FIREFLY
VEIN LIGHT®

Infant & Newborn IV Training Guide

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Overview

Evan & Adam
RN, BSN
Founders & Creators

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VEIN LIGHT®

Our Mission:

To reduce delays in care in infants and newborns by increasing success rates of 1st attempt IVs on a national scale.

Founders

Firefly Vein Light® was hand designed by two pediatric ER travel nurses that recognized delays in care that were a direct result of insufficient or lack of availability of infant and newborn vein finders. After years of designing, engineering, and testing Adam and Evan are proud to present Firefly Vein Light®.

Acknowledgements

Proudly engineered, manufactured, and headquartered in The United States.

- Engineered: California
- Manufactured (ISO 13485): Michigan
- Distribution/Headquarters: Tennessee

Disclaimer.

- Firefly Vein Light® LLC or Nurse Kelly's Notes are not responsible for clinical outcomes of patients while using our products or services.
- This training was designed based on neonatal intensive care and pediatric emergency clinical nursing experience.
- Variations to care may apply based on clinical presentation of the patient.
- Always follow your regional, local, and facility protocols.
- Only work within your licensed scope of practice.

What Is A Vein Light (Transilluminator)?

A vein light (transilluminator)

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- This is a specialized tool specifically designed to assist in IV placement for infants and newborns.
- Newborns have smaller, more fragile veins than older children and adults. making successful IV placement difficult. Conditions including uncontrolled maternal diabetes may contribute to the development of excess adipose tissue, further complicating identification of veins suitable for IV insertion.
- A vein light is an effective tool that can help clinicians identify possible sites for IV placement in newborns and infants.

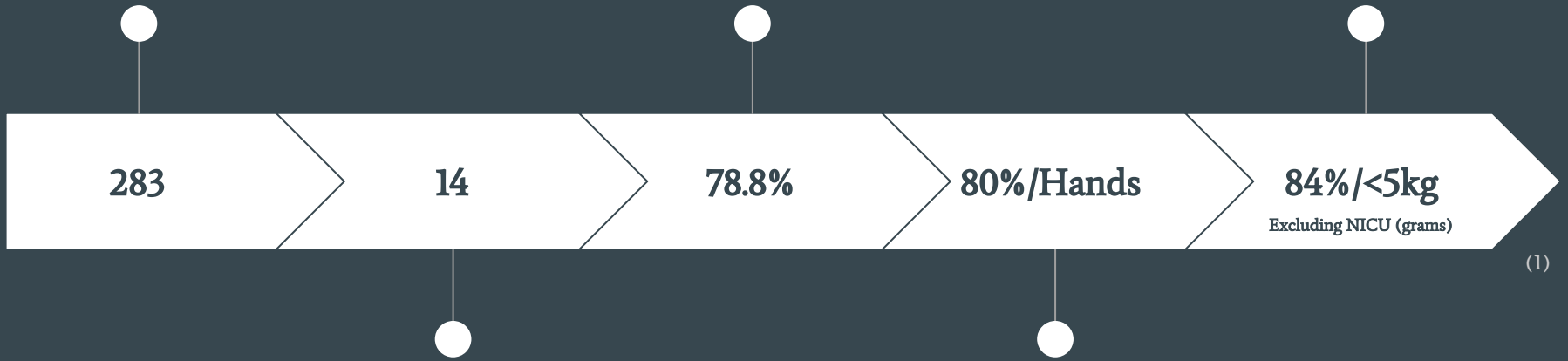
Firefly Vein Light® 2023 Clinical Study

Full report on our website

IV Start Sample Size.

Average 1st attempt success rate using the Firefly Vein Light®.

Highest 1st attempt success rate based on patient weight.



(1)

Total number of states in participation.

Highest 1st attempt success rate based on IV location.

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Why <2 years old?

- The first two years the child is still growing into their “baby fat”.
- This poses a unique challenge for nurses as the veins sit below a very thick layer of adipose tissue.
- By illuminating from below you will get an accurate view of the deep veins as well as reducing shadows that can be misleading as seen with other types of technology for IVs in this population.
- As the child grows and develops their motor skills they will develop muscle mass which is much more dense than adipose tissue therefore the transilluminator is specific for this younger age range.

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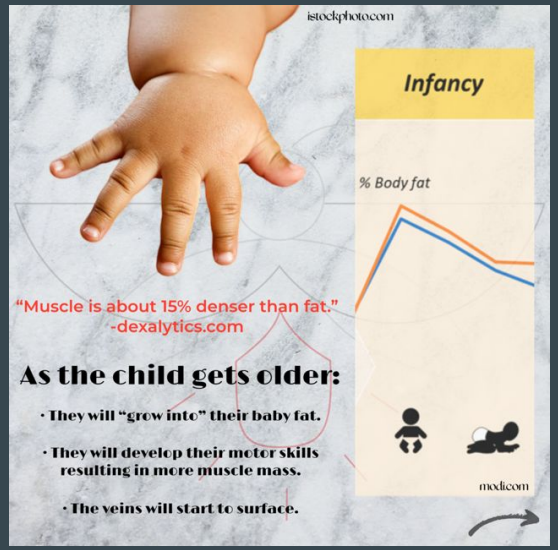

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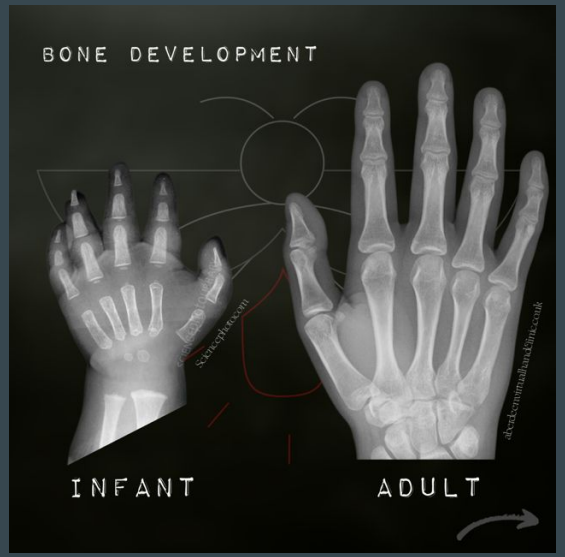

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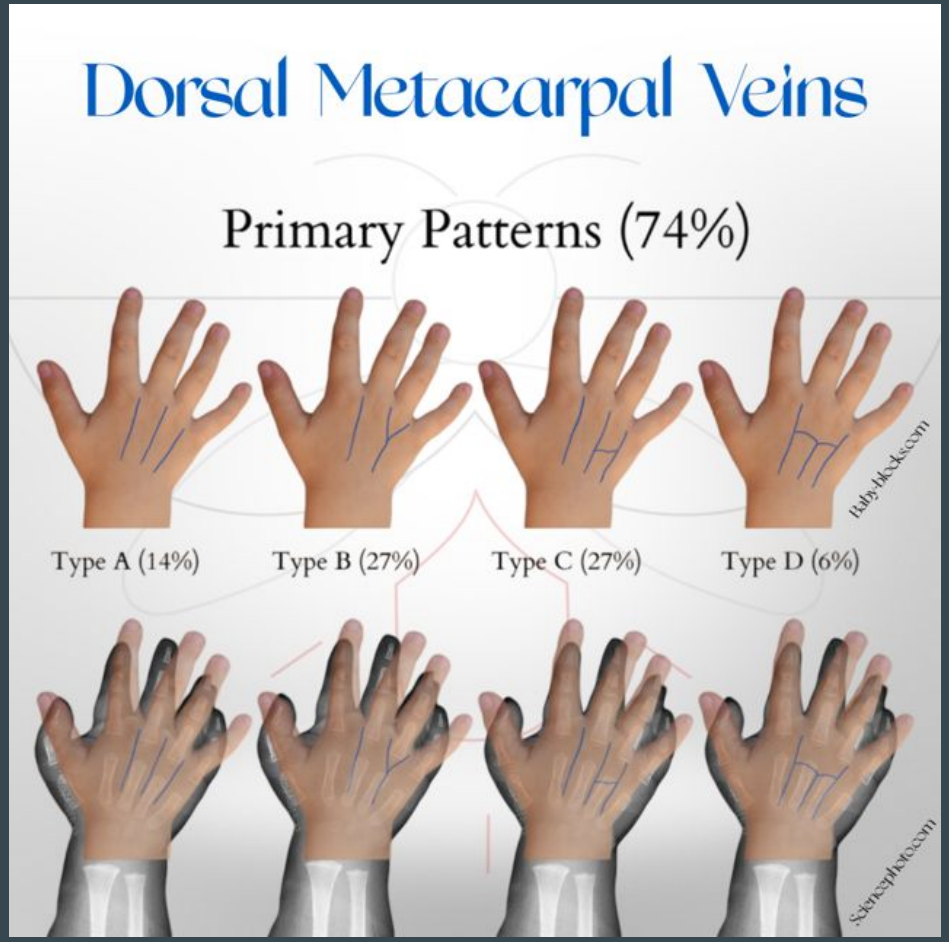
The Hands!

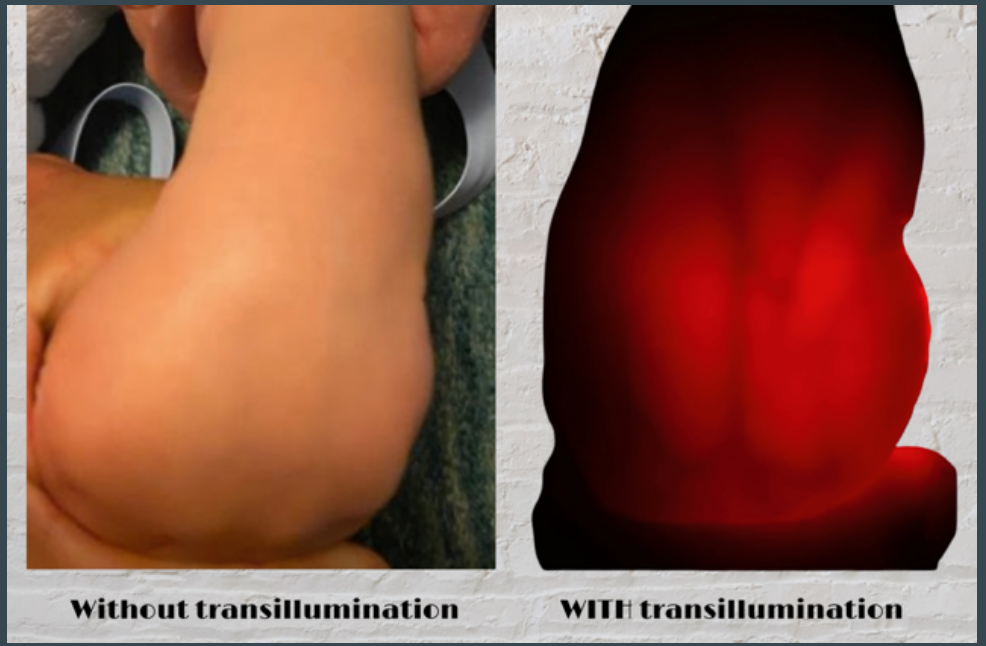

Dorsal Metacarpal Veins
Primary Patterns (74%)
Type A (14%)
Type B (27%)
Type C (27%)
Type D (6%)

(6)

(4)

The Hands!

(1)



^ The top of a 1 year old's hand.

Family Centered Care

The child is not the only patient.

The Family

It is very important be transparent with the plan of care to the family. Placing an IV in their child is a terrifying thought for them. To reduce their anxiety and to boost their confidence in you, briefly explain clinical necessity, the process of the IV placement, and their role in the event. This can be delegated to the charge nurse, child life specialist, or another qualified team member.

Let them be the hero!

Never use the family as your holder. Let them be the hero after the peripheral IV placement when they comfort the child.

Give them a role.

The family loves to be involved. Assign them to turn the lights on once you attain your PIV (this will be explained later) or ask them to have the child's favorite toy/blanket on standby. This not only helps them feel like they are a part of the care but creates some distraction for them from the thought of the PIV.

The IV Tray

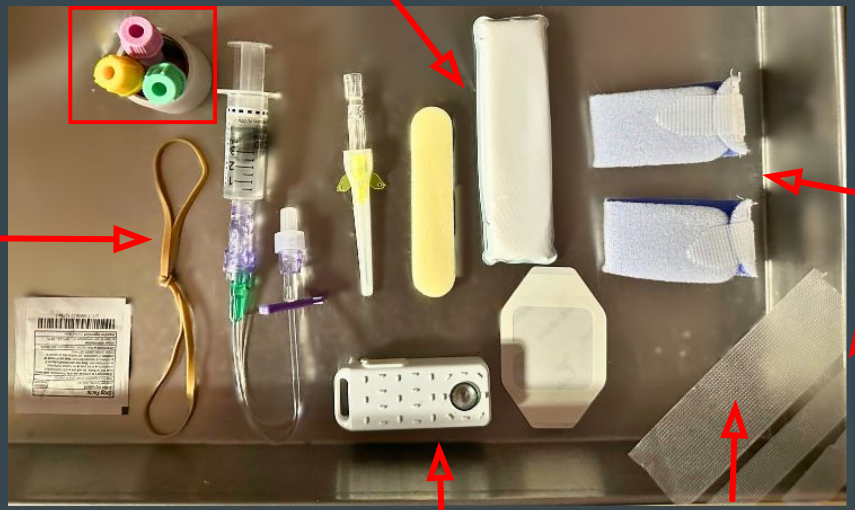
Preparation and Consistency

The IV tray:

- Consistency will be your best friend when you have a fighting child.
- By having your tray set up the same every time you will have quicker response times to the components you need from memory.
- Securing your IV quickly is a necessity with a small child who will fight (and win).

NICU PRO TIP:
Place neonatal blood tubes in a roll of tape.

Arm board. (Two sizes shown here).



Basic IV set.
The preferred catheter size in newborns is a 22 or 24 gauge.

A rubberband may be used instead of a tourniquet.

Tape: 3-5 total strips.

1. 1 full-size, long enough to encircle the arm without overlapping.
2. 2 half-thickness, one the same length, the other no more than ½ the length.
3. 2 optional pieces to secure an arm board, if needed OR foam bracelets.

Firefly Vein Light®.

The Firefly Vein Light® Model 2.0*

Hand Designed by PEDS Nurses.

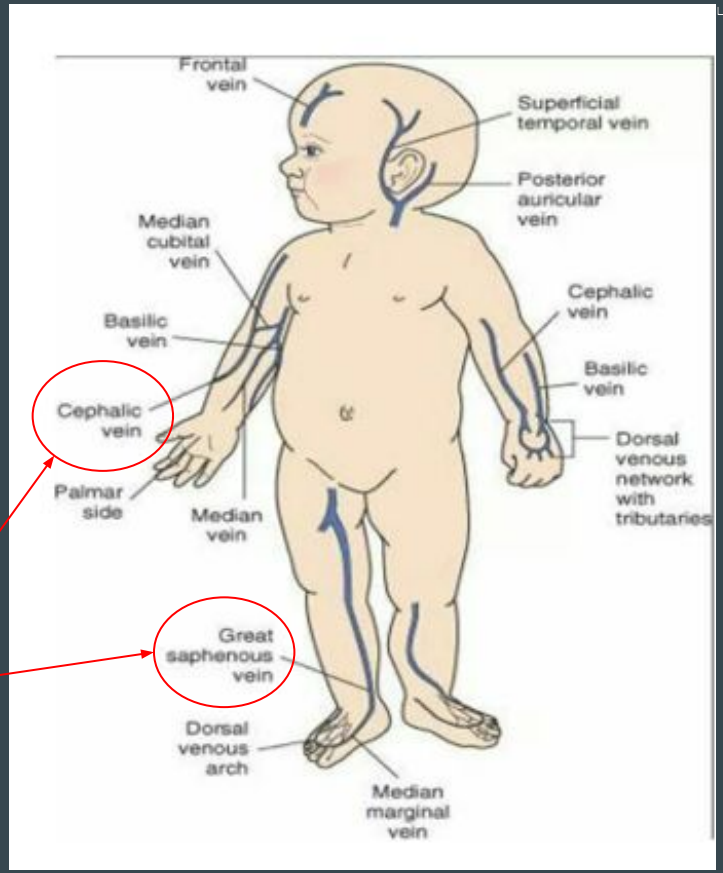
- Clinical application was the highest priority.
- Designed from a PEDS nursing perspective.
- Patient safety was taken into consideration on multiple levels:
  - Safe cleaning
  - Internal thermal sensor
  - Manufactured in the USA with the highest federal standards (ISO 13485).
- By designing the Firefly to attach to your ID badge there is instant access to the tool you need to assist in increasing your 1st attempt IV success.

The Approach

Steps to Success

The approach

- Similar to your IV tray set up your approach should be as consistent as possible.
- Of course there will be variations of approaches based on illness, IV locations, etc.
- Peripheral IVs in newborns can be inserted in the hands, arms, feet, legs, or scalp.
- If possible, try not to insert at sites where flexion occurs.
- If the newborn is a candidate for a PICC line, consider avoiding the **cephalic** and **saphenous** veins as these sites are preferred for PICC insertion.



Steps to Success

Step 1: Choose your site.

- Once you have the order to place an IV the first step is determining which site you are going to use. (Prior to setting up or getting your supplies).
- Perform hand hygiene, put on gloves, and use your Firefly to check all your options (anatomy and visibility may vary).
- Preference is given to distal sites, versus proximal sites. Recommended IV sites for infants and newborns, in order from most preferred to least preferred:
    - The hands
    - The foot
    - The ankle
    - The forearm
    - The scalp
- Use caution when selecting sites near arteries, tendons, and nerves.
- If the scalp is the selected site, hair should be trimmed with scissors, not shaved. IV insertion should occur on the scalp near the hairline only.

Steps to Success

Step 2: Warming measures and heel warmer application

- Ensure a neutral thermal environment to avoid vasoconstriction and decreased peripheral perfusion, especially in smaller patients.
- Prior to going to get supplies and setting up, place a heel warmer on the desired IV location to increase blood flow.
- Extreme caution should be used when placing heel warmers on the desired IV location in infants > 1 kg due to the risk of burns.
- DO NOT USE heat packs or homemade compresses. Use Heel warmers ONLY.

Steps to Success

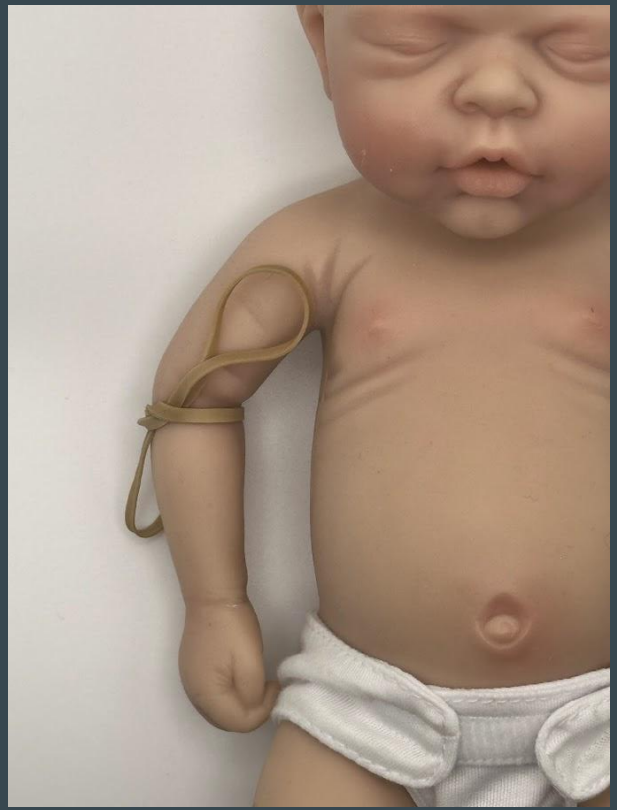
Step 3: Swaddle or Hand Hug

- Possibly the single most important step.
- For infants who are not under humidity (typically < 25 weeks gestation and/or < 1 kg): Swaddling will help reduce the movement of the patient making your IV attempt much easier.
    - The swaddle should be snug and safe, and should not be too tight as that could restrict tidal volume.
- For infants who are under humidity (typically < 25 weeks gestation and/or > 1 kg): Hand hugging may be performed in lieu of swaddling.
- Keep the desired site exposed.
- The swaddle should immediately be removed after successful IV/securement when the patient is febrile.

Steps to Success

Step 5: Tourniquet

- Placing the tourniquet just proximal of the IV site can be beneficial.
    - For IVs in the hand... consider placing the tourniquet on the patient's forearm.
    - For IVs in the AC and forearm... consider placing the tourniquet on the upper arm.
    - For IVs in the foot and ankle... consider placing the tourniquet on the patient's calf.
    - Do not use a tourniquet for scalp IVs!
- Be mindful of the pressure in the veins when placing a tourniquet too tightly. In most cases you cannot palpate the vein below the adipose tissue.
- Apply the tourniquet immediately before puncturing the skin. If left in place for too long, the ability to see and/or feel the vein may be compromised.



Steps to Success

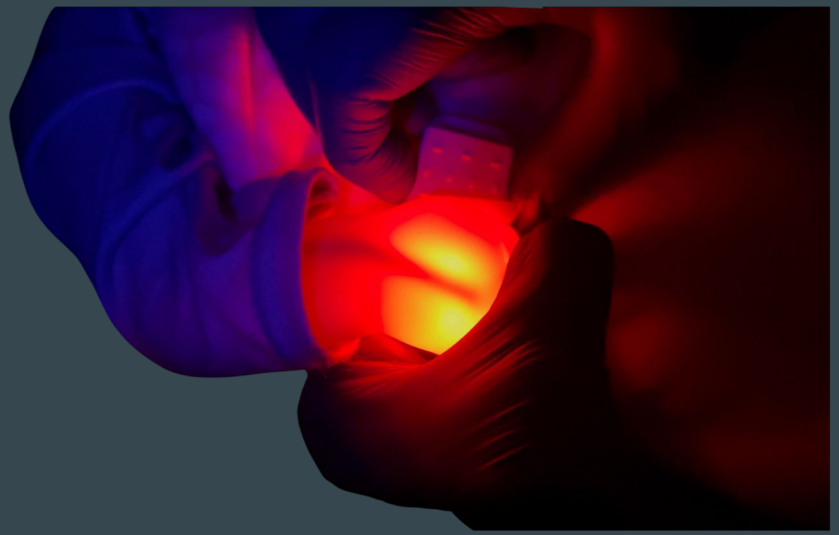
Step 6: Hold

- The 2nd most important step.
- Get another nurse or tech to assist with holding or hand hugging.
- Remember let the parents be the hero after and not the holder.
- It is extremely important to hold the elbow or the knee to prevent the patient from bending the chosen extremity during the IV placement.

Steps to Success

Step 7: Dim the light

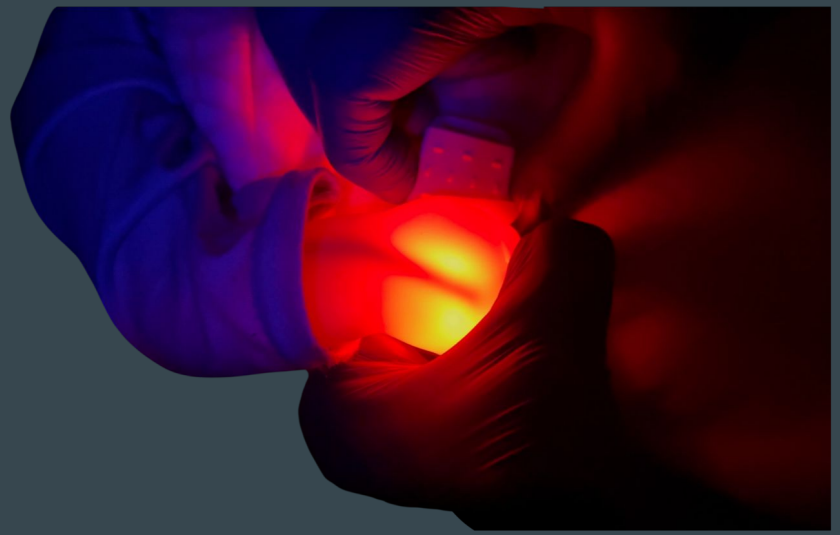
- Dimming the lights can be beneficial to maximizing the technology of using a transilluminator.
- You will still need a light source to see your flash of the IV catheter (computer, overhead dimming lights, partially open curtains, etc).
- This is a good opportunity to give the parents a role in their child's care by having them turn the lights on for you when you are in the vein.



Steps to Success

Step 7 (Continued) : Lumen Settings

- The Firefly has four different lumen settings
  - 7, 14, 22, and 29.
- The lower lumen settings are designed for newborns and NICU patients.
- The higher settings are designed for your heavier patients and darker skinned patients.

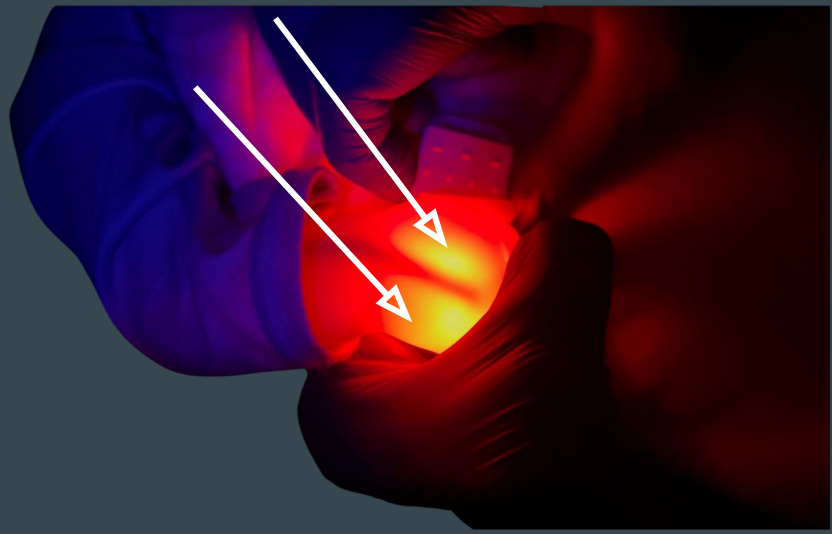


- There is a built in thermal sensor on the Firefly that will deactivate the device if heat is detected to protect the patient's skin.
- The device was designed to prevent generating heat but was added for additional safety.

Steps to Success

NICU PRO TIP!

- If you press down with your finger on each side of the vein while illuminated the vein should bow around your finger.
- This is a good indicator that the vein has adequate blood volume for you to attain the IV.
- If the vein does not move it is worth considering another location.

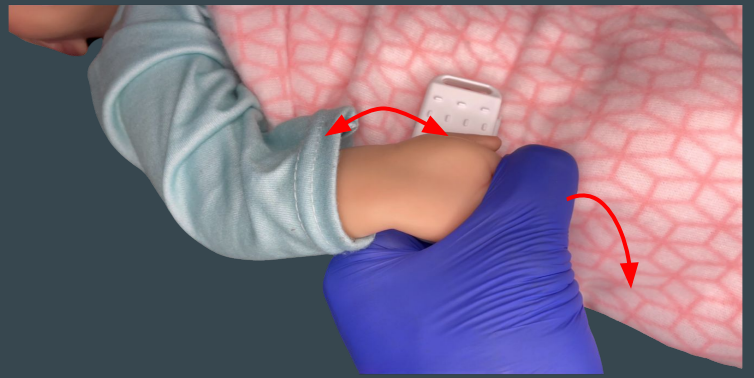


The IV Technique

Steps to Success

The Hand Hold

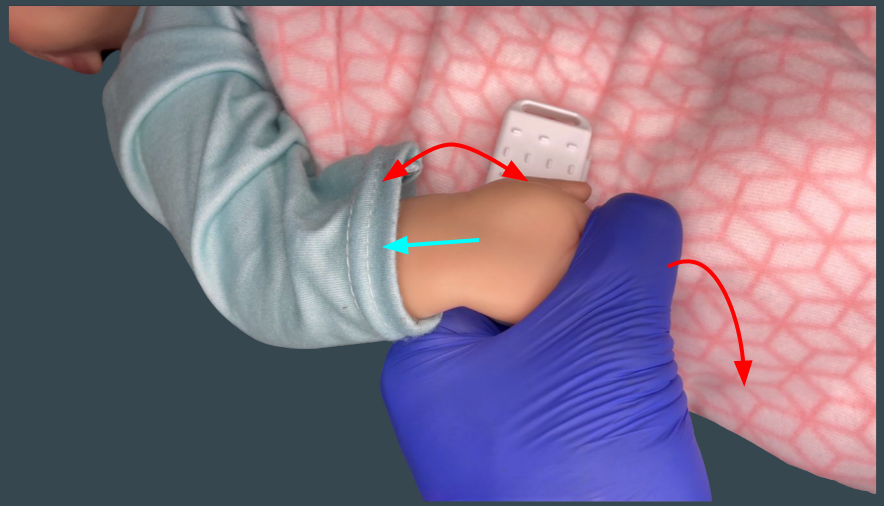
- Place the Firefly FIRMLY against the patient's hand from below.
  - Note the studded surface. This was hand created to help with traction for the diaphoretic patient!
- Curl the patient's fingers around the Firefly and use your thumb in a downward manner to help create tension on the top of the hand.
- To anchor the vein, stretch the skin overlying the vein with the non-dominant, non-inserting index finger.
- Flex the patient's wrist downward while holding.
  - Both of the last two tips are important to help create a tight surface. This will help you to:
    - stabilize the skin
    - control the adipose tissue
    - decrease the probability of the vein rolling, and
    - make it easier to advance your catheter through the patient's skin and into the vein.



Steps to Success

NICU PRO TIP!

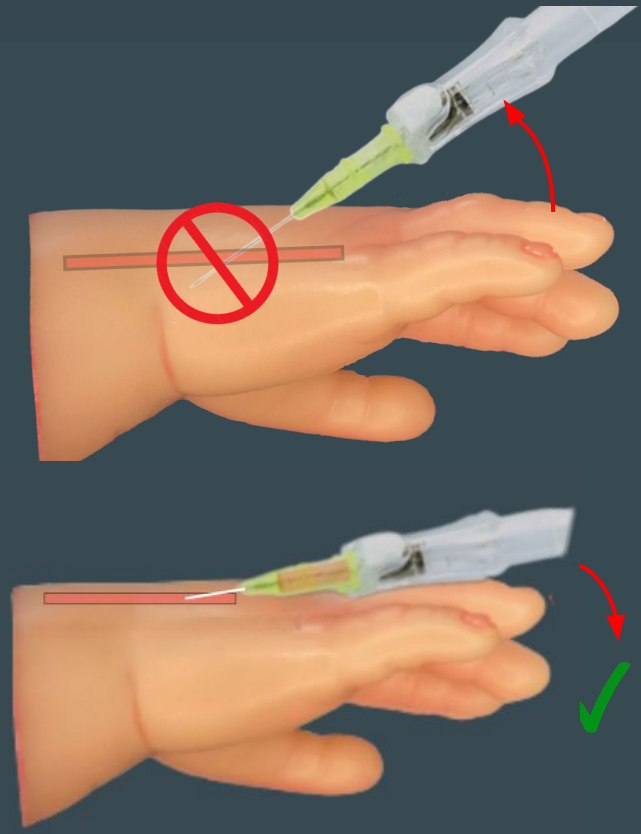
- If an assistant is helping you hold the limb, have them lightly pull back on the patient's skin just above your desired IV site.
- This will create a bit more tension of the skin making it easier for your catheter to advance through the skin.



Steps to Success

Small Target!

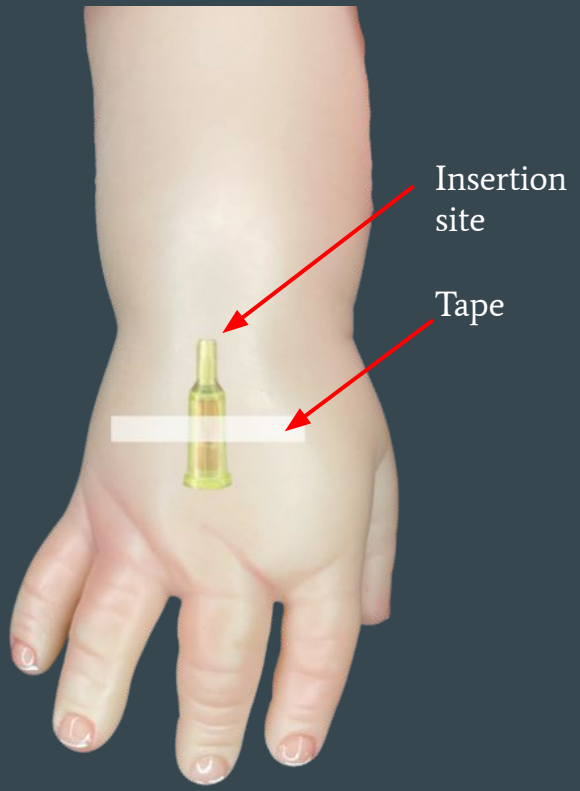
- Hold the catheter almost parallel to the vein, at a 15- to 25-degree angle, with the needle bevel up.
  - A smaller angle may be needed in extremely premature infants, due to their smaller vein size.
- Once you achieve flash in your catheter, advance the catheter, withdraw the needle, and remove the tourniquet.
  - If you are certain that you are in the vein but do not see flashback, it may be due to the smaller vein size or decreased peripheral circulation.
  - Flush 0.5 mL or less of saline into the vein and assess for edema or swelling in the surrounding tissue.



Steps to Success

Securing the Hub

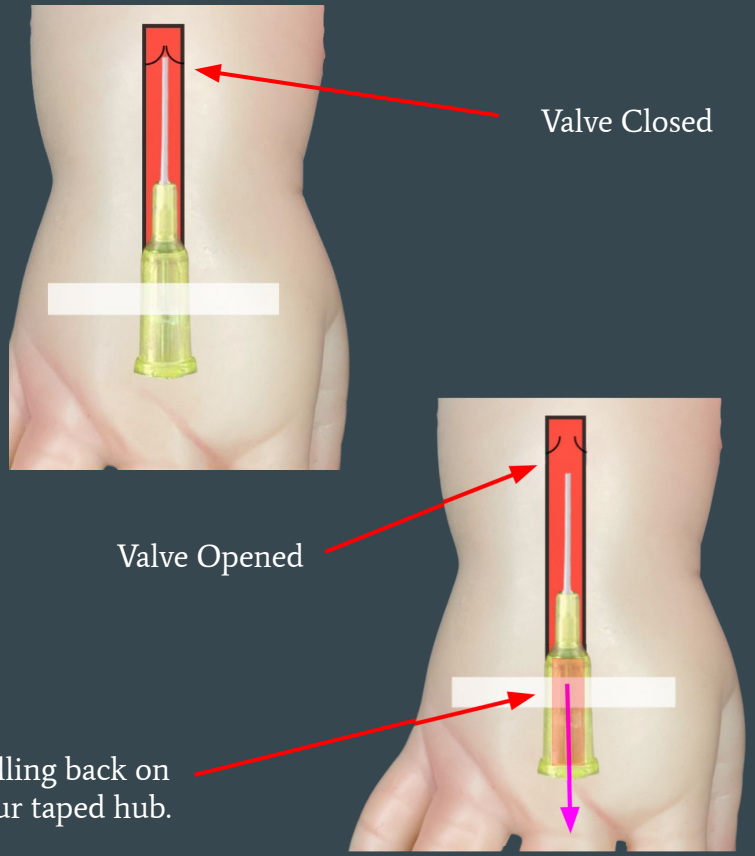
- Due to infection risk, non-sterile adhesives should not be placed directly over the insertion site. Tape should instead be placed just beyond the point of insertion to provide additional stabilization of the catheter.



Steps to Success

Valves

- The anatomy on infants and newborns tend to be very different due to size. You will often encounter the tip of your catheter sitting right on the valve. You will feel a vibration when drawing blood.
- The thin strip of tape allows you to pull back slightly to assist blood flow resulting in the valves opening and you drawing the blood needed.

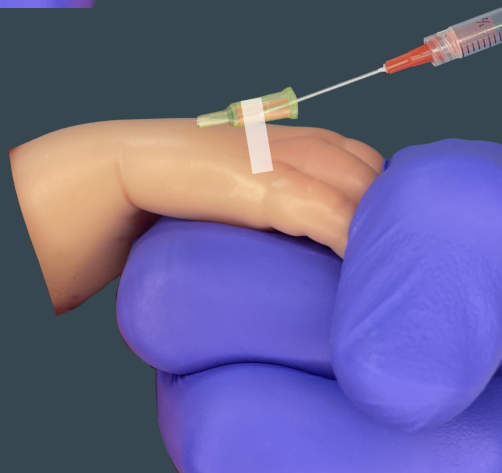


Steps to Success

Blood Draw

- There are two methods to drawing blood from the hub outside of the traditional way of pulling from the line.
  - Drip Method: The neonatal lab tubes caps come off and there is a lip that is used to catch blood as it drips from the hub.
  - Blunt Tip Method: You can use a blunt tip needle and an empty syringe to pull blood as it comes from the hub (this can be helpful for blood cultures).
- These two methods are beneficial because it allows the blood to flow out naturally without causing stress on the vein from pulling from the line.

Drip Method

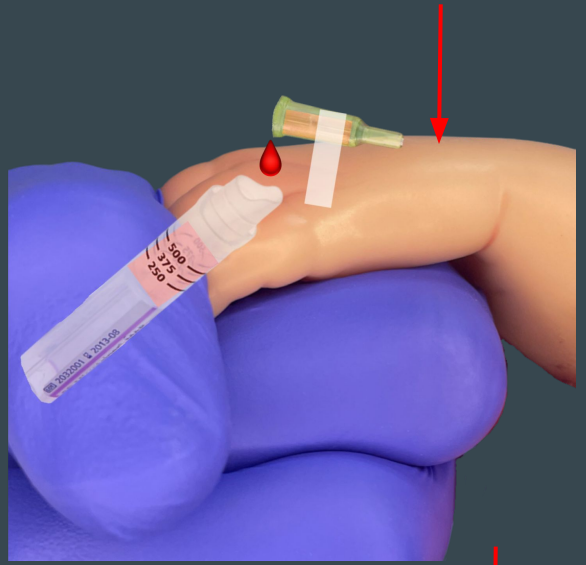


Blunt Tip Method

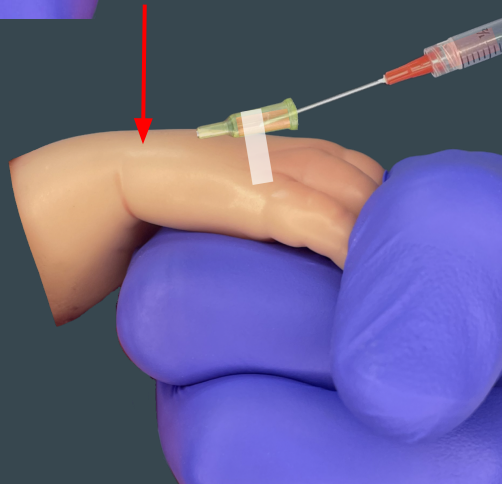
Steps to Success

NICU PRO TIP!

- Have the holder press on the patient's skin just proximal to the catheter insertion point, creating pressure to stop the blood flow between tubes and/or syringe changes.



Drip Method



Blunt Tip Method

The Arm Board

Steps to Success

The Arm Board

- Use the least amount of adhesive possible to secure an armboard.
  - Cotton gauze can be used to pad tape to minimize direct contact of adhesive with skin.
- To avoid compromising venous return...
  - Do not to fully encircle the limb with tape.
  - Try to secure the armboard on bony prominences, not on soft tissue.
- If available, non-adhesive devices, such as a foam bracelet, can be used to secure the armboard. Along with a foam bracelet, a diaper can also be used to protect the IV site. Just make sure to remove your protection of choice to visualize the point of insertion and surrounding area hourly.
- Ensure that the insertion site remains visible with the armboard secured on the patient's limb.

PICC Insertion: Special Considerations

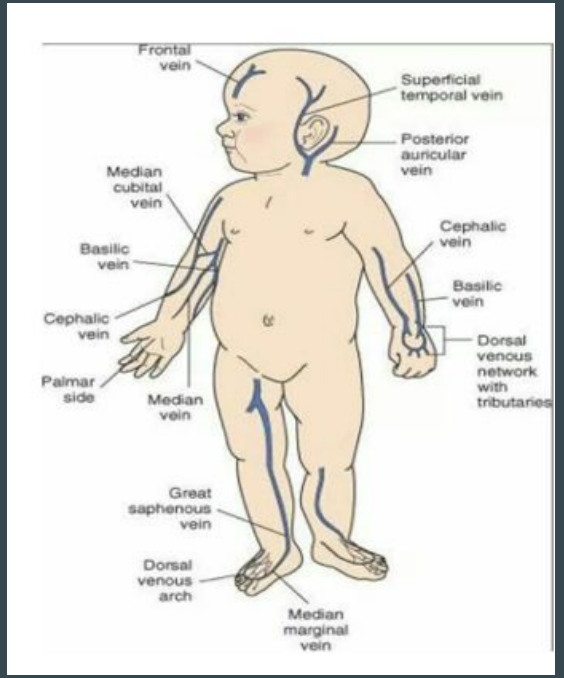
Introduction

- Insertion of PICC lines should only be performed by personnel trained in and deemed competent at PICC line insertion!
- Examples of indications for PICC lines include:
  - Need for venous access lasting > 6 days
  - Infusion osmolarity >600 mOsm/L
  - Infusion of vesicants or irritants (for example: dobutamine, dopamine, epinephrine)
  - Solution pH < 5 or > 9
- Staff should perform positive patient identification, verify orders for PICC insertion, and verify informed consent prior to starting PICC procedure insertion.

Preparation

Identifying sites for insertion

- Identify 3-4 preferred sites prior to performing the procedure.
  - Commonly accessed upper extremity sites: Axillary, brachial, cephalic, posterior auricular
  - Commonly accessed lower extremity sites: Femoral, popliteal, saphenous, temporal
- For upper extremity insertion: Measure length from the insertion site, under the clavicle, to the third intercostal space at the right side of the sternum
  - Caution should be used if a site at the axilla is selected in order to avoid accidental insertion into the axillary artery.
- For lower extremity insertion: Measure length from the insertion site, up to the femoral pulse site, to the right of the umbilicus and up to the xiphoid process



Preparation

Positioning and preparing the patient

- Administer anesthetics and analgesics as prescribed prior to the procedure as prescribed.
    - Caution should be used with topical anesthetics due to their tendency to vasoconstrict.
- Restrain the patient as needed. In the case of upper extremity insertion, the head should face the extremity being cannulated to decrease the risk of catheter migration into the jugular vein.

Preparation and Consistency

The PICC tray:

- Prior to opening sterile supplies, don a hat and mask.
- Many facilities use pre-packaged PICC procedure kits, which contain many of the components needed for insertion.
- Once the kit is open, don a sterile gown and sterile gloves.
- As with IV insertions, arrange your sterile area the same way every time.
- To use the Firefly Vein Light during PICC insertion: Have a second person observer place the vein light into a sterile glove. The gloved vein light can safely be left on the sterile field and used during the procedure without introducing contaminants.
- To prepare the catheter: Flush the catheter with heparinized solution. Then, trim the catheter per manufacturer guidelines and per facility protocol

Preparation and Consistency

While sterile, but prior to venipuncture (continued):

- With either chlorhexidine or povidone iodine, cleanse the insertion site and surrounding area per facility protocol.
- Place sterile drapes on your patient, leaving the cleaned area exposed.

Steps to Success

Small Target and Precision!

- If using a tourniquet, apply it now.
- Place your gloved Firefly Vein Light against the patient's extremity, anchor the vein and stretching the skin overlying the vein with the non-dominant, non-inserting index finger.
- Similar to IV insertion, hold the introducer almost parallel to the vein, at a 15- to 25-degree angle, with the needle bevel up.
    - A smaller angle may be needed in extremely premature infants, due to their smaller vein size.
- Once you achieve flash, remove the needle from the introducer, leaving the introducer in place.
- If used, remove the tourniquet. Using toothless forceps, advance your catheter into the introducer in 0.5 cm to 1 cm increments.
- When the catheter is advanced as far as possible into the introducer, stabilize the catheter with your non-dominant thumb and withdraw the introducer. Then, use the break or peel the introducer per manufacturer guidelines.
- If needed, re-advance the catheter to ensure that it remains at the intended insertion depth.

Steps to Success

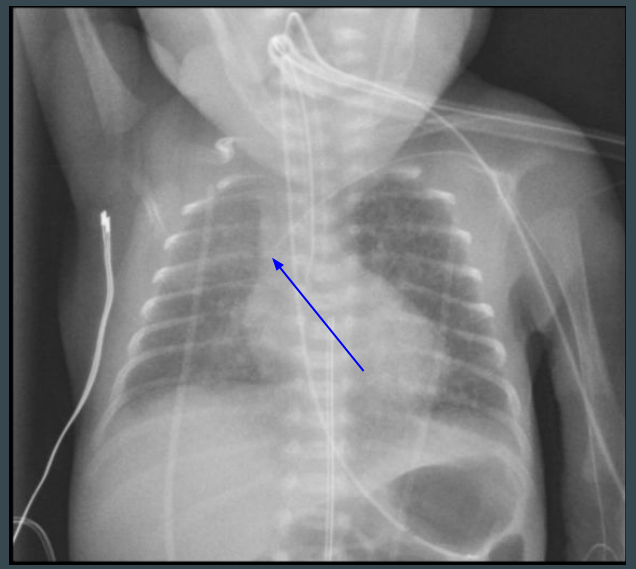
Securing the PICC

- Use transparent dressing and recommended dressing or adhesive to secure the PICC.
    - If bleeding or oozing are ongoing, a sterile gauze may be placed under the dressing at the insertion site.

Steps to Success

Confirming PICC Placement

- Radiologic confirmation should be performed to assess catheter placement.
    - For lower extremity PICC insertions, consider an anteroposterior x-ray *and* a lateral view to ensure that the catheter was not inadvertently placed in the spinal veins.
- If the sterile field is preserved during radiologic confirmation, the PICC may be advanced *or* retracted based on imaging.
- If the sterile field is *not* preserved during radiologic confirmation, the PICC may only be retracted based on imaging.

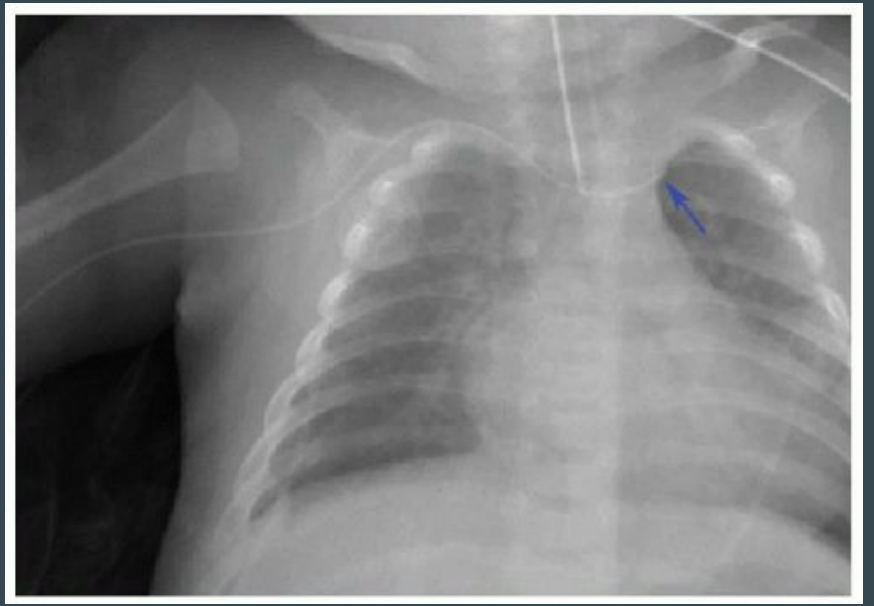


Left upper extremity PICC in the superior vena cava

Steps to Success

Troubleshooting

- If you have difficulty threading the catheter to the intended insertion depth:
  - Reposition the extremity
  - Withdraw and reinsert the catheter
  - Flush the catheter
  - Re-measure with a sterile measuring tape to confirm that the initial insertion depth is correct.
  - If the catheter cannot be advanced further, it may need to be removed.
- If the catheter does not have blood flow when aspirated...
  - Confirm that the insertion depth correlates with the measurement taken prior to insertion. PICCs that are too shallow or too deep may not aspirate blood consistently.
  - Consider radiologic confirmation of placement in a central vessel.
    - Lines that are not central (i.e., that are in the brachiocephalic vein) or that are inserted too deeply and cross the vertical plane (i.e., inserted into an upper extremity but dwell in the inferior vena cava) may not aspirate blood.



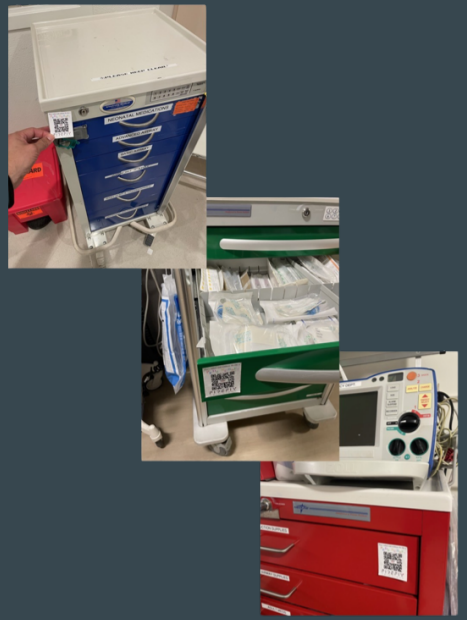
Right upper extremity PICC crossing the midline into the left brachiocephalic vein

Additional Resources

Video/Step by step

QR Code Sticker

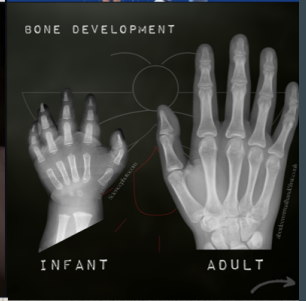
- Designed to place on your NICU crash cart, IV tray, or nursing station.
- Instant access to our step by step video for a quick refresher prior to attempting your infant and newborn IV.
- PDF Training Guide
- QR code also provided on every Firefly badge buddy.

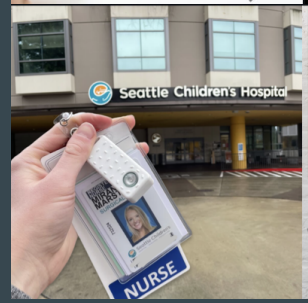


Hospital Education

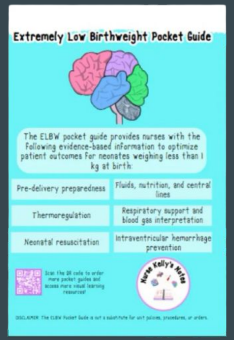
Hire TEAM FIREFLY for your annual education day!

@fireflyveinlight

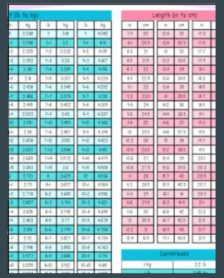




Nurse Kelly's Notes



Available at www.fireflyveinlight.com



Thank you for allowing Firefly to be a part of the care you provide to the children in your community!

www.fireflyveinlight.com

Chattanooga, TN

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