On the road to successful I.V. starts

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Article Outline

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Expert clinicians share tips and insights based on decades of experience performing and teaching venipuncture techniques.

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PERFORMING VENIPUNCTURE and starting intravenous (I.V.) infusions are among the most challenging clinical skills you'll ever have to master. Yet few nursing schools offer enough hands-on learning, and hospitals typically provide only limited opportunities for supervised practice.

If you work in a busy hospital, you can understand why. For an experienced practitioner, it's quicker and easier to perform venipuncture than to coach a less-experienced nurse through the procedure and provide feedback. So the less-experienced nurse never develops the skills to perform venipuncture confidently under all kinds of conditions-which can cause frustration and needless pain for patients.

If all this sounds familiar, this special guide will help you increase your knowledge and critical thinking. Use it along with other opportunities to learn. Courses via the Internet, traditional classroom instruction, lab practice sessions using anatomic training arms, and work with clinical preceptors can help build your confidence. **To become truly proficient, however, you must perform many procedures on real patients.**

The learning process will also involve practicing on all types of arm sites. Veins that you can easily see and palpate aren't always available, so you must learn to cannulate more difficult veins too. In the following pages, we'll show you how.

Your employer must determine that you're competent to perform these procedures before you work independently. This process usually involves working under the supervision of a clinical preceptor or a more-experienced colleague who likes to teach others. Check the processes outlined in the policies where you work to determine how you must demonstrate competency and what procedures must be included. This may be limited to venipuncture, but it could include I.V. medication administration, use of electronic infusion pumps, and blood administration. **Begin by working with patients who are well hydrated without chronic diseases or a history of many courses of infusion therapy**.

As you work to improve your skills, you're bound to have a few failures. **If you make two unsuccessful venipuncture attempts, don't persist on a patient. Call in the I.V. team (if available) or a nurse who's more skilled at venipuncture.**

Don't let a few setbacks discourage you. With practice, you can refine your venipuncture skills. Then continue using them to keep them current.

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SELECTING A VEIN

When choosing an appropriate vein for venipuncture, you'll consider many factors, including:

* the patient's medical history

* his age, body size and weight, general condition, and level of physical activity

* the condition of his veins

* the type of I.V. fluid or medication to be infused

* the expected duration of I.V. therapy

* your skill at venipuncture.

Consider the characteristics of the therapy, such as the osmolarity and pH, and the length of time therapy will be required. If therapy is likely to continue beyond 6 days, contact the I.V. team or vascular access resource group to assess the patient for a midline catheter (MLC) or peripherally inserted central catheter (PICC). Short peripheral catheters are indicated when the therapy lasts 6 days or less, when the fluids and medications have a pH between 5 and 9, and when the osmolarity is less than 500 mOsm/liter.

If therapy is expected to last less than 6 days, you'll want to **start with the most distal site** in the upper extremities and move up as necessary. The Infusion Nurses Society (INS) recommends that each subsequent cannula be placed proximal to the last one. By thinking out cannula placement ahead of time, you can head off problems during therapy.

To learn more about the veins most commonly used for I.V. starts, see *Mapping out a plan*.

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Exploring the options

For most adults, assess hand veins first. Starting with a hand, preferably the nondominant one, leaves more proximal sites available for subsequent venipunctures. But you shouldn't use hand veins in older adults who've lost subcutaneous tissue surrounding the veins or in patients who'll be getting in and out of bed frequently or using their hands for other activities.

Infusion of vesicant medications into hand veins is also contraindicated. Vesicant medications cause tissue necrosis, which could result in loss of hand function from damage to tendons and ligaments.

Sites in the hand require support on a handboard to reduce vein irritation and subsequent complications such as phlebitis and infiltration injury. Mobility shouldn't be affected if you correctly position the handboard to allow finger movement and provide wrist support. Make sure you remove the handboard at established intervals to check the patient's circulation.

Veins in the fingers and thumb may be easily visible when a tourniquet is placed; however, they're prone to complications and can't support a catheter for long periods. Their small diameter allows little or no blood flow around the catheter. The motion of the finger can lead to phlebitis, infiltration, and subsequent tissue damage. If these veins are the only sites you find, ask another nurse to assess your patient.

Most adults have many venipuncture sites on both sides of the forearm. Using these veins is usually a good option for short-term I.V. therapy because hand and arm mobility aren't restricted. This is a plus for patients in home care or those who are using crutches or a walker.

A patient's weight can also be a factor in your choice of forearm veins. In an obese patient, for example, you may not be able to see veins in the forearm. But you may be able to palpate a healthy vein if you know the typical locations.

Don't routinely use veins in the antecubital fossa and above for peripheral catheters. These sites may limit the patient's range of motion, increase the risk of phlebitis and

infiltration, interfere with blood sampling, and prevent the use of these veins for midline and PICC insertions.

Starting at a distal site and making subsequent venipunctures proximal to the previous sites is crucial. When a complication develops at a proximal site, you can't use veins distal to this site because the fluids and medication would infuse into the damaged site, compounding the problem.

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Avoid these sites

Don't use veins in the wrist for venipuncture because of their close proximity to nerves. Besides the risks of causing pain and damaging nerves, preventing movement at these sites may be impossible, increasing the risk of complications.

Although used in infants, veins of the legs, feet, and ankles shouldn't be used in adults. The superficial veins of the legs and feet have many connections with the deep veins. Catheter complications can lead to thrombophlebitis, deep vein thrombosis, and embolism. **But if you have no choice during an emergency, the dorsum of the foot and the saphenous vein of the ankle can be used until central venous access is obtained**. You can stabilize a foot vein by asking the patient to point the foot toward the end of the bed, then use the same stretching technique you'd use to stabilize a hand vein. Remove catheters in the lower extremity as soon as possible.

Image Tools

Other sites to avoid include:

* veins below a previous I.V. infiltration

* veins below a phlebitic area

* sclerosed or thrombosed veins

* areas of skin inflammation, disease, bruising, or breakdown

* an arm affected by a radical mastectomy, edema, blood clot, or infection

* **an arm with an arteriovenous shunt or fistula.**

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Evaluating the vein you choose

A vein that's suitable for venipuncture should feel soft, elastic, and engorged-not hard, bumpy, or flat. Inspect and palpate it for problems. Some veins that appear suitable at first glance feel small, hard, or knotty on palpation. A vein sclerosed from previous I.V. therapy isn't suitable for venipuncture.

To palpate a vein, place one or two fingertips (not the less-sensitive thumb) over it and press lightly. Then release pressure to assess the vein's elasticity and rebound filling. To increase the sensation in your fingers, practice palpating veins on friends or co-workers. Always practice while wearing gloves because gloves must be worn during venipuncture procedures to reduce your exposure to blood. To acquire a highly developed sense of touch, palpate before every cannulation-even if the vein looks easy to cannulate.

Although some veins feel and look suitable, they don't take cannulation well because their lumens are irregular and narrowed from scarring. In that case, you'll have trouble advancing the cannula smoothly into the vein. Or you may find that an apparently suitable vein is too fragile and easily damaged. If bleeding through the vein wall occurs, the area will become puffy, bruised, and painful. Although you can't always foresee these problems, expect a patient who's received several courses of I.V. therapy in recent months to have fewer suitable veins.

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Avoiding arteries

Because they're located deeper than veins, arteries are rarely damaged during venipuncture. **In the antecubital fossa, however, where arteries and veins lie close together,** the risk increases. Before performing venipuncture at any site, palpate for arterial pulsation (which occurs even after a tourniquet has been applied properly) to locate nearby arteries. In some cases, you may also see pulsation.

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Stay off your patient's nerves

Nerves are located close to superficial veins in many locations on the hand and arm, especially in the wrist and antecubital fossa. Never perform venipuncture on the palm side of the wrist and avoid the large cephalic vein at the level of the wrist too. Recent research has demonstrated that the superficial branch of the radial nerve crosses the cephalic vein at least once and up to three times as it extends from the wrist to the forearm.

To avoid all these possible intersections when using the cephalic vein, perform venipuncture 4 to 5 inches (10 to 12.5 cm) above the level of the wrist, if possible, depending on the number of available venous sites and the length of therapy.

If your patient complains of tingling, a pins-and-needles sensation, or numbness, a nerve may be damaged. **Immediately remove the catheter and choose another venipuncture site.** Don't probe around after piercing the skin or use a plunging or jabbing technique to insert the catheter.

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SELECTING A CANNULA

Federal legislation in 2001 amended the Bloodborne Pathogens Standard from the Occupational Safety and Health Administration (OSHA), meaning that I.V. catheters with an engineered safety mechanism must be provided. After venipuncture, the stylet is a hollow-bore, blood-filled sharp. Needle-stick injury with this type of device carries the highest risk of bloodborne disease. Catheters with a safety mechanism greatly reduce your chances of being stuck with a contaminated needle.

Several brands of catheters are available with various safety mechanisms. They may require a little more practice for you to handle proficiently, but the effort is worth the reduced chance of being exposed to hepatitis B or hepatitis C virus, human immunodeficiency virus (HIV), or other bloodborne pathogens.

An over-the-needle catheter and a closed I.V. catheter system with attached tubing are ideal choices for veins of the hand or forearm. Most over-the-needle catheters range from ⅝ inch to ¼ inches; closed-system catheters are between ⅝ inch and ½ inches long. The diameters of these cannulas range from 16- to 24-gauge. After inserting either type of device, you'll withdraw the steel needle, leaving only a flexible plastic catheter in the vein.

If you're using an over-the-needle catheter, plan to attach a short, small-diameter extension tubing or use a closed I.V. catheter system with an integrated extension set. This lets you loop the tubing and secure it away from the insertion site. If the tubing gets pulled, this secured loop prevents catheter dislodgment and vein irritation**. Another advantage of having this additional piece of tubing or integral extension set is that you'll change the tubing away from the insertion site, decreasing cannula manipulations and the risk of contamination.**

Avoid steel butterfly-type needles except for short-term duration (1 to 4 hours) or injections of one-time doses. An inflexible steel needle greatly increases the risk of vein injury and infiltration. Never use these devices for any medication that would cause tissue necrosis if it extravasated.

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Intermediate and long-term therapy options

Midline catheters are a good choice when the therapy will last between 1 and 4 weeks. An MLC is inserted via the basilic, median cubital, or cephalic vein of the antecubital fossa and advanced until the tip rests in the proximal portion of the upper arm, level with the axilla but distal to the shoulder. Therapies suitable for infusion through an MLC include those with osmolarities less than 500 mOsm/liter and a pH range between 5 and 9.

A PICC is indicated when therapies will be needed for 1 to 12 months. A PICC is inserted via the veins of the antecubital fossa or the upper arm, but the tip resides within the superior vena cava. Solutions with extremes of osmolarity and pH can be infused because the high blood flow around the catheter tip will rapidly dilute the infused solution.

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Choosing the right size

Depending on the vein used, the I.V. cannula should usually be ⅝ inch to ½ inches long. To reduce the risk of phlebitis, the catheter should have the smallest diameter possible so it takes up less space in the vein. This allows better blood flow around the catheter, lessening the risk of phlebitis and promoting proper hemodilution of the fluid.

When selecting a catheter, consider the patient's condition and the type of solution you'll be running through the catheter in the next 72 to 96 hours. Using the smallest-gauge catheter in the largest vein possible will reduce the mechanical and chemical irritation to the vein wall. Keep these general guidelines in mind:

* 24- to 22-gauge for children and elderly patients

* 24- to 20-gauge for medical patients and postoperative surgical patients

* 18-gauge for surgical patients and for rapid blood administration. Blood can be infused through smaller-gauge catheters, but the flow rate will be slower.

* **16-gauge for trauma patients and those requiring large volumes of fluid rapidly**.

Before inserting any needle or cannula, carefully inspect it for imperfections, such as problems with the catheter tip. Follow the manufacturer's recommendations about adjustments that you should or shouldn't make to the catheter before insertion.

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GETTING STARTED

Obtain the I.V. fluid from floor stock or from the pharmacy. Compare the label on the container with the prescriber's order to confirm accuracy of the type of fluid and any added medications.

Additional information can be gleaned from the patient's medical record. Check for allergies, especially to antiseptic agents (iodine, for example) or latex. A long history of hospitalizations is a clue that your patient has had many I.V. catheters in the past, possibly decreasing the number of venous sites available now. A history of vasovagal reactions indicates he's at risk for this reaction during venipuncture.

Gather the equipment you'll need and prime the I.V. tubing before you enter the patient's room-especially if you're relatively inexperienced. With privacy, you'll have time to get organized, look over the equipment, and plan your approach without making your patient anxious.

If you're working with a preceptor, devise a system of communication ahead of time so that the preceptor will know when to step in and perform the procedure. This may happen if you don't feel comfortable performing the procedure because of the patient's veins or his attitude toward the procedure.

When you enter the room, wash your hands or clean them with an alcohol-based hand rub, identify the patient, and introduce yourself if you're meeting for the first time. Take a few minutes to explain the procedure. Encourage the patient to ask questions and answer them with direct and complete information. Avoid using words that might add to his apprehension, such as needle or stick. Instead, you might say, I'm going to put this soft plastic catheter in your arm to deliver your medication. He may relax a little when you show him the equipment.

As you talk, note whether his skin is cool or diaphoretic: If he's anxious, vasoconstriction could make veins hard to find.

Acknowledge his feelings with a comment like, I can see you're a little nervous, and do your best to put him at ease. If he's never had an I.V. catheter inserted before, for example, assure him that he'll be able to use his hand and arm after venipuncture.

If he's nervous, chilly, or hypotensive, expect to spend a little extra time dilating and distending the vein before venipuncture.

Make sure you're in a comfortable position by raising the height of the bed to prevent unnecessary bending. Make sure that lighting's adequate for accurate vein assessment and I.V. catheter insertion. The patient should be supine with his head slightly elevated (unless contraindicated) and with his arm supported. Patients are at an increased risk for vasovagal reaction if they're sitting up during venipuncture. Assess the patient's nondominant arm first to allow him to use his dominant hand freely.

Apply the tourniquet and assess his veins. If they fill poorly, try these tips:

* Position his arm below heart level or hang his arm down to encourage capillary filling.

* Instruct him to open and close his fist several times. (Make sure his fist is relaxed during venipuncture.)

* Gently rub or stroke his arm to warm the skin.

* Cover his entire arm with moist compresses for 10 to 15 minutes to trigger vasodilation by increasing blood flow to the area.

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Applying a tourniquet

You'll apply the tourniquet 5 to 6 inches (12.5 to 15 cm) above the intended venipuncture site. Peripheral veins in a well-hydrated patient should distend within a few seconds. **Venous distension may take longer in elderly or dehydrated patients**.

Use a single-patient-use disposable tourniquet because reusable tourniquets can be a source of cross-contamination. To apply it as painlessly as possible, avoid pulling hair or pinching the skin. Apply it tight enough to trap venous blood in the lower arm's veins without interfering with arterial flow. If you can't feel a pulse below the tourniquet (or if the patient complains of discomfort), it's too tight. As the occluded veins distend, the skin below the tourniquet will become slightly darker from venous congestion.

1. Make sure the tourniquet lies flat against the patient's skin. Bring the ends of the tourniquet toward each other, so that one overlaps the other.

Image Tools

2. To tie the tourniquet, lift and stretch it; then use two fingers to tuck the top tail under the bottom. Make sure the tails point away from the venipuncture site.

3. Use this technique to stabilize the veins: Lift the tied tourniquet and stretch the skin and underlying tissue away from the venipuncture site. Then gently lower the tourniquet. You may be able to retract several inches of skin and tissue away from the site with this maneuver, which is especially helpful with older patients (who have less collagen and elastin than younger adults) and patients who've lost a lot of weight recently.

Image Tools

When the tourniquet is in place, ask the patient to open and close his fist several times. This encourages venous distension.

After identifying a desirable vein, you can encourage it to enlarge with a light tap of your finger. (Hitting it too hard will cause vasoconstriction.) The vein should become as engorged as possible to create a bigger target and improve your chances of success. Gently palpate the vein to see if it feels soft and bouncy. When you depress and release an engorged vein, it should spring back to a filled state.

If the vein won't distend sufficiently, remove the tourniquet and let the vessels refill. Sometimes veins fill better on the second try because of a rebound effect. If necessary, use one or more of the techniques previously described to dilate the veins. (Apply warm moist compresses, for example.) Then reapply the tourniquet and stretch the skin as just described. Make sure the tourniquet is tight enough to occlude the veins; a tourniquet that's too loose is a common reason for inadequate vein distension.

Note: Some clinicians prefer to use a blood pressure cuff instead of a tourniquet-especially for elderly patients, whose fragile veins are more likely to rupture when engorged if a tourniquet is applied too tightly. Inflate the cuff, then deflate it to just below the patient's diastolic pressure to make the vein visible without engorging it excessively.

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Preparing the site

Once you've selected a vein, don gloves and prepare to clean the site. If the site is excessively hairy, you should clip the hair as recommended by the INS. Never shave the site because this causes microabrasions. Always clean visibly dirty skin with soap and water.

Image Tools

Next, apply an approved antimicrobial solution. Chlorhexidine gluconate solution is the preferred agent, according to the Centers for Disease Control and Prevention (CDC); tincture of iodine 2%, 10% povidone-iodine, 70% isopropyl alcohol, and combination povidone-iodine/alcohol preparations are also acceptable agents. Don't use aqueous benzalkonium-like compounds or hexachlorophene to prepare the site.

The procedure that you use to apply an antimicrobial solution for site preparation is crucial. If you're using chlorhexidine, use a back-and-forth motion, which increases the friction and allows the antiseptic solution to penetrate the lower layers of the epidermis. If using another agent, use a circular motion and work outward, as shown.

Image Tools

Although the surface area for prepping depends on the size of the extremity, in most adult patients an area 2 to 3 inches (5 to 7.5 cm) in diameter is acceptable.

Never blot excess solution at the insertion site. Let the solution air-dry completely. Much of the solution's germicidal action takes place during this time. Chlorhexidine gluconate achieves its antimicrobial action within 30 seconds; povidone-iodine requires at least 2 minutes to kill organisms on the skin. Never apply 70% isopropyl alcohol after a 10% povidone-iodine prep because this may irritate the skin and it interferes with povidone's germicidal action.

If a patient is allergic to iodine, the prepping solution of choice is chlorhexidine gluconate or 70% isopropyl alcohol. When you use 70% isopropyl alcohol, you should apply it with friction for at least 30 seconds or until the final applicator is clean.

The INS recommends that you use single-unit containers of antimicrobial solution. Be sure to discard the containers after use.

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Stabilizing the vein

Superficial veins have a tendency to roll because they lie in loose, superficial connective tissue. **Prevent rolling by maintaining the vein in a taut, distended, stable position**. Hand veins are generally easier to immobilize than upper arm veins. Hand veins may also

be easier to cannulate because they're usually surrounded with less fatty tissue. But remember, there's a greater chance of nerve injury in the hand and wrist.

Use the following techniques to immobilize hand and arm veins.

1. To immobilize a hand vein, grasp the patient's hand with your nondominant hand. Place your fingers under his palm and fingers, with your thumb on top of his fingers below the knuckles. Pull his hand downward to flex his wrist, creating an arch. To maintain the proper angle, make sure his elbow remains on the bed. Use your thumb to stretch the skin down over the knuckles to stabilize the vein, as shown here. Keep a firm grip throughout venipuncture.

Image Tools

2. To stabilize a vein on the forearm, encircle the patient's arm with your nondominant hand and use your thumb to pull downward on the skin below the venipuncture site.

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Using a local anesthetic

If ordered or permitted by hospital policy, you may use a local anesthetic before venipuncture to reduce the patient's pain and anxiety. Follow your employer's policy regarding documenting your competency to perform this aspect of the procedure. Although intradermal injections prior to insertion are controversial (and not recommended for routine use by the INS), using an anesthetic may make venipuncture easier on everyone because the patient will be less inclined to tense up and pull away. In most institutions, the anesthetic of choice is 1% lidocaine (Xylocaine) without epinephrine or buffered lidocaine, which helps remove the sting from this procedure. An alternative choice is an intradermal injection of bacteriostatic 0.9% sodium chloride. The preservative benzyl alcohol acts as a local anesthetic. You might also consider using topical anesthetic creams, but keep in mind that these creams must be applied 30 minutes to 1 hour before the procedure and may cause vasoconstriction, which could make cannulating the vein difficult.

Iontophoresis, a method of delivering local anesthesia to the skin using a mild electrical current, is another possibility. To learn more about these options, see the Photo Guide Electrifying News about Iontophoresis (*Nursing2000*, January, page 48).

If using lidocaine, make sure you have a health care provider's order or standing orders before you begin; then ask the patient if he's ever had an allergic reaction to lidocaine or other local anesthetics.

You'll administer the anesthetic after cleaning the skin, while the tourniquet is in place and the vein is immobilized. This will help you give the anesthetic at exactly the same site you've chosen for venipuncture. Follow this procedure:

* Put on gloves. Using a tuberculin syringe, draw up the appropriate amount of the anesthetic solution.

* Position the syringe and needle at a 5- to 15-degree angle to the side of the vein where you plan to insert the cannula.

* With the bevel up, introduce the needle tip into the skin slightly to one side or below the vein as shown. Take care not to penetrate the vein wall. By administering the solution beside or below the vein, you can avoid accidentally injecting the drug into the vein.

* Insert about one-fourth to one-third of the needle's length to anesthetize a superficial vein; you may have to go deeper for a deep vein. Lift up the needle tip slightly so a wheal can be formed.

Image Tools

* As you depress the plunger, watch the small intradermal wheal rise. Very superficial veins may require only 0.05 ml of solution; with deep veins, you may have to inject the entire 0.2-ml dose to produce a wheal about the size of a pea (0.5 cm).

* Withdraw the needle. To hasten absorption and prevent the wheal from obscuring the vein, gently massage the wheal with an alcohol sponge. Allow 5 to 10 seconds for the anesthetic to take full effect.

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HOW TO APPROACH THE VEIN

An I.V. cannula can be inserted in several ways. The choice depends on cannula length, vein location, and your preference. No matter which method you use, though, the cannula

should enter the skin at such an angle that the needle punctures the vein wall and enters the lumen without piercing the opposite wall. Here are three ways to do this:

1. ***Approaching the vein from the top***. Insert the cannula at a 5- to 15-degree angle (depending on vein depth; for example, use a 5- to 10-degree angle for a superficial hand vein). Take care not to insert it too far into the lumen or it may penetrate the back wall.

Image Tools

2. ***Approaching the vein from the side***. Position the cannula tip adjacent to the vein, aimed toward it. This method, which is preferred if you've injected a local anesthetic, reduces the risk of piercing the vein's back wall.

Image Tools

3. ***Approaching a vein that's palpable and visible for only a short segment***. This technique may help you cannulate a vein that extends into deeper tissues, where you can't see or feel it. Insert the cannula about 1 to 2 cm below the vein's visible segment, then tunnel the cannula through the tissue to enter the vein. Tunneling may reduce trauma to the vein wall on insertion.

Image Tools

Note: Avoid performing venipuncture in areas where valves are palpated or where two veins bifurcate. The insertion site should be proximal to a valve or a bifurcation, according to the INS.

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Inserting the cannula

Before performing venipuncture, stretch and immobilize the vein as shown earlier. Press the vein lightly to check for rebound elasticity and to get a sense of its depth and resilience. Palpate the portion where the cannula tip will rest, not the point where you intend to insert the cannula. If you touch the insertion site, you'll have to reclean the skin.

To insert the cannula, follow the steps shown here.

1. Using your dominant hand, grasp the cannula or the cannula's wings (if using an over-the-needle butterfly). If you previously administered a local anesthetic, its effectiveness will extend for only ¼ to ¾ inch (0.6 to 1.9 cm) from the injection site. Touch the spot with the cannula tip and ask the patient if it feels sharp. If he says no, you know the site is properly anesthetized. Proceed at once with venipuncture.*Note:* If you didn't use a local anesthetic, encourage the patient to relax. Tell him to breathe slowly in and out as you insert the cannula.

Image Tools

2. Insert the cannula at a 10- to 30-degree angle, depending on the vein's depth. Insert the cannula bevel up to reduce the risk of piercing the vein's back wall. Position your fingers so you can see blood backflow in the flash chamber or extension tubing. Some catheters and closed catheter systems are designed to provide early or continuous flashback of blood, which will improve your success on the first attempt. While keeping the vein immobilized, advance the cannula through the skin and vein with one quick motion. Don't always expect to feel a popping or giving-way sensation. Look for blood backflow in the cannula tubing or hub to tell you that you've entered the vein lumen.*Note:* Backflow may occur briefly if the stylet passes through the lumen and out the opposite wall. But the blood flow will stop when the stylet leaves the vein lumen.An alternative is to enter the skin and pause slightly to position the cannula tip over the vein wall. Then insert at least one-fourth of the length of the cannula into the vein.

Image Tools

3. Upon visualization of backflow, lower the cannula almost parallel to the skin and advance it slightly to ensure the cannula tip is in the lumen of the vein. While immobilizing the vein, push the catheter off the stylet and advance it completely into the lumen of the vein. Refer to the manufacturer's recommendations for further details on this step. (Also see *Advancing the cannula: Three options*.)**If the initial insertion isn't successful, you can try repositioning the cannula as long as you haven't pulled back the stylet or removed the catheter tip from the skin.** A deeper or more superficial approach to the vein may work, but don't excessively probe the area, which could damage the nerve. If necessary, slightly increase traction applied to the insertion site to prevent the vein from rolling. **If you're still unsuccessful, remove the catheter and try again with a new catheter at a new site-preferably on the opposite arm. Never reinsert a stylet back into a catheter. This can shear off a piece of the plastic. Never reuse the same catheter**; catheter-related infection can occur.Start the infusion or flush the catheter. Watch carefully for signs of infiltration, which would indicate that fluid is leaking out of the vein. If infiltration occurs or if the patient complains of an unusual tingling or burning sensation, remove the catheter immediately.

Image Tools

4. Release the tourniquet once the cannula is totally advanced into the vein, apply digital pressure beyond the cannula tip, and stabilize the hub. Activate the safety mechanism to house the needle. With the safety device shown here, push the white activation button to shield the needle. Dispose of the syringe and needle immediately into an approved sharps container. Make sure you're familiar with the techniques unique to the device you're using.

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DOCUMENTING THE PROCEDURE

Documentation is critical to record your actions, the patient's reaction, and clinical outcomes. Adequate documentation includes:

1. the date and time of the procedure

2. the type, length, and gauge of the catheter inserted

3. the number of attempts made

4. the exact location of each attempt and the final successful site. You can document this by putting a simple mark on an anatomic drawing of the arm or by using the vein name and a thorough description of the location on that vein. Be very specific. The cephalic vein, for example, extends from the wrist up the entire length of the arm.

5. the type of dressing applied

6. the patient's response to the procedure, using direct quotes or comments from the patient if possible

7. the condition of the I.V. site using a standard scale, such as the assessment scales for phlebitis and infiltration published by the Infusion Nurses Society

8. the types of fluids and medications infused through the catheter, including the infusion rate, dose, and diluent for all medication and any additives to the primary fluid

9. if and why you applied an armboard

10. patient teaching.

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TROUBLESHOOTING TIPS

Common reasons for problems during venipuncture include:

* improper tourniquet placement-too high, too low, too tight, or too loose (causing insufficient engorgement)

* failure to release the tourniquet promptly when the vein is sufficiently cannulated. Intravascular pressure may cause bleeding into tissue.

* a tentative stop and start technique-often a problem with beginners who lack confidence. A tentative approach can injure the vein and cause bruising.

* inadequate vein stabilization, allowing the stylet to push the vein aside

* failure to recognize that the cannula has gone through the opposite vein wall (as indicated by diminished blood return)

* stopping too soon after insertion, so only the stylet-not the plastic catheter-enters the lumen. (Blood return disappears when you remove the stylet because the catheter isn't in the lumen.)

* inserting the cannula too deep, below the vein. This is evident when the cannula won't move freely because it's imbedded in fascia or muscle. The patient may also complain of severe discomfort and experience nerve injury.

* failure to penetrate the vein wall because of improper insertion angle (too steep or not steep enough), causing the cannula to ride on top of or below the vein.

Hematoma formation and leaking from the insertion site are problems that might require you to stop venipuncture. These problems occur most commonly in older adults, who have fragile veins, and in infants, who have very small ones. Vasospasm, another problem that can prevent catheter insertion, is more common in patients who are anxious about the procedure.

If blood backflow stops when you remove the stylet, the catheter may not be fully in the vein or it may have passed through the vein's opposite wall. Other possible reasons for a lack of backflow include severe vasospasm or an occlusion of the cannula with a fat plug or blood clot. In many cases, you can't tell exactly what's wrong.

A sudden backflow of blood when you retract the catheter indicates puncture of the opposite wall. Remove the catheter; otherwise, the infusing fluid could infiltrate from the additional puncture site. Never try to reinsert the stylet; you'd shear the plastic catheter.

As you work to correct problems, don't forget to check the patient and reassure him. Occasionally, an inexperienced nurse becomes so focused on the problem in front of her that she doesn't realize that the patient is hyperventilating or becoming light-headed from anxiety or having a vasovagal reaction.

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ADVANCING THE CANNULA: THREE OPTIONS

There are several ways to advance an over-the-needle cannula into the vein. Once you find the way that works best for you, stay with it. With any method, insert the cannula with a smooth motion as you advance the needle through the skin and into the vein. You should adapt your techniques based on manufacturers' recommendations for each product.

Method 1: The one-handed technique

Image Tools

With practice, you can learn to advance the catheter off the stylet with one hand, while the other maintains vein stretch. If the vein is small, leave the tourniquet on to increase the vein size during catheter advancement. You should release the tourniquet before removing the stylet to avoid excessive blood spillage.

* Advance the catheter into the vein and check for blood return in the flash chamber or along the integrated extension tubing.

* Using a push-off tab on the plastic catheter hub, push the plastic catheter off the stylet and into the vein.

* Use your nondominant hand to hold skin traction during the entire catheter advancement.

* Activate the safety mechanism according to the manufacturer's instructions. Connect the I.V. tubing or short extension set.

Method 2: The two-handed technique

Image Tools

* Insert the catheter into the vein until blood backflow is visible.

* Lower the angle and advance about ⅛ inch into the vein to ensure that the entire plastic catheter is inside the vein lumen. Continue to hold the stylet hub with your dominant hand.

* Release the skin traction held by your nondominant hand. Move your dominant hand to the plastic catheter hub and hold the stylet hub with your nondominant hand. Separate the plastic catheter from the stylet by pushing the catheter into the vein slightly.

* Continue to hold the plastic catheter with your dominant hand.

* Reestablish skin traction with your nondominant hand. Advance the plastic catheter with your dominant hand until it's inserted completely. Be careful to avoid moving the stylet back into the catheter lumen. Remove the tourniquet.

* Activate the safety mechanism according to the manufacturer's instructions. Attach the I.V. tubing or attach a short extension tubing with an injection cap.

Method 3: Floating the cannula into the vein

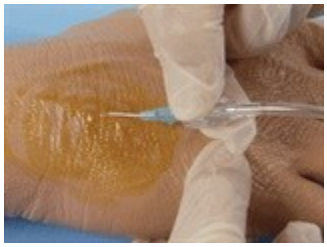
Image Tools

With this method, you'll remove the stylet before fully advancing the cannula. It's a good technique to use if you're inexperienced: You'll be less likely to puncture the vein's opposite wall because you'll advance the catheter only after you see adequate blood return. Also, fluid flow helps float the catheter into place.

* Perform venipuncture and advance the cannula about one-third to one-half its length into the vein or until you see blood flashback.

* If desired, you can place a protective pad or sponge under the hub to catch blood that escapes when you remove the stylet. Prevent contact between the shaft of the plastic catheter, the skin, and the pad or sponge.

* Release the tourniquet and activate the safety mechanism.

* Attach the tubing and start the I.V. infusion at a slow rate. This technique requires flowing fluid to work.

* Use one hand to maintain vein stretch while advancing the cannula with your other hand.

* When the cannula is fully advanced, adjust the I.V. rate.

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SPECIAL CONSIDERATIONS FOR DEEP VEINS

Although a deep arm vein is a challenge to cannulate, sometimes you have no choice because it's all that's available. Cannulating an arm vein also has the virtue of freeing the patient's hand so he can move around more easily.

When you stretch a deep arm vein to immobilize it, it may seem to disappear because stretching may flatten it slightly. So you must be able to see it by palpating it with your fingers. To cannulate a vein that's palpable but hard to see, follow these steps:

1. Palpate the vein and use anatomic landmarks to situate the vein in your mind. Don't palpate the site again after the skin antiseptic has been applied. Ask the patient to relax his fist as tight muscles can compress veins.

2. Use skin traction techniques by encircling the patient's arm with your nondominant hand and stretching the skin downward with your thumb. Using moderate pressure, retract the skin away from the insertion site to stabilize the vein.Grasp the cannula with your fingers, touching only the hub, so you can easily see blood backflow. Aim the cannula tip at the vein you visualize by the anatomic landmark and insert it in one smooth motion.

3. Use your nondominant hand to maintain vein stretch. Lower the cannula angle and continue advancing the cannula until you see blood backflow in the hub, indicating that the cannula tip has entered the vein.

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SECURING AND DRESSING THE CATHETER

Adequate catheter securement is crucial to reducing complications and ensuring adequate dwell time of the catheter. In the following photos, you'll see how to secure and dress the catheter.

Tape placed under a transparent dressing should be clean, preferably strips of tape from an I.V. start kit. It shouldn't be taken from rolls of tape moved between patient rooms, from other procedures, or from nurses' pockets.

Attach the administration set or extension set to the catheter hub. Place a ½-inch-wide strip of tape across the catheter hub; it shouldn't cover the puncture site. Then place a ½-

inch-wide strip of tape under the catheter hub, adhesive side facing up. Fold the tape strip around the catheter hub. If you're using a catheter hub with wings, fold the tape strips across the wings rather than the hub.

Image Tools

Cover the venipuncture site and catheter hub with the transparent dressing but don't cover the hub-tubing junction. Fold a 2x2 gauze pad in half and cover it with a 1-inch-wide tape strip. Place it under the catheter hub-tubing junction. This prevents skin breakdown from tubing taped directly to the skin.

Image Tools

Finally, curl the tubing to the side. Place a 1-inch-wide tape strip over the tubing directly on top of the tape under the hub.

A transparent dressing lets you observe the insertion site for phlebitis, infiltration, and infection without disturbing it. Also, because it's waterproof, you won't need to replace it routinely unless it's loosened or soiled. Apply it directly to the site without stretching it (which may make the patient's skin itch). It should cover the catheter and part of the hub. Follow the dressing manufacturer's instructions for specific application technique.

Make sure no tubing extends beyond the hand, where it could catch on something. Also, the hub should be positioned to let you change the tubing away from the insertion site.

Catheter securement devices are available for purchase and have been demonstrated to reduce complications and increase the catheter dwell time.

You may want to use stretch netting to cover the entire I.V. site. It prevents accidental dislodgment while allowing easy site access.

Image Tools

Catheter insertion sites affected by the motion of a joint should be supported on a handboard to avoid the risk of infiltration or mechanical phlebitis from motion of the catheter inside the vein. Even though these catheters are made of soft plastic materials, vein damage is still a very real possibility.

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REMOVING THE DRESSING AND CANNULA

Perform hand hygiene, turn off the I.V. infusion, remove all tape, and put on gloves. Moisten the transparent dressing, tape, or catheter securement device with alcohol or adhesive remover, following the manufacturer's recommendation. Then, while stabilizing the patient's hand as shown at right, gently grasp one edge and slowly peel the dressing from the skin in the direction of hair growth. Avoid skin trauma by peeling the dressing back rather than pulling it up from the skin.

Image Tools

Apply a folded gauze sponge over the insertion site and hold it lightly with your thumb. Then grasp the wings and withdraw the cannula in one smooth motion.

Image Tools

After the catheter has cleared the skin, apply pressure to achieve hemostasis. Tape the gauze pad in place and elevate the patient's arm. Apply direct pressure for 1 to 2 minutes. (Depending on his condition, the patient may be able to do this himself.) If he's going home, tell him how soon he can remove the bandage and tape (usually within 6 hours).

Inspect the catheter removed from the vein to ensure that the complete length has been removed.