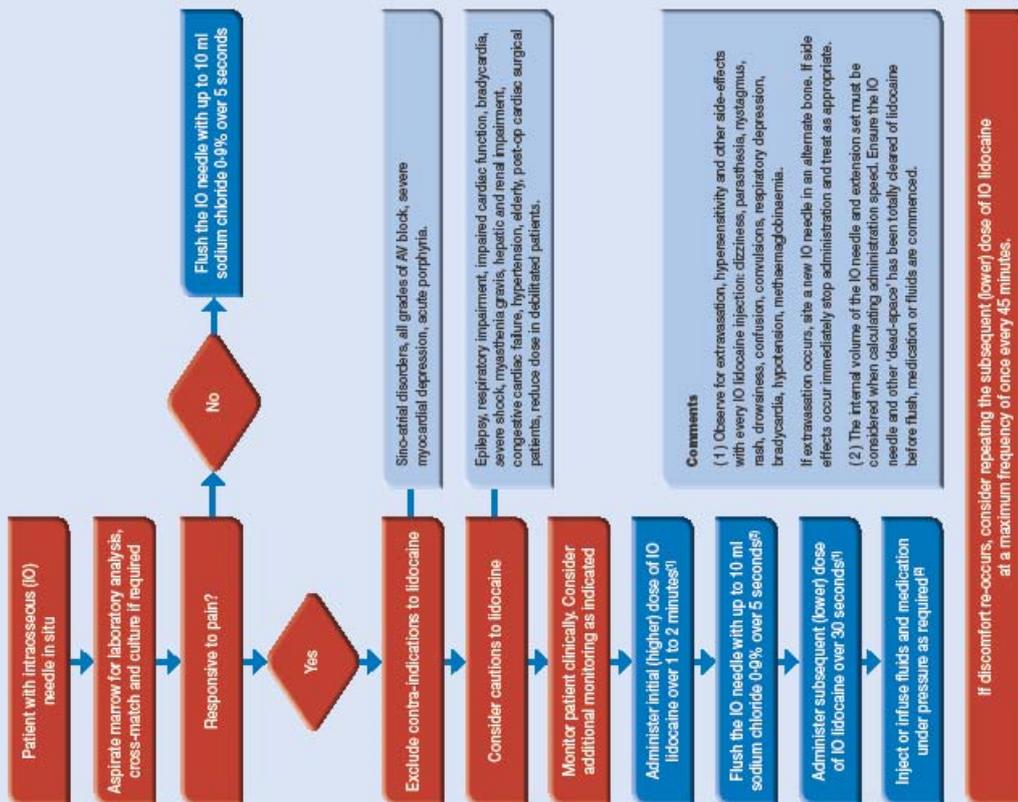
This interesting video shows some common mistakes in IO insertion:

[www.youtube.com/watch?v=YXfyL8kvFTg](http://www.youtube.com/watch?v=YXfyL8kvFTg)



# IO Analgesia: a suggested protocol

Intraosseous administration of preservative-free lidocaine. Read this guideline fully before use - if in doubt seek senior medical advice.



Age	Volume of preservative-free lidocaine - titrate IO to analgesic effect		Volume of 2% (ml) 1 ml of 2% = 20 mg/ml		Volume of 1% (ml) 1 ml of 1% = 10 mg/ml	
	Initial	Subsequent	Initial	Subsequent	Initial	Subsequent
Neonate	3	0-07	0-03	0-03	0-15	0-07
Neonate	4	0-1	0-05	0-05	0-2	0-1
7 weeks	5	0-12	0-06	0-12	0-25	0-12
3 months	6	0-15	0-07	0-07	0-3	0-15
5 months	7	0-17	0-08	0-08	0-35	0-17
7 months	8	0-2	0-1	0-1	0-4	0-2
1 year	9	0-22	0-11	0-11	0-45	0-22
15 months	10	0-25	0-12	0-12	0-5	0-25
2 years	12	0-3	0-15	0-15	0-6	0-3
3 years	14	0-35	0-17	0-17	0-7	0-35
4 years	16	0-4	0-2	0-2	0-8	0-4
5 years	18	0-45	0-22	0-22	0-9	0-45
6 years	20	0-5	0-25	0-25	1	0-5
7 years	23	0-57	0-28	0-28	1-1	0-57
8 years	26	0-65	0-32	0-32	1-3	0-65
9 years	29	0-72	0-36	0-36	1-4	0-72
10 years	32	0-8	0-4	0-4	1-6	0-8
11 years	35	0-87	0-43	0-43	1-7	0-87
12 years	39	0-97	0-48	0-48	1-9	0-87
13 years	44	1-1	0-55	0-55	2-2	1-1
14 years	50	1-2	0-62	0-62	2-5	1-2
15 years	54	1-3	0-67	0-67	2-6	1-3
16 years	58	1-4	0-72	0-72	2-8	1-4
60	60	1-5	0-75	0-75	3	1-5
70	70	1-7	0-87	0-87	3-4	1-7
80+	80+	2	1	1	4	2

The lower volumes of 2% lidocaine (<1 ml) may be difficult to accurately measure, and use of, or dilution to, 1% lidocaine should be considered under these circumstances. Use the appropriate syringe size for the volume to administer to ensure maximum accuracy:

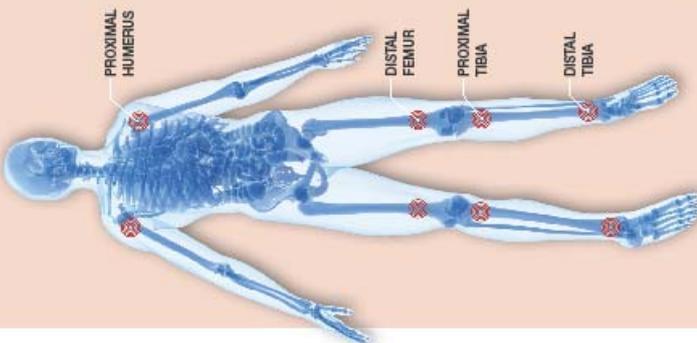
Volume	Syringe size
0 - 1 ml	1 ml
1 - 2.5 ml	2.5 ml
2.5 - 5 ml	5 ml

## Intraosseous Guide

Consider:

1. Site
2. Needle
3. Analgesia
4. Flush
5. Pressurised Flow
6. Monitor Site

Suggested IO Sites



Disclaimer: Whilst every care has been taken to ensure that doses and recommendations are correct, the responsibility for final check must rest with the prescriber. © Dr Richard Hilson 2011, all rights reserved.