

*PERSYS MEDICAL*®

# INTRODUCTION: IO ACCESS

## [Introduction: IO Access](#)



# NIO™ INTRAOSSEOUS ACCESS



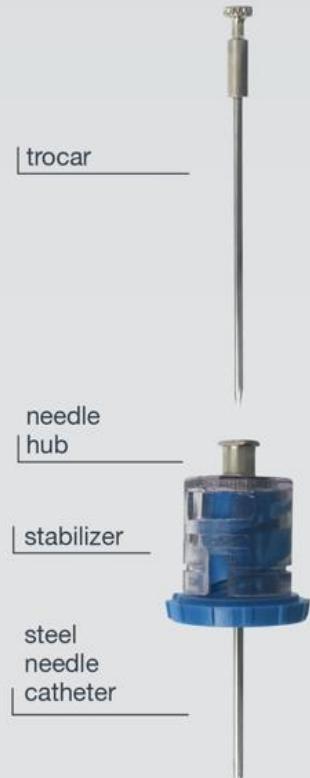
**NIO™ Infant Needle**  
(2.3kg) to 3 years  
18G / 2.6mm



**NIO™ Pediatric Needle (adjustable)**  
3-9 years ..... 18G / 14mm  
9-12 years ..... 18G / 18mm



**NIO™ Adult Needle**  
12 years to adult  
15G / 25mm



# OBJECTIVES



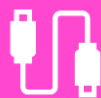
Define Intraosseous Access



Identify Patients and Situations for Use



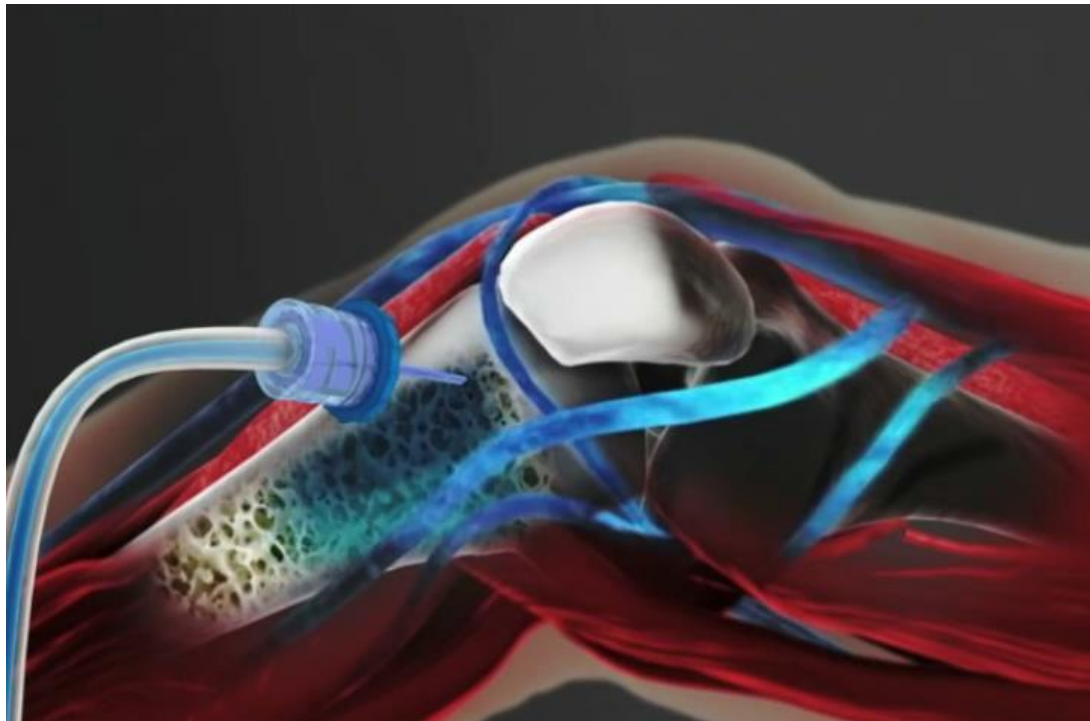
Practice Locating Sites and Landmarks



Demonstrate Use of the NIO Intraosseous Device

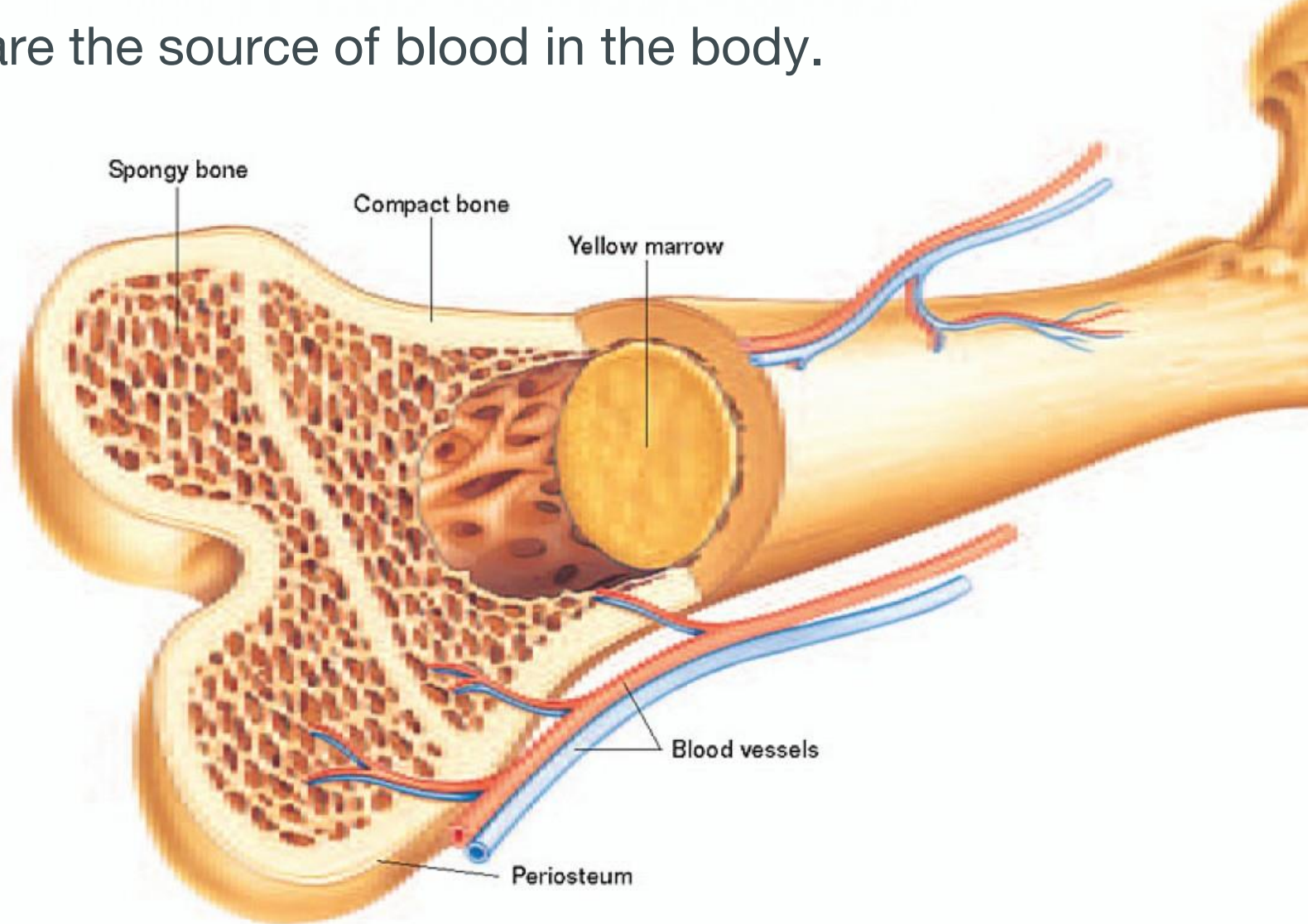
# DEFINITION

- Percutaneous placement of an intravascular catheter into the medullary cavity with the goal of providing vascular access.



# WHY GO IN THE BONE?

Bones are the source of blood in the body.



# BENEFITS



- Fast vascular access — 10 seconds
- “Non-Collapsible vein”
- Reliable “bridge” access
- Large volume infusion
- High flow rates
- Low infection rate — 0.6%
- First attempt success rate >98%

# SITUATIONS WHERE IO SHOULD BE USED

- Cardiac or respiratory arrest
- RSI (Rapid Sequence Intubation)
- General anesthesia
- Vascular therapies
- Sepsis/antibiotics
- Procedural sedation
- Mass-casualty incidents
- Preventative care:
  - Anticipate difficult IV on the patient
  - Anticipate patient will deteriorate rapidly





## Pre-Insertion



# NIO™ INSERTION OBESE CADAVER

[Left Insertion](#)

[Rt Insertion](#)



# EFFICACY OVERVIEW

- Time of absorption into central circulation is practically the same as IV
- Same dose, concentration, and rate of medications can be administered
- Flow rates for **adults**
  - Tibia: ~1lt/hr.
  - Humerus: ~5lt-9lt/hr.

(\*The NIO **must** be flushed with normal saline and then used with a pressure bag or automated pump [300mmHG] to achieve maximum flow rates)
- May be used with Level 1<sup>®</sup> Rapid Infuser or Belmont<sup>®</sup> Rapid Infuser
- NIO needle can be used for cat scan pressure injection
- Extension tubing is **not** pressure rated for cat scan

# NIO™ FLUOROSCOPY

[NIO Fluoro](#)



# CONTRAINDICATIONS

- Infection at the insertion site
- Fracture or trauma in the selected bone
- Orthopedic procedure/surgery on the insertion site
- IO in the last 48 hours in the same bone
- Unable to locate landmarks
- Hx of bone disease (considered a relative contraindication).



# POSSIBLE COMPLICATIONS

- **Osteomyelitis**
  - A rare occurrence
  - Less than 1%
  - More recent data indicates fewer than one infection per 100,000 insertions
- **Compartment Syndrome**
  - Primary complication from IO use
  - Usually secondary to extravasation
- Bone fractures
- Air embolism
- Fat embolism



# PAIN MANAGEMENT

- Due to the structure of the bone, when infusing fluids under pressure, conscious patients will feel pain.
- Known allergy to Lidocaine?
- For conscious adult patients consider using 1 ml of 2% lidocaine (preservative free and epinephrine free) and infuse slowly (over a period of 2 minutes), allow to dwell in the IO space 90 seconds.



**Always follow medical protocols!**

# ADULT SITES

Humeral Head



Proximal Tibia





# PRIOR TO INSERTION: CONSIDERATIONS

- Obtain physician order or follow hospital/EMS protocols (ACLS/PALS)
- If time permits obtain consent/explain procedure
- Check for allergies
- Consider the use of lidocaine as a local subcutaneous anesthetic and intravascular anesthetic (per protocol)
- Identify landmarks



# PROXIMAL HUMERUS ADDUCTION / INTERNAL ROTATION

## Adduction / Internal Rotation



Proper adduction



Proper arm internal rotation (with the thumb towards the buttocks)

# LOCATION: PROXIMAL HUMERUS

1



With one hand, bisect the arm at the deltoid. With the other hand, bisect the axilla anteriorly.

2



Rotate hands inward until the thumbs meet.

3



Palpate the surgical head of the humerus with your thumbs. Move  $\frac{1}{2}$  inch towards the greater tubercle.

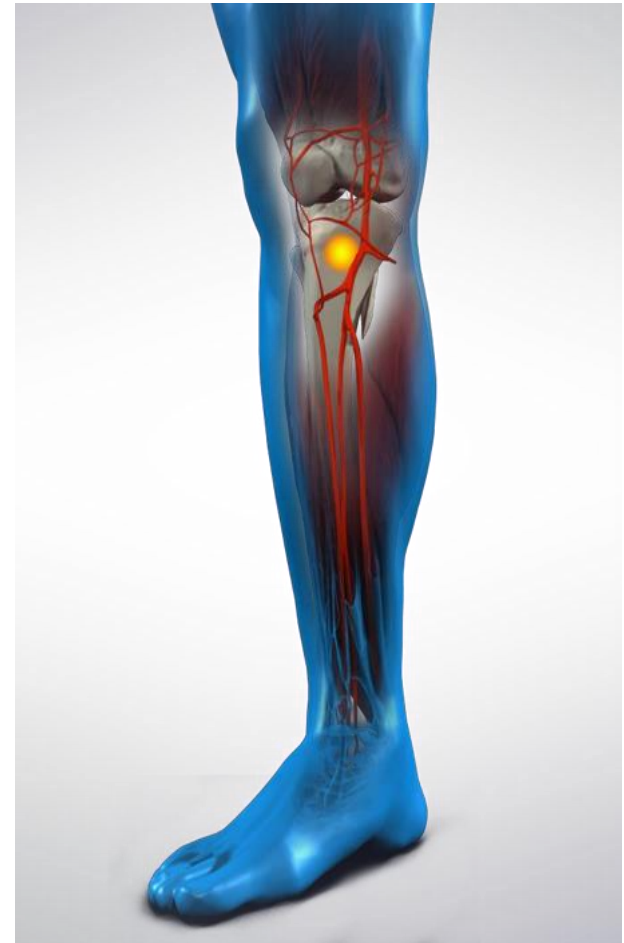
# PROXIMAL HUMERUS: INSERTION

## Proximal Humerus Insertion



# LOCATION: PROXIMAL TIBIA

- From the **Tibial Tuberosity** go medially approx. 2cm (1in), towards the center of the tibia, to the tibial plateau.
- From the **tibial plateau** go **up** (proximally) 1cm (0.5in) towards the patella.



# LOCATION: PROXIMAL TIBIA

[Location: Proximal Tibia](#)



# NIO™ ADULT

## INSTRUCTIONS FOR USE



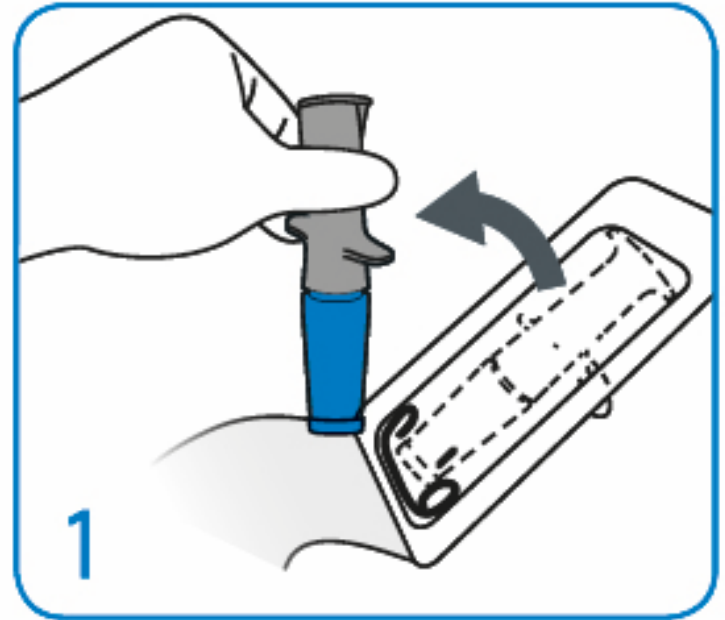
# OPERATIONAL STEPS

Always wear gloves during the IO procedure.

Open the pack and take out the NIO Adult.

Make sure that the NIO is free of all packaging parts.

If needed, separate the blister eyes from the NIO by pulling straight out. **Never** twist the stabilizer base.

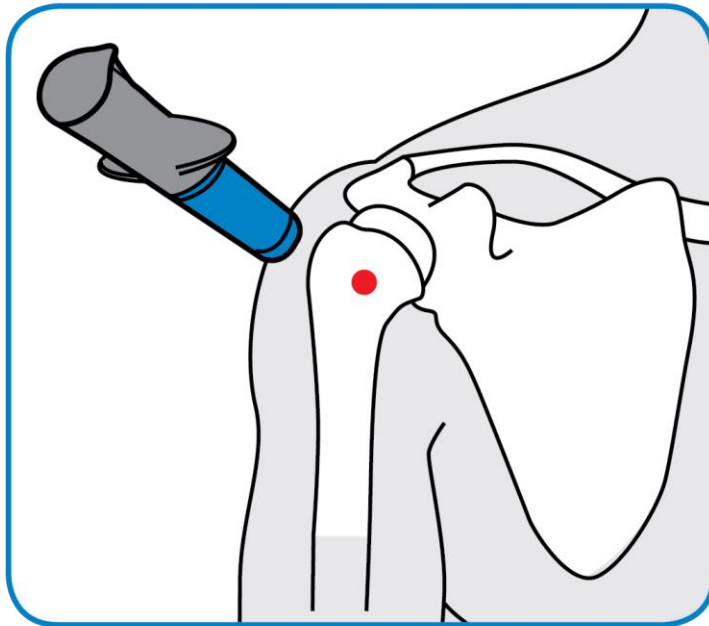




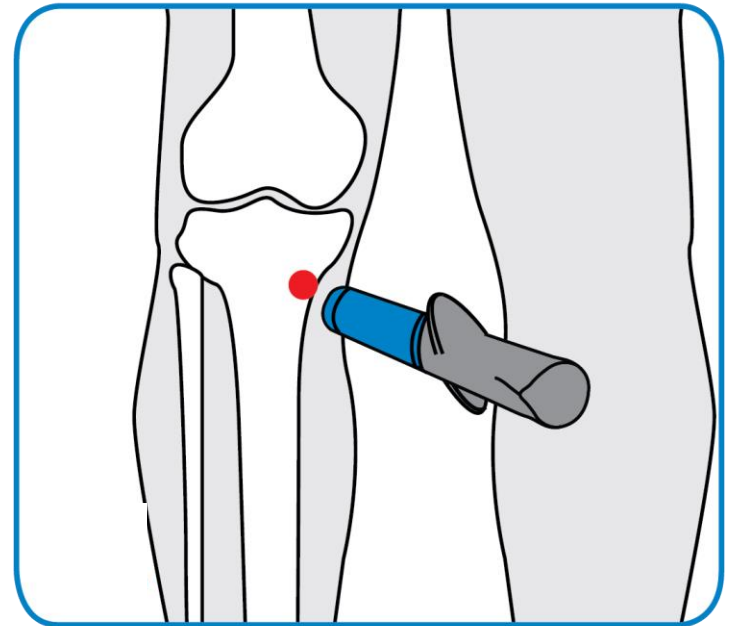
# OPERATIONAL STEPS

Select the appropriate site:

**Humeral Head**



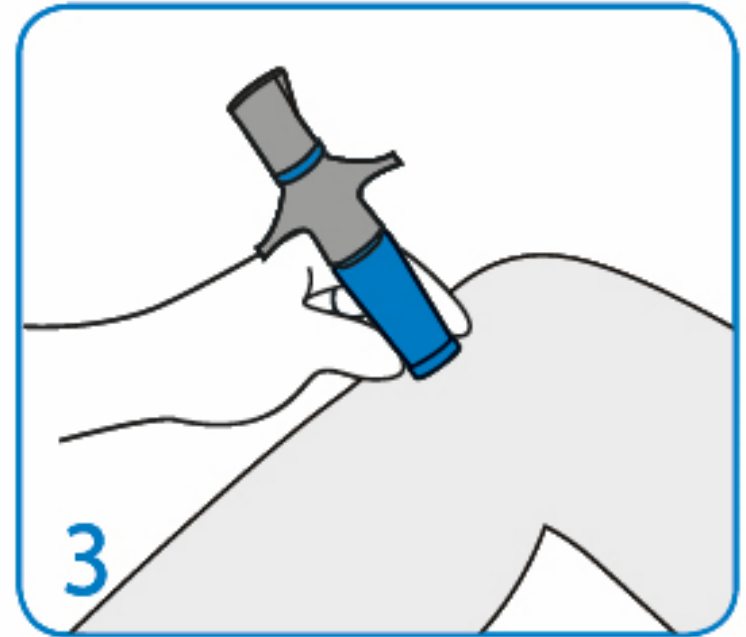
**Proximal Tibia**



# NIO PLACEMENT

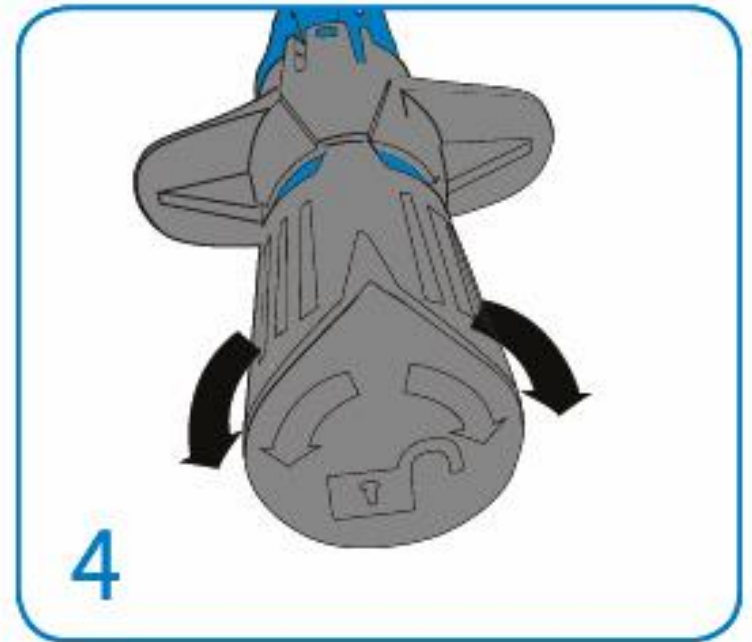
Hold the NIO at the base at a 90° angle to the surface against the skin.

With your non-dominant hand on the textured dots holding it like a dart, fan out your other fingers to stabilize the NIO against the skin. **(Never grasp over or around the gray locking tabs.)**



# UNLOCK THE NIO CAP

Unlock the NIO by rotating the cap 90 degrees in either direction.



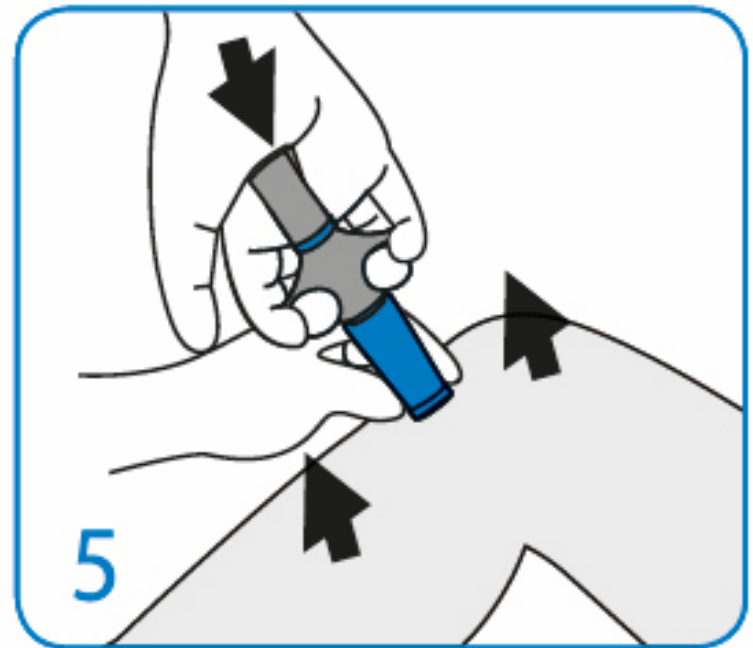
# DEPLOYING THE NIO-A

## THIS IS A **TWO-HANDED** PROCEDURE

Place dominant hand over the cap of the NIO.

Press device down against patient's skin, maintain downward pressure.

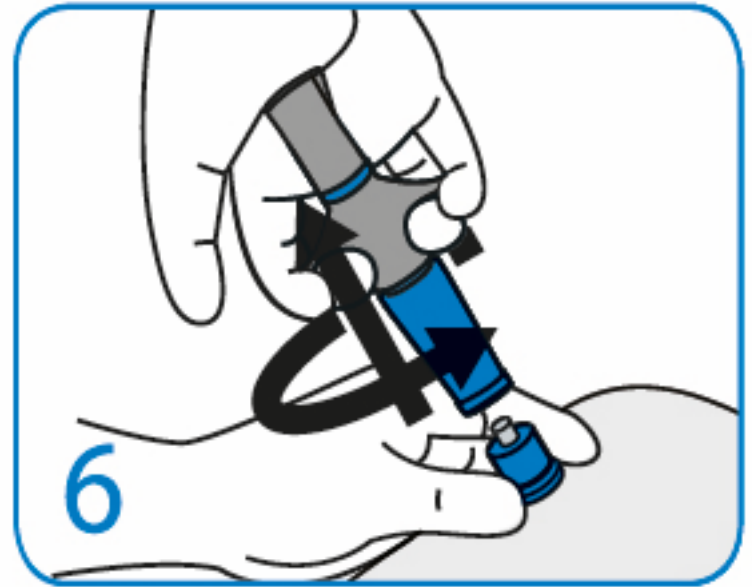
While pressing down on the device, squeeze trigger wings. This deploys the NIO.



# POST-DEPLOYMENT

While holding the stabilizer base against the insertion site, gently pull the NIO in a rotating motion upwards.

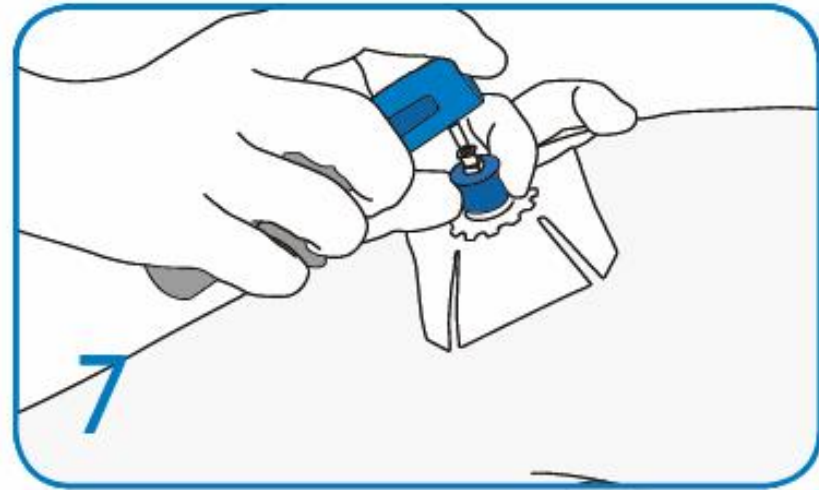
At this point, it is recommended to use the NIO Fixation dressing to affix the stabilizer base to the patient's skin.



# REMOVING TROCAR

After **securing** the NIO with the NIO Fixation dressing, continue holding the needle stabilizer in place and pull up on the **trocar** (twisting may be necessary).

The keyhole notch on the distal end of the NIO can be used to assist in removing the trocar.

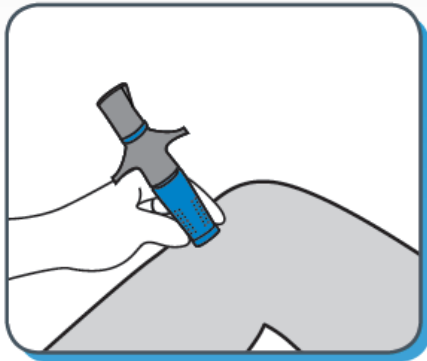


# NIO™ ADULT

## OPERATION STEPS SUMMARY (S.U.P.S)

**nio**  
ADULT

**S.U.P.S.**



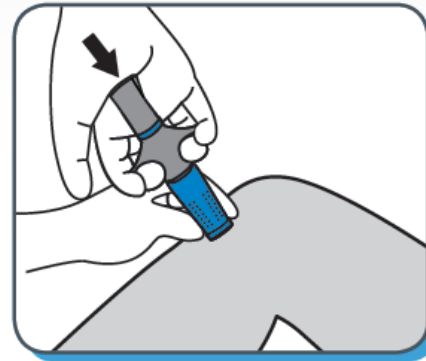
### STABILIZE

With your non-dominant hand, hold the NIO by the **textured dots** at a 90° angle to the access site and maintain downward pressure.



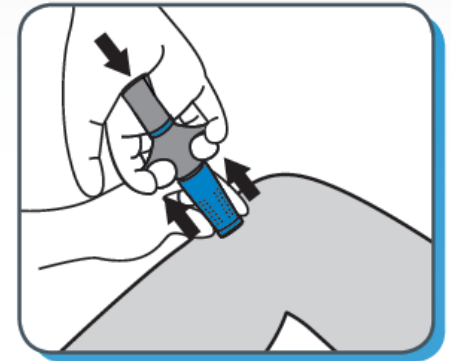
### UNLOCK

Unlock the NIO by rotating the cap 90° in either direction, so that the cap aligns with the trigger wings.



### PRESS

Place the palm of your dominant hand over the cap of the NIO and apply downward pressure, while your non-dominant hand stabilizes the NIO against the patient's skin.



### SQUEEZE

With your dominant hand, maintain downward pressure on the cap and squeeze the trigger wings.

# POST-INSERTION OF THE NIO™

## Post-Insertion of the NIO



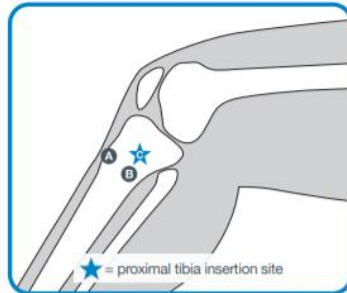


# NIO-A: NEXT STEPS POSTER

## nio | NIO Next Steps ADULT

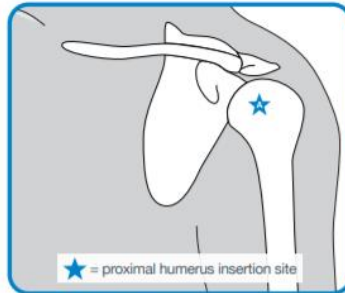


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www.persysmedical.com



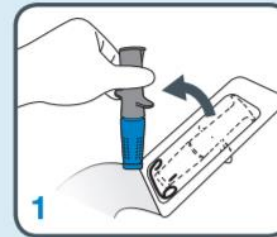
### LOCATING THE PROXIMAL TIBIA

- A: Tibial tuberosity
- B: 2cm (1in) medial, towards inner leg
- C: 1cm (0.5in) proximal, towards knee



### LOCATING THE PROXIMAL HUMERUS

- A: Adduct the patient's arm and locate the greater tubercle, next to the head of the humerus. Palpate the surgical neck of the humerus with your thumbs. Move 1cm (0.5in) towards the greater tubercle. **Note:** To prevent accidental removal of the device, immobilize the patient's limb throughout the procedure.

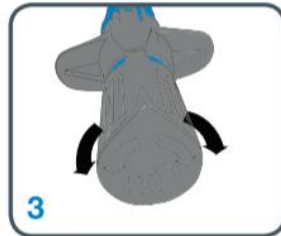


### OPERATING THE NIO ADULT™

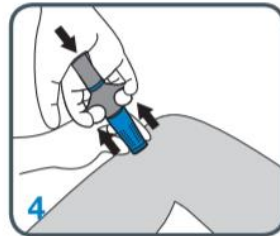
1. Remove the NIO-A from its packaging. Locate and disinfect insertion site.



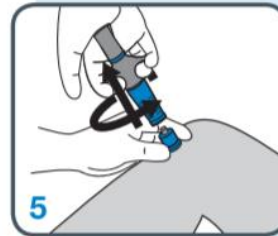
- Note: This is a two-handed procedure.**
2. With your non-dominant hand, hold the NIO-A by the textured dots and position the device at the insertion site, at a 90° angle to the skin. Your non-dominant hand should maintain this position and continue to stabilize the device for the duration of the procedure.



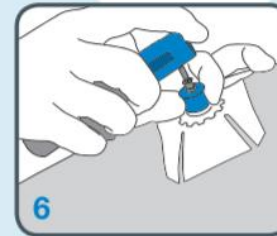
3. Unlock the NIO-A by rotating the cap 90° in either direction.



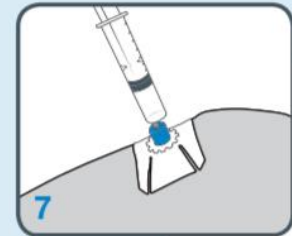
4. Place the palm of your dominant hand over the cap and apply downward pressure, pressing the device against the patient's skin. While maintaining downward pressure, squeeze the trigger wings upward. This will deploy the device.



5. With your non-dominant hand, hold the stabilizer base against the patient's skin. With your dominant hand, gently lift the NIO-A in an upward and rotating motion.



6. At this point, it is recommended to use the NIO Fixation dressing to affix the stabilizer base to the patient's skin. While holding the blue stabilizer base and cannula in place, remove the trocar by pulling it up (a twisting motion may be necessary). The trocar removal notch, located at the distal end of the NIO-A, can assist in removing the trocar from the cannula.



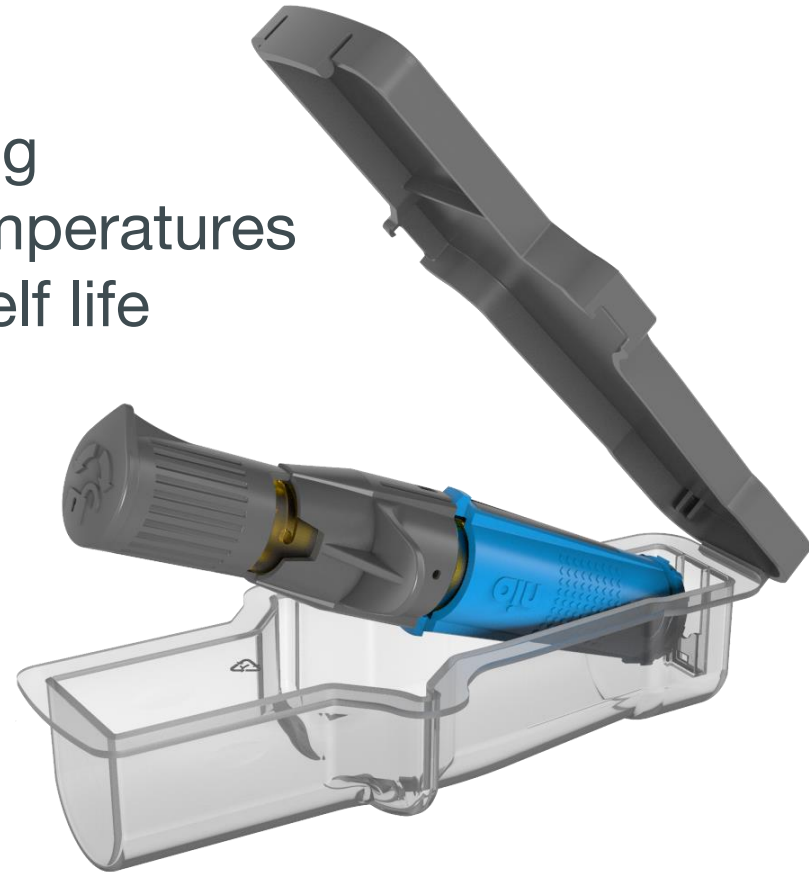
7. Connect a syringe and confirm a secure fitting. If desired, aspirate for bone marrow. Always confirm successful needle placement by flushing with up to 20cc of fluid, or per institutional protocol.

**PERSYS MEDICAL**

# NIO+

## RELIABLE POWERFUL VASCULAR ACCESS IN ANY CIRCUMSTANCE

- Compact and durable packaging
- Proven durability in extreme temperatures
- 3-year extreme temperature shelf life
- Vascular access in 10 seconds
- Lightweight - approx. 140g
- Reliable safety mechanism
- No exposed needle
- Single use device
- Fully assembled



# NIO+

The NIO+ core, made of reinforced polymer, is resistant to elevated thermal temperatures which enable the NIO+ to operate under extreme temperature conditions.

The device comes fully assembled in a durable casing that provides reliable vascular access for adults.



# NIO™ PEDIATRIC

## INSTRUCTIONS FOR USE



2015-2019 version of NIO-P



2020 and beyond version of NIO-P

# NIO PEDIATRIC DEPLOYING

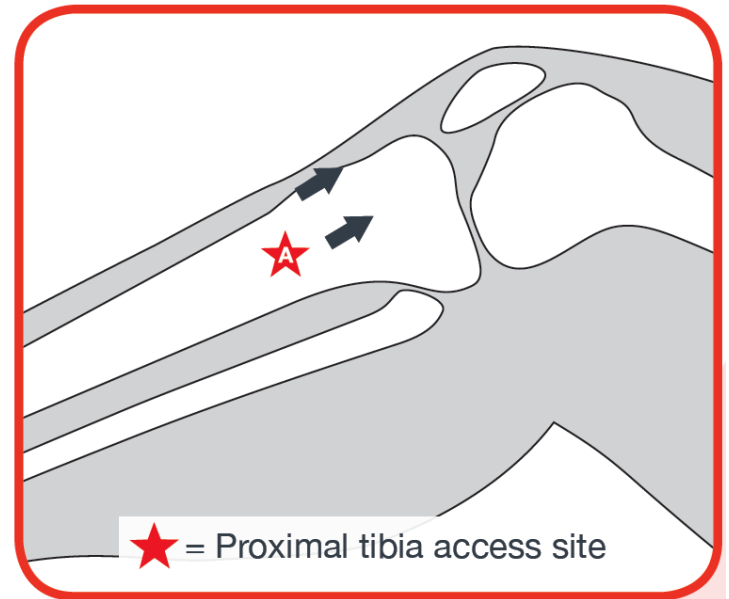
## NIO Pediatric Deploying



# PEDIATRIC PROXIMAL TIBIA

## Locating pediatric tibial access site:

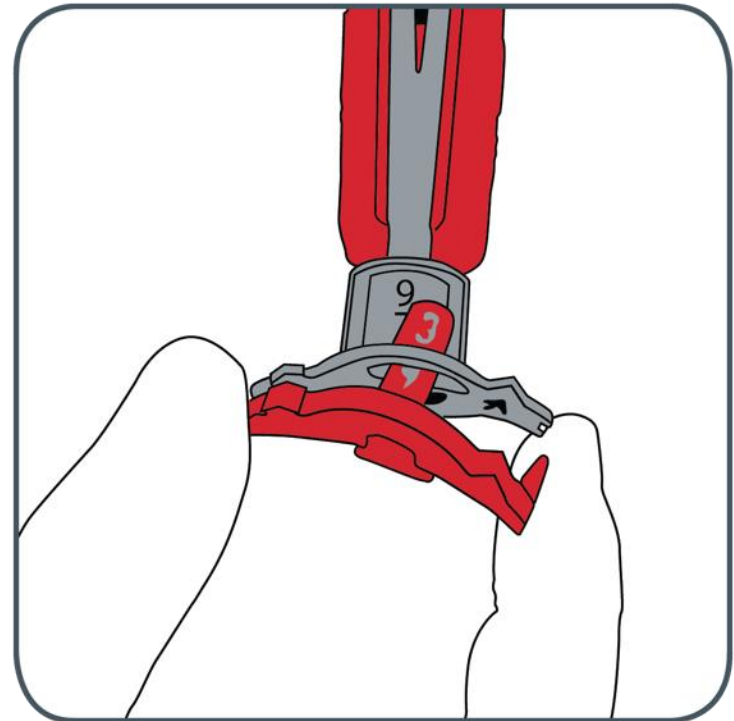
This device features locating arrows which aid in access site landmarking.



# OPERATING THE NIO-P

To operate, place the designated locating arrow (**R for right leg, L for left leg**) on the prominent aspect of the tibial tuberosity, aligned parallel to the long axis of the tibia. Locating arrows should be pointing up towards the patient's knee.

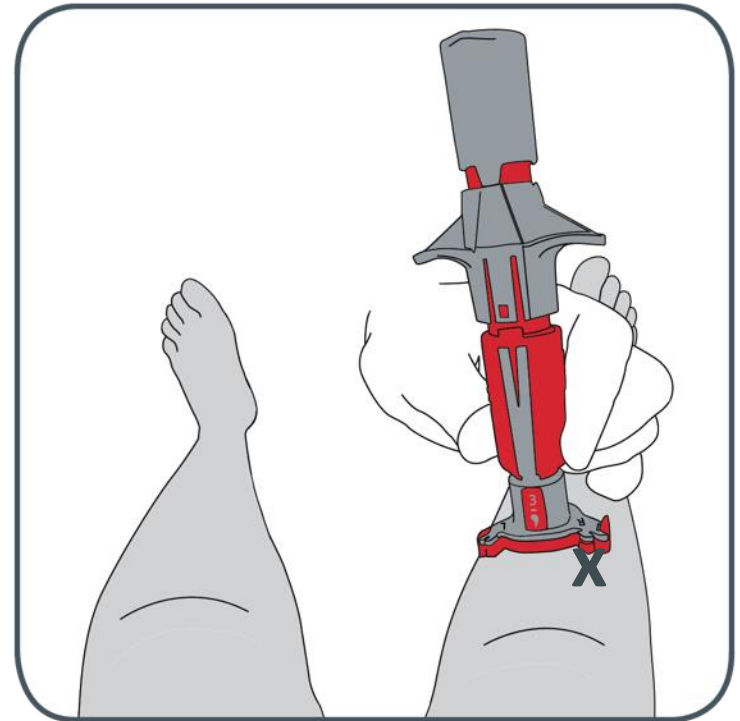
Remove the NIO-P from its packaging. Locate and disinfect access site. Ensure penetration depth indicator correlates with patient's age. For 3-9 year olds, leave the red spacer intact. For 9-12 year olds, remove the red spacer.



Age	Proximal Tibia
3-9 years .....	14mm (0.55in)
9-12 years .....	Adjust to 18mm (0.7in)

# PLACE LOCATION ARROW POINTING UPWARD

With non-dominant hand, hold NIO-P by the textured dots and place the designated location arrow (R for right leg, L for left leg) on the prominent aspect of the tibial tuberosity, parallel to the long axis of the tibia.





# UNLOCK THE NIO CAP

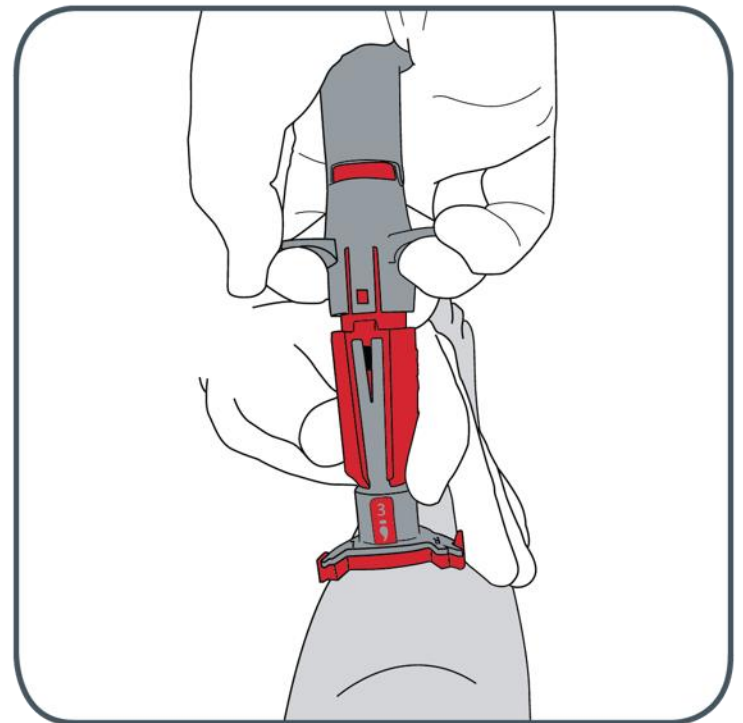
With device to patient's skin,  
unlock NIO-P by rotating cap  
90° in either direction, until cap  
aligns with trigger wings



# DEPLOYING THE NIO-P

## THIS IS A **TWO-HANDED** PROCEDURE

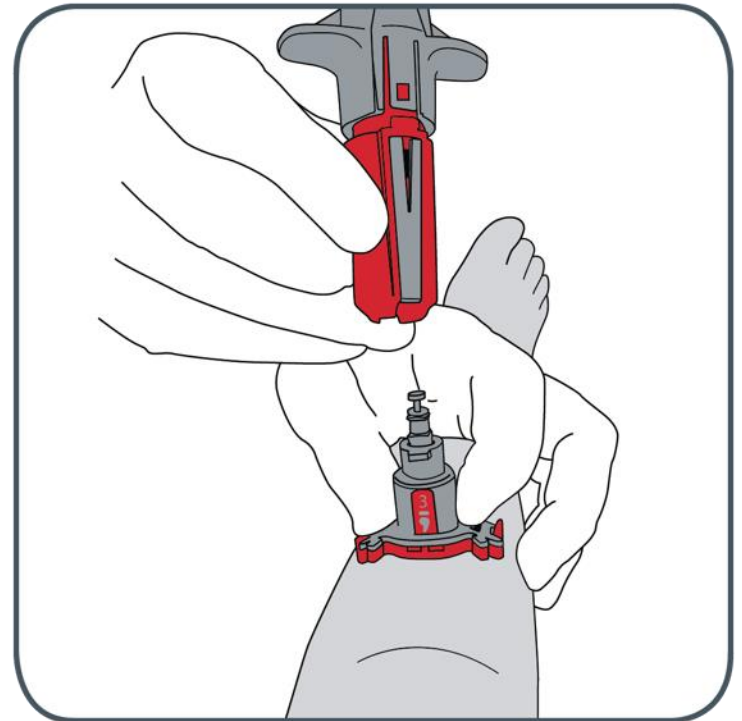
Place palm of dominant hand over cap and apply downward pressure. While **maintaining downward pressure**, use fingers to squeeze the trigger wings.



# POST-DEPLOYMENT

Hold red stabilizer base against insertion site and gently lift NIO-P in an upward and rotating motion.

At this point, it is recommended to use the NIO Fixation dressing to affix the stabilizer base to the patient's skin.



# REMOVING TROCAR

Hold stabilizer base in place and pull trocar out, leaving cannula in stabilizer hub.

The trocar removal notch on the distal end of the NIO-P can be used to assist in removing the trocar from the cannula.



# NIO-P: NEXT STEPS POSTER



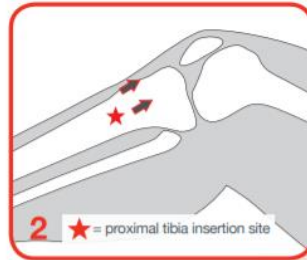
## NIO Next Steps



### OPERATING THE NIO PEDIATRIC™

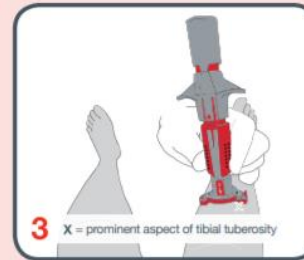
1. Remove the NIO-P from its packaging. Locate and disinfect insertion site. Ensure penetration depth indicator correlates with patient's age. For patients 3-9 y/o, the device is ready to use. For patients 9-12 y/o, remove the red spacer.

Age	Proximal Tibia
3-9 years old	14mm
9-12 years old	Adjust to 18mm



### LOCATING THE PROXIMAL TIBIA

The NIO-P features unique locating arrows, which aid in access-site landmarking.  
2. Place the locating arrow (R for patient's right leg, L for patient's left leg) on the prominent aspect of the tibial tuberosity, aligned parallel to the long axis of the tibia. The locating arrows should be pointing up, towards the patient's knee.

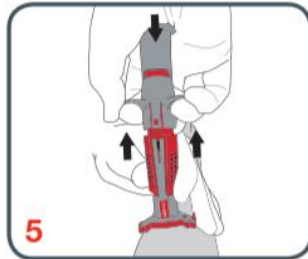


### Note: This is a two-handed procedure.

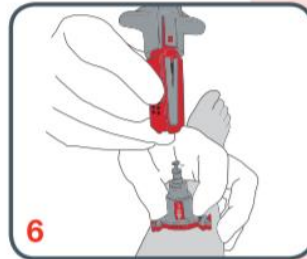
3. With your non-dominant hand, hold the NIO-P by the insertion site, at a 90° angle to the skin. Your non-dominant hand should maintain this position and continue to stabilize the device for the duration of the procedure.



4. Unlock the NIO-P by rotating the cap 90° in either direction.



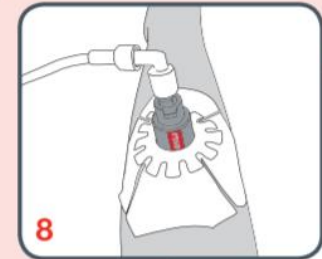
5. Place the palm of your dominant hand over the cap and apply downward pressure, pressing the device against the patient's skin. While maintaining downward pressure, squeeze the trigger wings upward. This will deploy the device.



6. With your non-dominant hand, hold the stabilizer base against the patient's skin. With your dominant hand, gently lift the NIO-P in an upward and rotating motion.



7. At this point, it is recommended to use the NIO Fixation dressing to affix the stabilizer base to the patient's skin. While holding the grey stabilizer base and cannula in place, remove the trocar by pulling it up (a twisting motion may be necessary). The trocar removal notch, located at the distal end of the NIO-P, can assist in removing the trocar from the cannula.



8. Connect a syringe and confirm a secure fitting. If desired, aspirate for bone marrow. Always confirm successful needle placement by flushing with up to 20cc of fluid, or per institutional protocol.



# NIO™ INFANT

## INSTRUCTIONS FOR USE



# NIO INFANT DEPLOYING

## NIO Infant Deploying

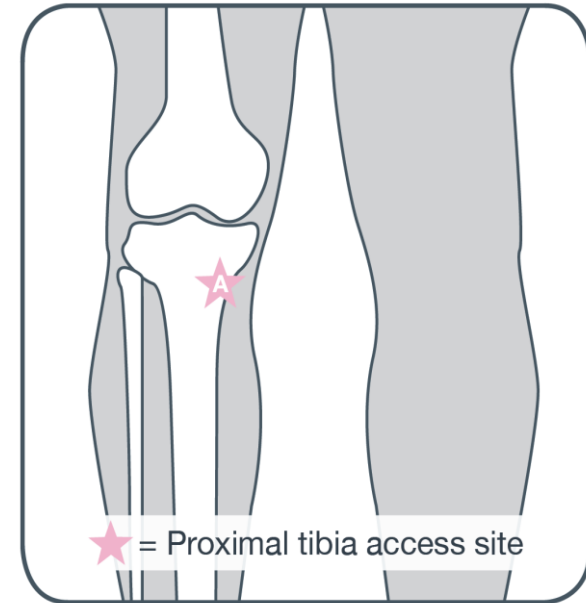


# IDENTIFY INSERTION SITE

Locate tibial tuberosity and extend patient's leg.

Insertion site is approx. 1cm (0.5in) medial to the tibia tuberosity, or just below the patella (approx. 1cm (0.5in) or one pinky finger width) and slightly medial (approx. 1cm (0.5in) or one pinky finger width), along the flat aspect of the tibia

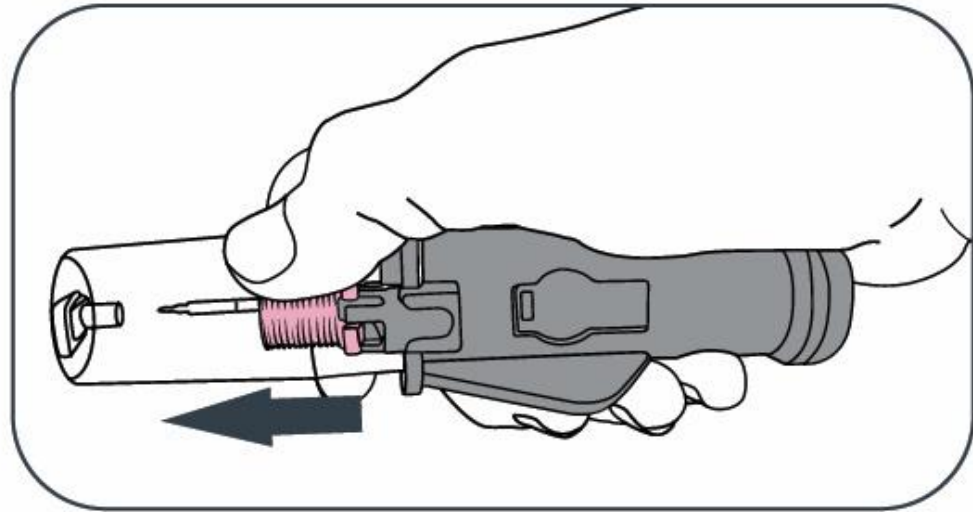
Use your non-dominant hand to hold and stabilize the limb. Pinch patient's tibia between your fingers to identify the medial and lateral borders and locate the center.





# REMOVE COVER

Remove the protective needle cover. Hand hygiene, PPE, cleanse sit per guidelines.

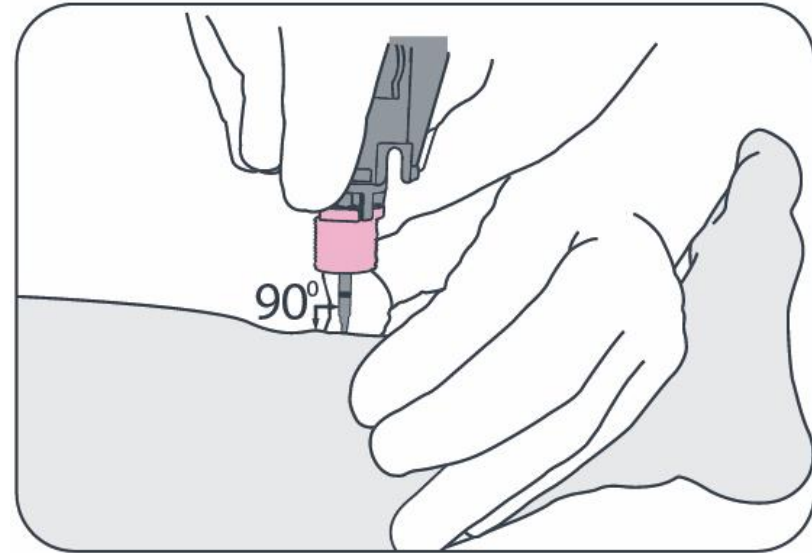


# DEPLOYING THE NIO-I

Hold NIO-I at a 90° angle to the surface against the skin at the insertion site.

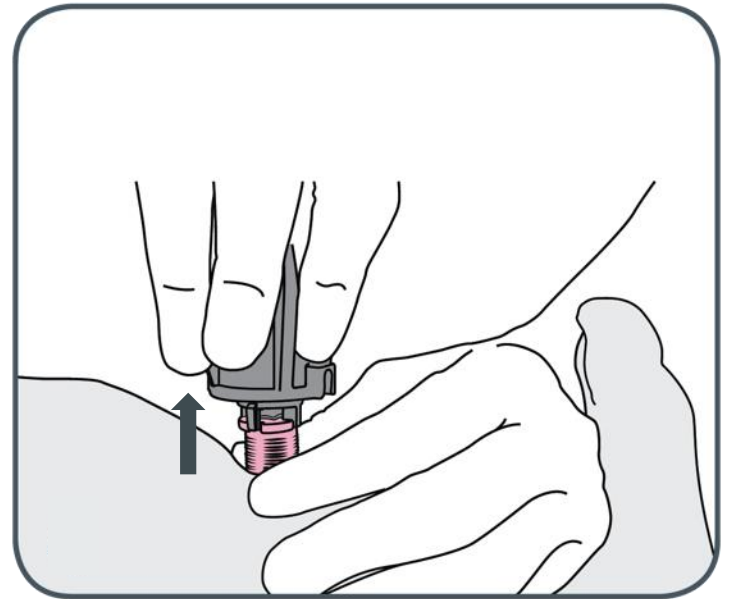
Penetrate through the soft tissue to reach bone. Slowly twist device while applying moderate downward pressure until a change in resistance is felt.

Visualization of the 5mm marker line on the cannula should be obtained to confirm adequate needle length.



# POST-DEPLOYMENT

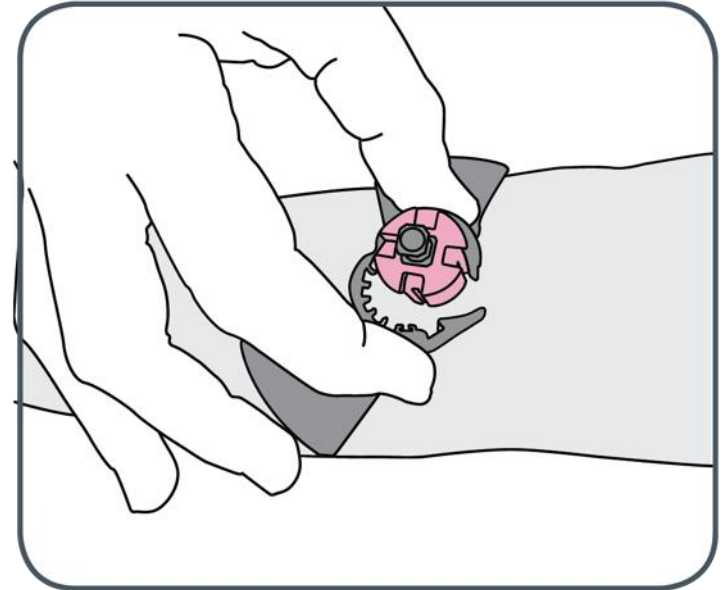
Secure the pink needle base with your non-dominant hand and pull the handle straight up with your dominant hand.



# FIXATION DRESSING PLACEMENT

Use the NIO-I Fixation dressing to affix the stabilizer base to the limb.

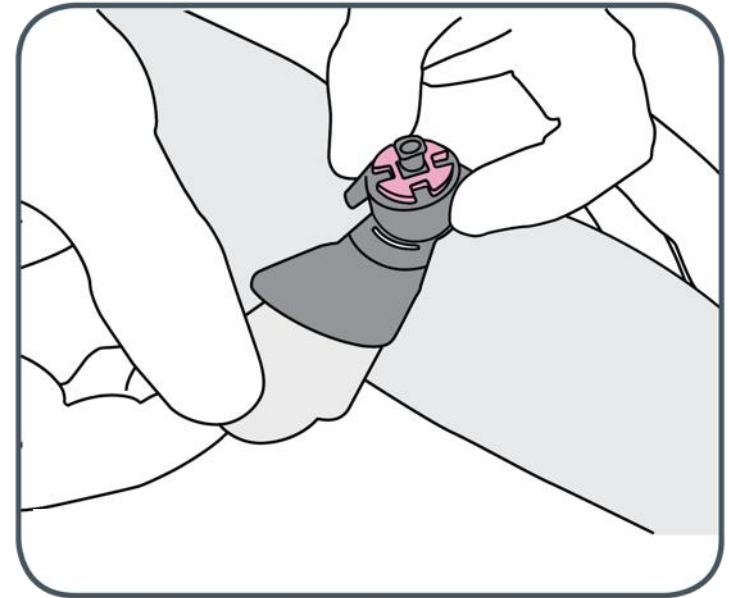
Place NIO-I Fixation dressing over the pink stabilizer site and lock the ring by squeezing its sides together until the clasp clicks shut.



# FIXATION DRESSING PLACEMENT

While holding the stabilizer, gently pull the liner to adhere the dressing to the skin.

Use your fingers to affix the adhesive tabs to the patient's skin, ensuring that the Fixation dressing is firmly adhered.

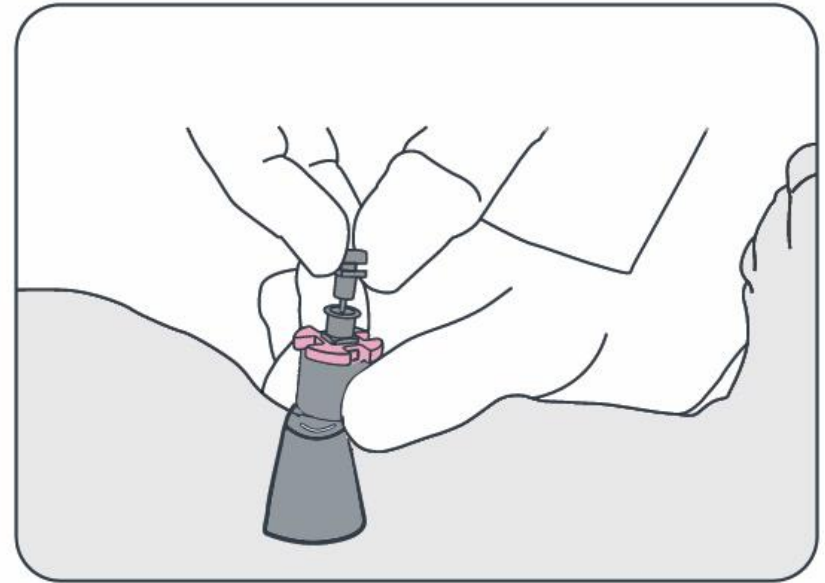


# TROCAR REMOVAL

With your non-dominant hand, hold the stabilizer base.

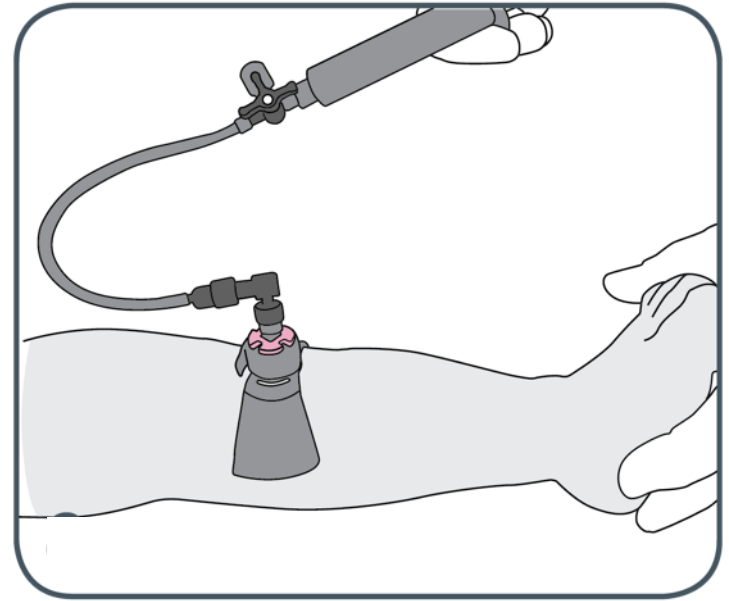
With your dominant hand, use your fingers to remove the trocar from the cannula (a twisting motion may be necessary).

Once removed, place the trocar into an appropriate biohazard container.



# CONFIRM NEEDLE PLACEMENT

Always confirm needle placement. Aspirate for bone marrow, prime, and flush with 2-5ml of normal saline. Connect infusion set and infuse medications per protocol.



# NIO INFANT POST INSERTION

## NIO Infant Post Insertion





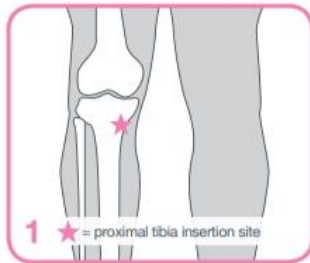
# NIO-I: NEXT STEPS POSTER



## NIO Next Steps

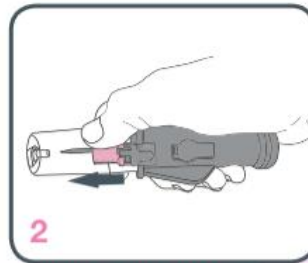


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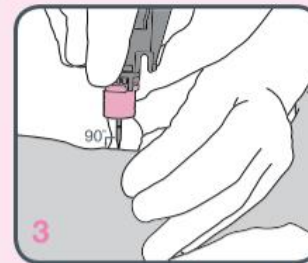
### LOCATING THE PROXIMAL TIBIA

1. Extend the patient's leg. Use your non-dominant hand to locate the insertion site. The insertion site is located approximately 1cm (0.5in) medial to the tibial tuberosity, just below the patella (1cm [0.5in] or approximately one pinky finger width) and slightly medial (1cm [0.5in] or approximately one pinky finger width), along the flat aspect of the tibia. To promote stability during insertion, use your fingers to pinch the tibia at the insertion site.

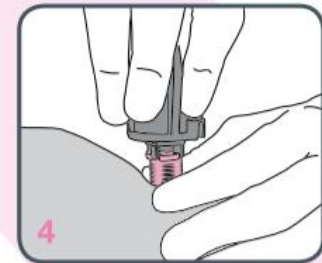


### OPERATING THE NIO INFANT™

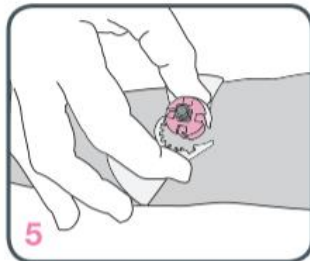
2. Disinfect the skin at the insertion site, per institutional protocol. Open the blister pack by peeling off the Tyvek and take out the NIO-I. With your dominant hand, remove the needle cover by sliding it away from the handle.



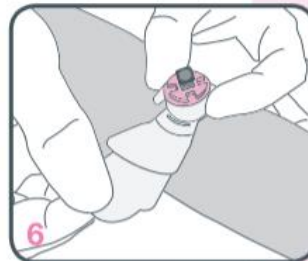
3. With your dominant hand, firmly hold the NIO-I by its handle. Position the needle at the insertion site, at a 90° angle to the skin. Maintain this angle throughout the procedure. Introduce the needle through the soft tissue until the tip of the trocar rests against the bone. At this point, visualization of the 5mm marker line on the cannula should be obtained to confirm adequate needle length. To access the medullary space, slowly twist the device while applying moderate downward pressure until a change in resistance is felt, indicating penetration through the proximal cortex and entrance into the medullary cavity.



4. With your non-dominant hand, hold the stabilizer base against the patient's skin. With your dominant hand, gently lift the NIO-I straight up by its handle.



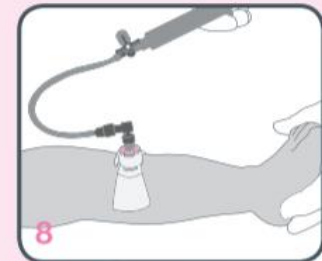
5. Use the NIO-I Fixation dressing to affix the stabilizer base to the limb. Position the Fixation ring around the stabilizer base and lower it onto the skin. Lock the ring by squeezing its sides together until the clasp clicks shut.



6. Remove the paper liner from the underside of the Fixation dressing to expose its adhesive tabs. Use your fingers to affix the adhesive tabs to the patient's skin, ensuring that the Fixation dressing is firmly adhered.



7. With your non-dominant hand, hold the stabilizer base. With your dominant hand, use your fingers to remove the trocar from the cannula (a twisting motion may be necessary).



8. After removing the trocar, connect a syringe and confirm a secure fitting. If desired, aspirate for bone marrow. Always confirm successful placement by flushing with 2-5ml of fluid, or per institutional protocol.



# NIO ACCESS SITE POSTER

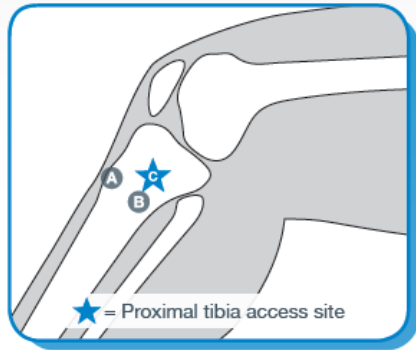
## ACCESS SITE LOCATING

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A D U L T

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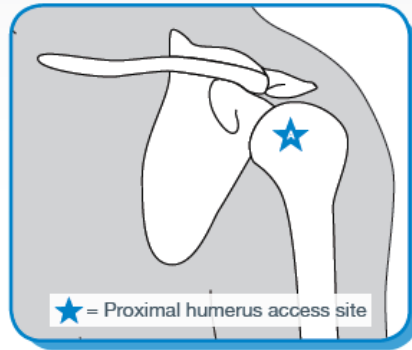
### NIO Adult™



#### LOCATING THE PROXIMAL TIBIA

- A:** Tibial tuberosity
- B:** 2cm (1in) medially, towards inner leg
- C:** 1cm (0.5in) superior, towards knee

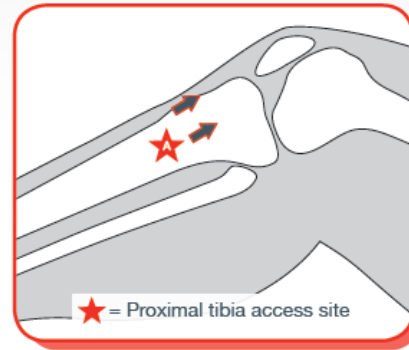
### NIO Adult™



#### LOCATING THE PROXIMAL HUMERUS

- A.** Adduct patient's arm with hand over umbilicus. One hand bisects the arm at the deltoid, while the other hand bisects the axilla anteriorly. Rotate hands inward until the thumbs meet. Palpate the surgical neck of the humerus with your thumbs, then move 1cm (0.5in) upward to the greater tubercle.

### NIO Pediatric™

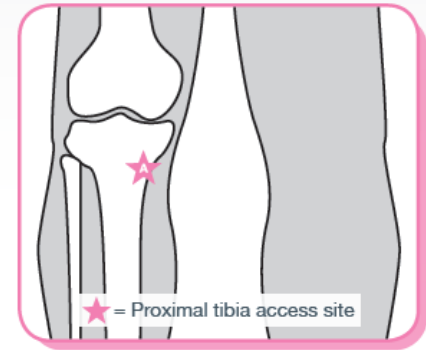


#### LOCATING THE PROXIMAL TIBIA

This device features locating arrows which aid in access site landmarking.

- A.** To operate, place the designated locating arrow (R for right leg, L for left leg) on the prominent aspect of the tibial tuberosity, aligned parallel to the long axis of the tibia. Locating arrows should be pointing up towards the patient's knee.

### NIO Infant™



#### LOCATING THE PROXIMAL TIBIA

- A.** Locate tibial tuberosity and extend patient's leg. Insertion site is approx. 1cm (0.5in) medial to the tibial tuberosity, or just below the patella (approx. 1cm [0.5in] or one finger width) and slightly medial (approx. 1cm [0.5in] or one finger width), along the flat aspect of the tibia.

Use your non-dominant hand to hold and stabilize the limb. Pinch patient's tibia between your fingers to identify the medial and lateral borders and locate the center.

# POST INSERTION

Confirm proper placement of needle by needle position, bone marrow return/blood return, no evidence of infiltration after flushing with preservative free saline (adults) up to 20ml and (pediatrics) 2-5ml.

Apply primed extension tubing, press downward on the luer hub and half-twist to secure tubing to the hub. (**Do NOT attempt to simply twist it on**)



# GO-IO™ KIT



## INTRAOSSUEOUS START KIT

- IV Extension set with 3-way stopcock
- NeedleVise® Sharps block
- Secure IV strap
- Alcohol prep pads
- Patient bracelet



# STABILIZATION

To prevent accidental removal of the device following the insertion of a humeral head IO, **immobilize** the arm.

Use the Secure IV strap holder face down on the patient's limb to secure IV tubing to the patient.



# MONITOR

- When infusing vesicants, chemotherapy, and highly concentrated medications, the IO needle should be rechecked for placement and patency, by confirming the needle is stable in the bone prior to drug administration.
- Frequently reassess needle placement, monitor the limb (per protocol) every 10 minutes for the first half hour or longer after beginning infusion.
- Monitor neurovascular extremity of the insertion site, checking for pulses, cap refill, color, temperature, and swelling.
- Document site when reporting off to next caregiver.

# DISCONTINUE NIO™

## REMOVAL:

- Remove or loosen the stabilization dressing.
- Remove the cannula and needle stabilizer by twisting and pulling vertically. **(Do not rock the needle back and forth)**
- 10ml syringe is **not** recommended for removal, if you do use the syringe be sure to press down and twist to confirm secure fitting.
- When no longer essential, patent, limit dwell to 24 hours, depending on local protocol.
- Hold manual pressure until hemostasis is achieved.
- Use caution placing sequential compression devices (SCDs) on the same extremity—follow SCD's instructions for use.
- Document on the dressing the time and date of removal—NO IO for 48 hours in the same bone.
- Document site and condition at time of removal.

# REMOVAL OF THE NIO™

- [Removal of the NIO](#)





# QUESTIONS



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## **Intraosseous (IO) Recommendations**

### **2015 American Heart Association guidelines recommend (AHA)**

- ✓ Intraosseous (IO) vascular access as an alternative in cases of emergency, if prompt venous catheterization is impossible.
- ✓ **AHA** guidelines also emphasize that providers should limit the time spent attempting to establish peripheral venous access in a critically ill or injured child.
- ✓ **AHA** supports IO or IV vascular access as the preferred route for drug delivery during CPR (adult & children) and recommends against central venous access as the initial route of vascular access during emergencies.

### **2010 Pediatric Advanced Life Support (PALS)**

- ✓ Use of the IO route as the initial vascular access route (II)

### **2015 Advanced Cardiac Life Support (ACLS)**

- ✓ Drugs and fluids can be delivered safely and effectively during resuscitation via the IO route if IV access is not available.
- ✓ IO access can be used for all age groups, can be placed in less than one minute, and has more predictable absorption than the ET route.
- ✓ Any ACLS drug or fluid that can be administered intravenously can also be given intraosseous.

### **2016 Infusion Nursing Society (INS Standard 55.1)**

- ✓ In the event of adult or pediatric cardiac arrest, anticipate the use of the IO route if IV access cannot be obtained quickly.
- ✓ The IO route also may be considered for emergent and non-emergent use in patients with limited or no vascular access; when the patient may be at risk if access is not obtained.

## 2018 UpToDate

- ✓ We recommend that infants and children in cardiopulmonary arrest or severe shock who do not have readily available intravenous access undergo intraosseous (IO) cannulation rather than central venous line placement or surgical venous cutdown.
- ✓ For adults in cardiopulmonary arrest or severe shock in whom intravenous access cannot be established, we suggest IO cannulation pending central venous line placement or surgical venous cutdown.
- ✓ Use IO when standard venous access methods cannot be rapidly achieved and as the first attempt at vascular access in cardiopulmonary arrest or severe shock in selected patients.
- ✓ The American Heart Association and the International Committee on Resuscitation endorse the use of IO access as a safe and effective means of vascular access in critically ill children and adults. IO cannulation permits rapid intravascular access in critically ill children and adults.

## **2015 Emergency Nursing Association (ENA)**

- ✓ Intraosseous access is significantly more expeditious than standard IV access and should be considered early when known or suspected difficult venous access exists (A Recommendation)
- ✓ IO access provides vascular access in a timely manner when faced with difficult IV access. This conclusion is supported by the consistent first attempt success rate and rapid time to insertion. IO access is still significantly underutilized in emergency care and should be considered when rapid vascular access is needed and the patient presents with difficult peripheral venous access.
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