UCSF Health

NEONATAL PEDIATRIC NURSING PROCEDURE

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL

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Critical Points

1. Prior to site selection, assess for contraindications (e.g., AV fistula, previous infiltration or phlebitis, limbs with compromised circulation or impaired sensation, PIV or PICC in same extremity).
2. Patient and family should be educated regarding PIV insertion and procedural support prior to setting up supplies (See Appendix E). Contact Child Life, as appropriate.
3. Avoid use of peripheral catheters for continuous vesicant therapy and total parenteral nutrition (TPN) whenever possible, recognizing the importance of close monitoring for signs of infiltration/extravasation when used. Refer to Mediation Administration (General) and Extravasation Prevention (Neonatal/Pediatric) procedures.
4. No more than two attempts at catheter insertion are recommended by any one RN. If a RN has made two unsuccessful attempts, another inserter should evaluate the patient for suitable IV access sites.
5. Further insertion attempts should be made only if other suitable sites are found. Contact the Vascular Access and Support Team (VAST) when a unit-based resource is unavailable. See PIV Insertion Resource Algorithm (Appendix A).
6. Consult with primary team to consider central venous access or alternative routes for medication or fluid administration when veins cannot be cannulated successfully.
7. For any medically fragile patient (e.g., all single ventricle cardiac patients), consult with attending or fellow prior to PIV insertion attempts.
8. Use a securement device to reduce risk of phlebitis (due to catheter movement), infiltration, and catheter migration; increase dwell time; and help to prevent catheter hub/extension tubing luer-connection related pressure ulcers.

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

Supplies

- Appropriate-sized safety IV catheter
- PIV Start Kit (*PMM 425193*):
  - 1 StatLock IV Ultra (*PMM 18940*)
  - 1 Chloraprep Sepp, for skin antisepsis (*PMM 16975*)
  - 1 transparent dressing
  - 2 gauze sponges 2x2
  - 1 IV label
  - 1 tourniquet
  - 1 alcohol pad (for cleaning blood escape at hub or site)
- Transparent dressing options:
  - Tegaderm Advanced 1683 (*PMM 20445*) – pediatric
  - Tegaderm Advanced 1682 (*PMM 882002*) – neonate
  - Tegaderm Advanced 1680 (*PMM 494197*) – pre-term
- Clean gloves
- Pre-filled 0.9% normal saline syringe (PMM 17178)
- Extension tubing (*PMM 5944*)
- Injection cap; if needed (*PMM 19165*)
- Alcohol wipe (if Chlorhexidine contraindicated; e.g. infant < 1 week of age)
- Neonatal StatLock (IV Ultra Neo – *PMM 56623*)
- Steristrip (*PMM 44882*), if using
- Disposable underpad (e.g., Chux)
- Tape to secure tubing
- Cavilon No-Sting Barrier Film (PMM 14318)
- Arm board; if needed (*PMM 254276* – premie; *PMM 41602* – infant; *PMM 41604* – child; *PMM 41593* – adult),
- Transparent IV Site Protector; if needed (*PMM 4619*)
- Topical or subcutaneous anesthetic agent (e.g., LMX4 or J-Tip), if using

Procedure

INSERTION

1. Review provider order for peripheral access requirement and topical or subcutaneous anesthetic agent (if using).
2. Assess and prepare child and family for procedure.
   a. Assess patient's cognitive level, readiness of child and family to participate in procedure.
   b. Discuss purpose of venipuncture/PIV placement, reinforce need for access and discuss risks and benefits; and provide "PIV Insertion in Your Child" education booklet (See Appendix E).
   c. Elicit child's input, as developmentally appropriate, on IV site selection.
   d. Develop procedural support plan with child, family and Child Life, as appropriate. Consider the following techniques:

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

- Offer pain management.
- Position for comfort.
- Utilize distraction techniques.
- Instruct in relaxation/deep breathing.
- Establish a "job" for child (e.g., holding still, signal to stop, etc.) and caregiver/parent role.
- Use scripting for inserter and assistants (e.g., scary words vs. clear language). See "PIV Insertion in Your Child" booklet (Appendix E) for clear and preferred language.
- Use the treatment room for procedure if at all possible.
- Identify individual child's preference for coping.
- Establish one primary person/voice to provide emotional support.
- Offer non-nutritive sucking (e.g., pacifier).
- Offer oral sucrose solution – for infants up to 4 months Corrected Gestational Age only. See Oral Sucrose for Procedural Pain in the Infant (Neo/Pedi) Nursing Procedure.
- Swaddle neonate/infant.

3. Review allergy status (e.g., tape, latex) via patient band and medical record.
4. Verify patient using two patient identifiers.
5. Select potential site(s) and apply topical anesthetic agent as ordered allowing 30-45 minutes to take effect, or utilize subcutaneous numbing agent. Refer to Fig. 1. for PIV sites commonly used in children.

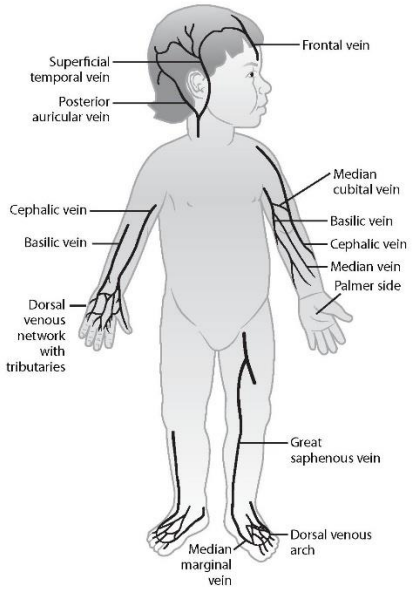

Fig. 1: Suggested sites for venous access in children

a. Consider using vein visualization technologies (e.g., AccuVein) to assist with vein identification. See AccuVein AV300 Quick Start Guide (Appendix D).
b. Vein assessment and site selection guidelines:

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

- Select the most distal site.
- Select a site proximal to any previous cannulation sites.
- In neonates and infants, scalp may be considered due to its supply of superficial veins, but should be avoided when possible.
- Foot veins may be used if patient is not of walking age, and may be considered in older children when other sites are not available.
- Avoid areas of flexion, existing phlebitis, bruises or previous areas of infiltration.
- Avoid limbs with compromised circulation, impaired sensation, and/or fistulas.
- If PICC insertion is anticipated, consider reserving larger vessels (e.g., antecubital, saphenous).
- Avoid sites that would interfere with ADLs, when possible.

c. For 4% lidocaine topical anesthetic cream use, apply to site and cover with dressing. (See dosing guidelines in Lexicomp)

- Neonates: Use 0.1 mL of cream per site. Do not exceed 4 applications in a 24 hour period. See Neonatal LMX4 Procedure.
- Pediatrics: Apply a 1/4 inch layer to intact skin.

6. Gather equipment.
   a. Select the smallest gauge catheter that will accommodate the prescribed therapy and patient need; 22 – 24 gauge is appropriate for most neonates and pediatric patients. A larger bore catheter is preferred for patients requiring IV contrast or blood products.
7. Don gloves and clean work surface with hospital-approved disinfectant.
8. Discard gloves. Perform hand hygiene.
9. Assemble equipment on work surface.
   a. Attach injection cap to extension tubing.
   b. Connect pre-filled normal saline syringe to injection cap/extension tubing and prime (omit priming if drawing labs).
   c. Open IV catheter, antiseptic, transparent dressing, and gauze packaging.
10. Move child to procedure/treatment room (if possible and appropriate).
11. Perform hand hygiene and don clean gloves.
12. Assess vein at selected cannulation site. Consider these techniques to assist in vein identification:
    a. Apply warm pack (e.g., infant heel warmer or instant hot pack) to the site for 10-15 minutes prior to attempting IV insertion.
    b. Apply a tourniquet.
    c. Have patient make a fist a few times.
    d. Lower arm below level of the heart.
13. Cleanse insertion site with antiseptic and allow to dry fully. Chlorhexidine (CHG) solution is preferred for skin antisepsis for infants over one week of age, > 27 weeks gestation and > 1000 grams. Use alcohol when CHG is contraindicated. Do not touch prepped area after cleaning.
14. Perform venipuncture while stabilizing selected vein with non-dominant hand.
15. Enter skin with bevel of catheter needle up. Approach intended vein at an angle appropriate to vessel depth.

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

16. Reduce the needle angle once flashback of blood is noted. Advance catheter into vein. Remove needle activating the safety feature as per brand-specific manufacturer guidelines.
17. Release tourniquet.
18. Gently press over the vein to prevent blood backflow (if required as per catheter brand/type).
19. Stabilize hub while connecting extension tubing. Draw labs if required, before flushing.
20. Determine catheter patency by flushing with 1-3 mL of normal saline (which may be done before or after IV securement). Observe for signs of infiltration. Discard safety housing in appropriate receptacle.
21. Apply securement device (e.g., StatLock for PIV) as per manufacturer instructions (see following pictures). This may be done before/under or after/over transparent dressing application.
    a. Do not place the securement device over a joint or articulation.

IV Ultra Neo

StatLock IV Ultra

22. If unable to use a securement device (e.g., due to anatomic location of catheter), stabilize catheter hub and cover with transparent dressing.
    a. Apply one folded 2x2 gauze, held in place with a Steristrip, or a piece of Coloplast (e.g., OR) under the catheter hub/extension tubing luer connection

    AND

    b. Monitor site under hub/extension luer for signs of pressure injury development more frequently when a securement device is not used.
23. Cover insertion site, securement device and catheter hub with a sterile transparent dressing (unless dressing applied before/under securement device). Non-sterile tape should never be placed directly over the insertion site.

1680/1682 – StatLock under dressing

1680/1682 – StatLock over dressing

1683 – StatLock under dressing

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

24. Ensure insertion site is visible at all times. Do not use rolled bandages (e.g., Kerlix, Coban), with or without elastic properties, to secure or cover any vascular access device because they can obscure signs of complications and may impair circulation or the flow of infusion.
25. Secure site with an arm board, if needed, to minimize catheter motion due to underlying joint movement.
    a. Use appropriately sized arm board to ensure it is taped well above and below the joint to be supported.
    b. Consider using double-backed tape when securing to arm board to minimize tape adhesive to skin.
    c. When taping hands, leave thumb and finger tips free.
26. Consider use of a Transparent IV Site Protector (i.e., plastic “house”).
27. Create a stress loop with the extension set and secure with tape.
28. IV taping tips:
    a. Avoid placing tape edges in skin folds or joints.
    b. Do not place tape completely around an extremity.
    c. Minimize tape directly on skin and consider applying skin barrier film (e.g., Cavilon) under tape.
29. Begin IV fluid administration or saline lock as prescribed.
30. Discard gloves and perform hand hygiene.

MAINTENANCE

1. Monitor PIV site at these frequencies:
    a. Assess site condition of *infusing* PIVs minimally every hour (every 1 hr.) in both acute and critical care settings. Assess non-infusing, saline-locked PIVs with every use and/or flush.
    b. For patients receiving vesicant hazardous medications, refer to monitoring and assessment guidelines described in the Medication Administration (General) nursing procedure.
    c. For patients travelling off unit, assess the IV immediately prior to leaving the unit, and immediately upon arrival back onto the unit.
2. Assess for signs of complication such as infiltration, extravasations and phlebitis. If present, discontinue infusion and prepare to restart the IV at another site, if indicated. Refer to Peripheral IV Infiltration & Extravasation Management for Non-chemotherapeutic Agents (Neonatal/Pediatric) or Hazardous Medication Safe Handling Medical Center Policy 6.09.04, as appropriate.
    a. Swelling near insertion site
    b. Redness at insertion site
    c. Discharge at insertion site
    d. Fluid leakage around insertion site
    e. Pain at insertion site
    f. Change in color or temperature in the extremity where catheter is placed
3. Assess all infusing PIVs for infiltration and grade according to the Pediatric PIV Infiltration Scale, (Fig. 1).
    a. Remove the PIV for any infiltration score of 1-4 and refer to the Peripheral Intravenous Infiltration and Extravasation Management for non-chemotherapeutic agents (Neonatal/Pediatric) nursing procedure for management of injury.

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

Pediatric PIV Infiltration Scale

Grade	Characteristics
0	No symptoms Flushes with ease
1	Localized swelling (1%-10%) Flushes with difficulty Pain at site
2	Slight swelling at site (up to ¼ of the extremity above or below site, or 10%-25% of the extremity above or below site) Presence of redness Pain at the site
3	Moderate swelling at site (¼ to ½ of the extremity above or below site, or 25%-50% of the extremity above or below site) Pain at site Skin cool to touch Blanching Diminished pulse below site
4	Severe swelling at site (more than ½ of extremity above or below site, or more than 50% of the extremity above or below site) Infiltration of blood products, irritants, and/or vesicants (any amount of swelling) Skin cool to touch Blanching Skin breakdown/necrosis Blistering Diminished or absent pulse Pain at site Capillary refill > 4 seconds

Fig. 2: Pediatric PIV Infiltration Scale. (Courtesy of Children's Medical Center Dallas, Dallas, TX)

4. Definitions of complication types:
    - **Infiltration** is inadvertent leakage of non-vesicant solution/medication into surrounding tissue. Symptoms include skin blanching, discoloration, swelling, coolness, pain and/or numbness. It is possible to obtain blood return from an infiltrated catheter.
    - **Extravasation** is inadvertent leakage of vesicant medication or solution into surrounding tissues. It may cause formation of blisters with subsequent sloughing of tissues as a result of tissue necrosis.
    - **Phlebitis** is inflammation of the vein intima. It occurs as a result of mechanical, bacterial, or chemical irritation. It is characterized by pain and tenderness along the course of the vein, erythema and inflammation with a feeling of warmth at the site, streak formation and/or a palpable cord.
5. Assess PIVs for proper securement. All PIVs should have a StatLock (unless over a joint or articulation). If unable to place a securement device, place one folded 2x2 gauze or a piece of Coloplast under the catheter hub/extension tubing luer connection to protect from pressure injury. This applies to all PIVs, including those inserted at outside hospitals.

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6. Ensure catheter patency by flushing with 1-3 mL of saline before administering any fluid or medication. This is especially important when infusing concentrated electrolytes, parenteral nutrition, or anticipating contrast administration.
7. Change PIV dressing when site appears soiled, damp, or loose. Use aseptic technique.
8. Remove catheter upon suspected contamination, complication, or upon order. Replace PIV in a new site, if indicated.

REMOVAL OF IV CATHETER

- PIV should be removed immediately upon suspected contamination, complication, or therapy discontinuation.

1. Assess and prepare child and family for procedure.
2. Verify identity using two patient identifiers.
3. Perform hand hygiene and don gloves.
4. Stop any infusing fluids.
5. Remove tape and dressing. Consider use of adhesive remover.
6. Place sterile 2x2 gauze above puncture site.
7. Pull catheter gently until it is removed.
8. Apply pressure against site until bleeding stops.
9. Apply bandage.
10. Inspect catheter for intactness; if broken notify provider immediately.
11. Discard catheter, solution, and tubing in appropriate receptacles.
12. Discard gloves and perform hand hygiene.

DOCUMENTATION (IN THE MEDICAL RECORD)

1. Document IV insertion procedure.
2. Document both site assessment and infiltration scale score every hour in both acute and critical care settings for all infusing PIVs.

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

References

Level of Evidence (FAME*)	Level*	Reference
	E4	Infusion Nurses Society (2016). Infusion Therapy Standards of Practice. *Journal of Infusion Nursing 39*(1S).
	E4	Alexander, M. et al. (2010). *Infusion Nurses Society: Infusion Nursing, An evidenced-based approach* (3rd ed). St Louis: Saunders Elsevier.
	E4	Bowden, V.R., Greenberg, C.S. (2009). *Pediatric Nursing Procedures* (2nd ed). Philadelphia: Lippincott Williams & Wilkins.
	E4	Gorski, L., Hadaway, L., Hagle, M., McGoldrick, M., Orr, M. & Doellman, D. (2016). Infusion Therapy Standards of Practice. *Journal of Infusion Nursing 39*(1S).
	E4	Hadaway, L & Millam, D. (2007). On the road to successful IV starts. *Nursing2005, 35*(1).
	E4	O'Grady, N. et al. (2002). Guidelines for the Prevention of Intravascular Catheter-Related Infections. *Infection Control and Hospital Epidemiology, 23*(12), 759-769.
	E4	Pop, R. (2012). A Pediatric Peripheral Intravenous Infiltration Assessment Tool. Infusion Nurses Society. *Journal of Infusion Nursing 34*(4), 243-248
	E4	Trivits, J. & Lebet, R. (2008). *AACN Procedure Manual for Pediatric Acute and Critical Care.* St. Louis: Saunders Elsevier.

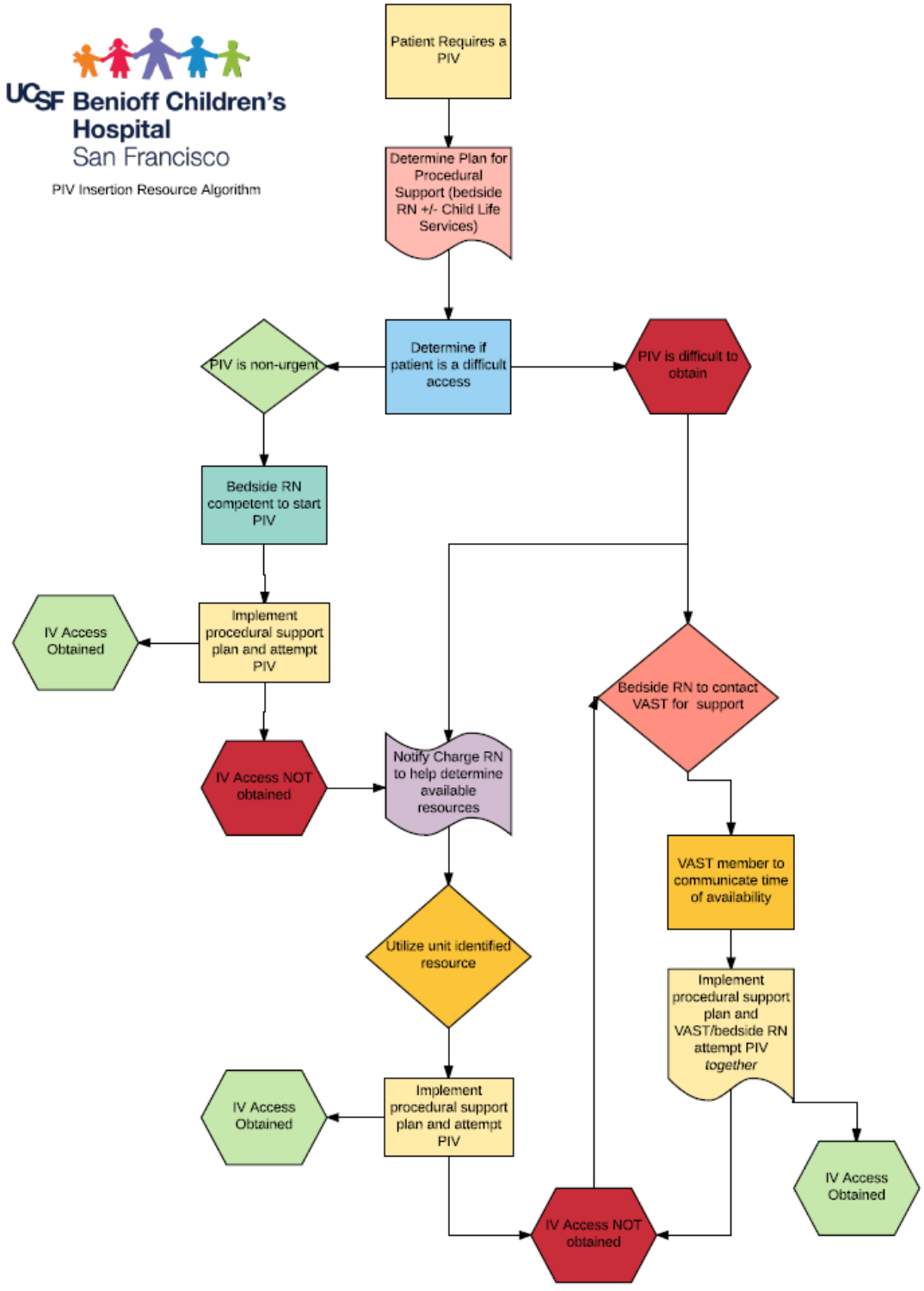
* FAME Scale details: See nursing policy *Policy, Procedure, & Competency Development, Review, & Approval*

Procedure History

Author:	Lisa Tsang, RN, MN; Beth Kennalley, RN, MSN, CNS
Originated:	10/10
Resources:	
Reviewed:	
Reviewed / Revised:	3/13 & 12/13: Beth Kennalley, RN, MSN, CNS; Lisa Tsang, RN, MN; Pedi Vascular Access Committee 6/14: (Appendix B) Lisa Tsang, RN, MN; Pediatric Vascular Access Committee 9/14: Lisa Tsang, RN, MN 2/17: Lisa Tsang, RN, MN; Mary Kay Stratigos, RN 7/17: Lisa Tsang, RN, MN; Kim Noh, RN; BCH Vascular Access and Support Team 2/20: Lisa Tsang, RN, MN, CNS 7/20: Lisa Tsang, RN, CNS 1/21: Lisa Tsang, RN, CNS

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

Appendix A: PIV INSERTION RESOURCE ALGORITHM



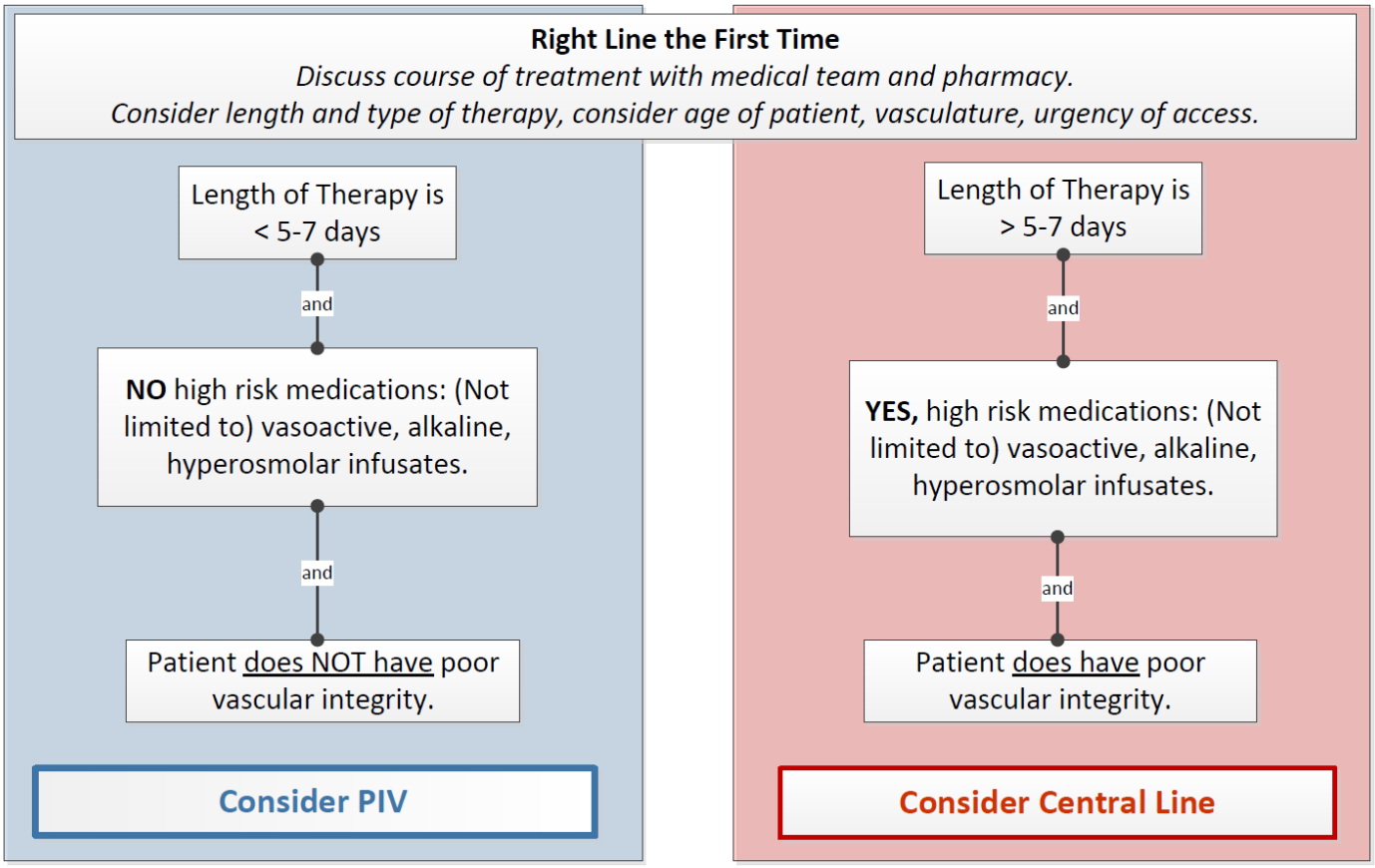
PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

Appendix B: PIV INSERTION & PHLEBOTOMY REQUEST EXPECTATIONS

• **PIV Insertion and Phlebotomy Request Expectations**			
Steps	**Actions**	**Who**	**Expectation**
1.	Patient assessment for PIV placement or phlebotomy completed	Bedside RN or unit resource	Basic assessment of need for PIV or phlebotomy is performed and potential sites identified. LMX4 may be placed at this time.
2.	Supplies for procedure gathered to the bedside	Bedside RN or unit resource	All supplies are readily available (PIV, gauze, alcohol wipes, tourniquet, lab vials, etc.); Child life should be present at this time if necessary; Consider movement to treatment room.
3.	PIV and/or phlebotomy attempted	Bedside RN and/or unit resource	Max of 2 attempts per provider Consider other unit resources before step 4
If after step 3 there is no success:			
4.	Contact VAST with request, including patient, room, procedure needed	Bedside RN or unit resource	Bedside and/or unit resource completed at least steps 1 and 2 for the known difficult PIV insertions or phlebotomy; Steps 1-3 are completed for standard basic PIV insertions or phlebotomy.
5.	VAST member to provide unit with time able to assist	VAST member	VAST member will let the unit know their estimated time of arrival.
6.	VAST member to bedside to attempt PIV or phlebotomy	Bedside or unit resource to assist and/or be mentored	VAST member will share their access knowledge and expertise with the bedside RN. The bedside RN will be an active participant in the PIV insertion or phlebotomy. Both parties will treat this encounter as a teaching moment and tailor their communication accordingly.
7.	VAST unable to obtain PIV or phlebotomy	Bedside RN to inform charge RN	Charge RN will assess the existing resources and either provide another resource or escalate with the medical team.

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

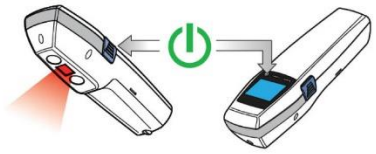
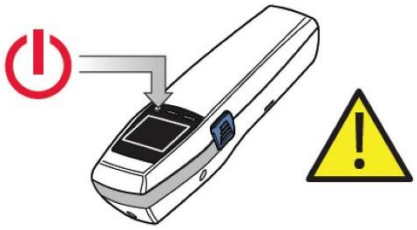
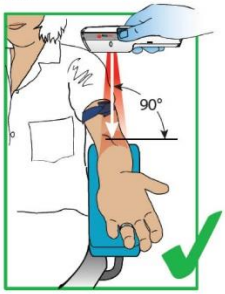
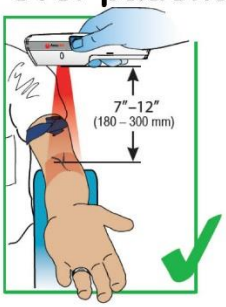
Appendix C: LINE SELECTION ALGORITHM



PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

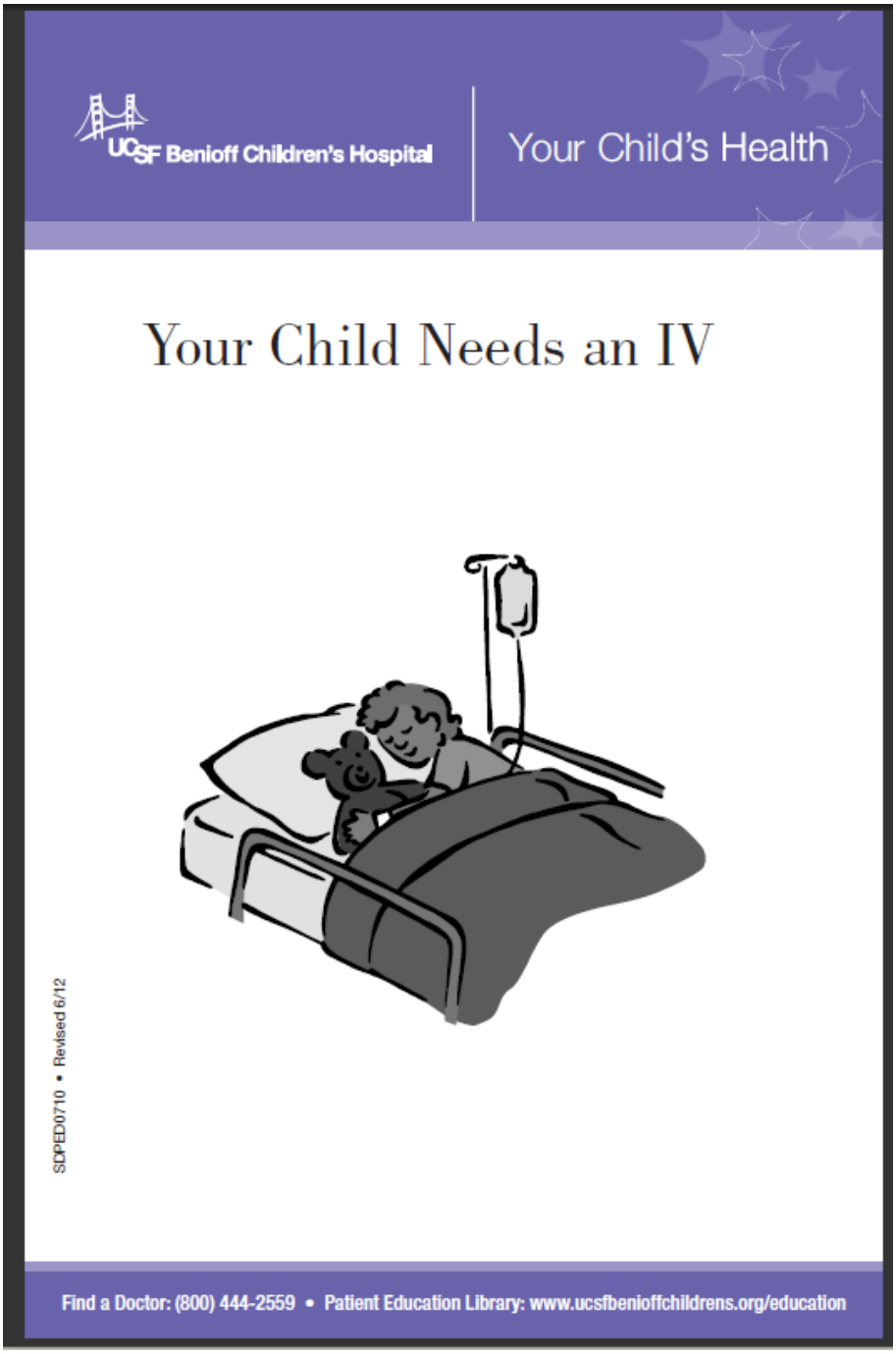
Appendix D: ACCUVEIN AV300 QUICK START GUIDE

AccuVein® AV300 www.accuvein.com Quick Start Guide

To turn on: depress Blue Side button or Right LCD button 	**To turn off: depress Right LCD button** 
Position at right angle (perpendicular) to vein direction 	**Position height 7"-12" directly over patient** 
3 Levels of Magnification **S1: Normal view** **S2: Increase magnification** **S3: Maximum magnification** 	**Ensure Accuvein "clicks" into Hands-Free holder** 

PERIPHERAL INTRAVENOUS CATHETER INSERTION, MAINTENANCE, AND REMOVAL *(continued)*

Appendix E: PIV INSERTION IN YOUR CHILD BOOKLET



View here: http://campuslifeservices.ucsf.edu/dmx/PatientEd/SDPED0710.pdf

Ordering Instructions: http://patiented.ucsfmedicalcenter.org/orderinginstructions.shtml

Appendix F: INSTRUCTIONAL VIDEOS ON PERIPHERAL IV INSERTION

PIV INSERTION WITH BD AUTOGUARD

PIV INSERTION WITH VIAVALVE