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Peripheral Intravenous Catheter Insertion

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Overview

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The purpose of peripheral intravenous catheter (PIV) insertion is to infuse medications, perform intravenous (IV) fluid therapy, or inject radioactive tracers for special examination procedures. Placing a PIV is an invasive procedure and requires the use of an aseptic, no-touch technique.

Common IV venipuncture sites are the arms and hands in adults and the feet in children. According to the Intravenous Nurses Society (INS), the feet should be avoided in the adult population because of the risk of thrombophlebitis. Venipuncture sites should be carefully assessed for contraindications, such as pain, wounds, decreased circulation, a previous cerebral vascular accident (CVA), dialysis fistulas, or a mastectomy on the same side. The median cubital vein and the cephalic vein in the wrist area should be avoided when possible. The cephalic vein has been associated with nerve damage when used for IV placements. The most distal site available on the hand or arm is preferred so that future venipuncture sites may be used if infiltration or extravasation occurs.

This video will demonstrate the insertion of a PIV, including the preparation and attachment of an IV extension set. Although a PIV securement device is used here to stabilize the IV catheter, according to INS recommendations, some facilities may not elect to purchase these devices, and the alternate chevron or U-shaped taping method may also be used.

Procedure

1. General PIV placement considerations (review in the room, with the patient).

1. Upon first entering the patient's room, wash hands with soap and warm water, applying vigorous friction for at least 20 s. Hand sanitizers may be used if the hands are not visibly soiled, but vigorous friction should also be applied.
2. At the bedside computer, log into the patient's electronic health record and review the patient's orders for PIV insertion. Review the patient history for potential bleeding complications during insertion, such as bleeding disorders, anticoagulant therapy, and low platelet counts. Obtain the patient's consent for the procedure.
3. Verify the patient's identity using two independent identifiers: the patient's name and medical record number. Do not include the patient's room number or bed number as identifiers.
4. Review with the patient any PIV insertion preferences, such as veins to avoid; known areas of decreased circulation; or any fistulas, if present.
5. Review the PIV insertion procedure with the patient, answering any patient questions or concerns. Also, discuss signs and symptoms of PIV-associated complications, such as swelling at the IV insertion site, redness around the IV insertion area, pain associated with fluid administration or flushing, and leaking of fluids at the IV insertion site.

2. Leave the patient room and wash your hands, following the instructions in step 1.1

3. Gather the supplies needed for PIV insertion.

1. Select the smallest-size over-the-needle catheter suitable for the IV therapy being delivered and for the expected length of therapy.
 1. Medication delivery and IV fluids require small-bore catheters, while larger catheters can be used for blood administration or high-volume fluid administration. Review hospital policies for the appropriate length and size. Small-bore over-the-needle catheters will maintain blood flow around the catheter, keeping the blood in contact with endothelial cells, allowing the IV to remain patent by minimizing the risk of infiltration/extravasation and phlebitis.
2. Gather an IV insertion kit. Alternatively, gather a piece of 2 x 2 sterile gauze; transparent, semipermeable occlusive dressing; IV extension tubing; a needleless connector; a prefilled saline flush syringe; a tourniquet; a 70% alcohol wipe or an antiseptic swab containing chlorhexidine; a film preparation pad; clear, 1-inch transpore tape, an IV adhesive securement device; a label; an absorbent pad; and two clean, latex free gloves. Adhesive bandage is also recommended in the case of failure to access a vein. In addition to adhesive bandage, duplicate supplies for multiple IV insertion attempts may also be needed. Chlorhexidine is preferred for its long-acting antibacterial properties and is recommended by the CDC.

4. Preparation for PIV insertion.

1. Return to the patient bedside and wash your hands upon entering the room, as described in step 1.1.
2. Explain the procedure to the patient and place the patient in a comfortable position. Adjust the bed height to maintain ergonomic nurse positioning and to decrease back strain. Ensure that the lighting is adequate.
3. Place supplies within reach on a bedside stand or over-bed table.
4. Prepare the IV extension set.

1. Open the IV needleless connector using aseptic technique and attach the prefilled saline flush syringe to the female end of the needleless connector, taking special care to maintain sterility on both ends of the device.
2. Move the syringe and needleless connector to your non-dominant hand, between your middle and ring fingers.
3. Open the IV extension tubing using aseptic technique. While holding the tubing in your dominant hand, remove the cap on the female end of the tubing with the thumb and forefinger of your non-dominant hand.
4. Attach the female end of the IV extension tubing to the male end of the IV needle access device, using aseptic technique.
5. Hold the IV extension tubing in your non-dominant hand, with the capped, male end of the extension tubing pointing up, toward the ceiling. Gently push the saline syringe plunger to prime the needleless connector and extension tubing, until all air has been removed and a few drops of saline are visible.
6. Place the primed needleless connector and extension tubing within reach, leaving the saline flush syringe attached to the extension set.
5. Prepare the remaining supplies for IV insertion.
 1. Remove the transparent, occlusive dressing from the catheter packaging. Remove the backing, leaving the sticky side up, and place it within easy reach.
 2. Remove two strips of clear transpore tape, each approximately 4 cm long, and place them within easy reach.
 3. Completely open 2 x 2 sterile gauze, chlorhexidine, an IV adhesive securement device, and adhesive bandage packaging, leaving them on their sterile packaging and within easy reach.
6. Don clean, non-sterile gloves.
7. Select a PIV insertion site.
 1. Visually inspect both patient arms for veins that are suitable for possible insertion sites. The cephalic, basilica, and median cubital veins, as well as the dorsal hand vein, are preferred.
8. Apply a tourniquet around the arm, approximately 10-15 cm above the chosen site of insertion. Make sure that the tourniquet is not too tight and that the pulses distal to the tourniquet are palpable.
9. Palpate the chosen insertion site and assess for sclerosed or hardened veins, infiltrates, phlebitis, bruising, or areas of venous valves (which feel like bulges in the veins). If the chosen vein is soft and free of complications, temporarily remove the tourniquet and prepare for venipuncture.
10. Place the absorbent pad under the chosen insertion site arm.
11. Prepare the over-the-needle catheter.
 1. Remove over-the-needle catheter from its packaging, remove the catheter cap, and place it between the ring and middle fingers of the non-dominant hand. Assess the catheter and needle for irregularities.
 2. Some over-the-needle catheters maintain suction tension from the sterilization process. Carefully move the catheter hub clockwise and back to the original position to break the tension and to allow for smooth advancement when inside the vein.
 3. Replace the over-the-needle catheter cap and set it within easy reach. Remove the gloves and discard them in the trash receptacle.

5. PIV insertion procedure.

1. Wash your hands as described in step 1.1 and reapply clean gloves.
2. Re-apply the tourniquet, as described in 4.8.
3. Tap the chosen insertion site 2-3 times to vasodilate the vein.
4. Scrub the insertion site in a back-and-forth motion using a chlorhexidine swab for 30 s. Allow the insertion site to completely dry. Drying allows for complete microbicidal activity and scrubbing with friction allows for penetration into the cracks and fissures of the epidermal layer.
5. Grasp the over-the-needle catheter with the non-dominant hand, remove the cap, and transfer the catheter to your dominant hand.
6. Using your non-dominant hand, stretch the skin taught and stabilize the vein 4-5 cm below the insertion site, taking care not to contaminate the point of insertion.
7. Holding the over-the-needle catheter between the thumb and middle fingers, with the bevel up at a 15-20° angle, pierce the skin directly over the vein until a flashback of blood is visible.
8. Drop the angle of the catheter a few degrees and advance the catheter with the needle by a few millimeters to ensure that the tip of the catheter has passed into the vein.
9. Using the index finger, advance the hub of the catheter fully into the vein, holding the needle steady.
10. While stabilizing the needle and catheter with the dominant hand, release the tourniquet with the non-dominant hand. Occlude the vein above the insertion site with the index finger of the non-dominant hand to reduce bleeding after needle removal.
11. Remove the stylet needle from the catheter and engage the needle safety device, if available. Place the needle down on the over-bed table or bedside stand.
12. Quickly obtain the pre-primed IV extension set with prefilled normal saline attached. Remove the cap from the male end and insert it into the catheter hub.
13. Stabilizing the IV extension set with your non-dominant hand, gently push the prefilled normal saline syringe plunger and flush the IV to ensure patency.
 1. While flushing the PIV, assess for swelling, redness, or leaking at the IV insertion site. Ask the patient if he/she feels any pain during the flushing. If none of the above are present, firmly screw in the IV extension set to the catheter hub. A cold sensation or salty taste in the mouth are both normal when flushing a PIV.
 2. Flush the PIV slowly, again with the dominant hand, while simultaneously engaging the clamp located on the IV extension set. Remove the prefilled saline flush and discard it on the over-bed table or bedside stand.

6. Secure the PIV with dressings.

1. Retrieve the barrier solution packaging, open the packaging, and spread a light film of barrier solution 1 cm around the insertion.
2. Retrieve the adhesive IV securement device, remove the backing, and place the sticky side against the skin and directly under the catheter hub. Firmly press (or slide) on the securement device to secure it to the catheter hub, following the manufacturer's instructions for the type of device used.
3. Retrieve the semipermeable, occlusive transparent dressing, place the insertion point at the center of the dressing, and lay it against the skin and over the catheter hub. Squeeze the dressing around the catheter hub to secure it to the adhesive and anchor the hub. If a securement device is not available, retrieve the 2 x 2 sterile dressing and fold it in half and in half again, making a small, 1-cm square. Gently place the dressing under the junction of the hub of the PIV catheter and the extension tubing to prevent skin breakdown and pressure between the catheter hub and skin.
4. Retrieve a piece of clear transpore plastic tape and, with the sticky side facing up, lift the IV extension tubing and secure the tape under the hub and 2 x 2 dressing. Fold the ends of the tape diagonally across the hub and over the transparent occlusive dressing, creating a chevron. Take care to leave the insertion site visible through the transparent dressing. Alternatively, fold the ends of the tape straight up and over the occlusive dressing, creating a U-shape to secure the IV catheter to the occlusive dressing.
5. Loop the IV extension tubing into a U-shape that points up past the insertion site, leaving the insertion site visible through the transparent occlusive dressing.
6. Retrieve the second piece of clear tape and lay it across the IV extension tubing. Secure the tape to the skin and occlusive dressing, again making sure to leave the insertion site visible through the transparent dressing. The insertion site should always be visible for the future evaluation of patency.

7. Retrieve the label and add the time and date of insertion, along with your initials. More information may be needed based upon hospital protocols and procedures. Place the label on the occlusive dressing.

8. Gather all packaging and the needleless prefilled saline syringe and discard them in a trash receptacle. Discard the over-the-needle stylet in a sharps container.

9. Review the signs and symptoms of complications in IV fluid therapy or medication administration, as described in step 1.5.

10. Remove and discard the gloves in a trash receptacle and wash your hands, as described in step 1.1

11. Document the PIV insertion in the patient electronic health record before leaving the patient room.

Applications and Summary

Placement of a PIV using venipuncture with an over-the-needle catheter for infusion therapy is an aseptic, no-touch procedure. Always educate the patient about the procedure and possible complications prior to venipuncture. Inform the patient about the process and the pain associated with insertion. In addition, many patients mistakenly think the needle remains in the vein after venipuncture. It is important to emphasize that only the soft, flexible catheter portion remains and that they will be able to move the limb freely without causing additional harm.

Complications such as extravasation and infiltration may occur with any infusion. Instruct the patient on the signs and symptoms of both infiltration and extravasation, noting that pain can be one of the first signs of complications. Prepare duplicate supplies prior to venipuncture in the event that a second venipuncture is necessary during the procedure due to inaccurate placement. The INS recommends only two venipuncture attempts per medical personnel before additional help is requested. A common mistake in PIV placement includes touching the venipuncture site after cleaning with antiseptic solution, thereby contaminating the insertion site. Another common mistake is inadequate chlorhexidine solution drying time, which can cause a decrease in antimicrobial action and inadequate adhesive action. Removing and reinserting the needle from the catheter during insertion should be avoided. This may increase the possibility of puncturing the catheter with the needle or even causing the catheter to break into the vein. The INS regularly researches and revises IV catheter placement procedures; therefore, every nurse should refer to it on a regular basis.

References

1. Policies and procedures for infusion nursing, Fourth Edition. Chapter 5: Vascular access device site selection and placement. Infusion Nurses Society. (2011).
2. Potter, P. A., Perry, A. G. Fundamentals of Nursing, Seventh Edition. Elsevier. St. Louis, MO. (2009).