Understanding peripheral I.V. therapy

Few nursing responsibilities require more time, knowledge, and skill than administering peripheral I.V. therapy. At the bedside, you need to assemble the equipment, prepare the patient, insert the venous access device, regulate the I.V. flow rate, and monitor the patient for possible adverse effects. You also have behind-the-scenes responsibilities, such as checking the practitioner’s orders, ordering or preparing supplies and equipment, labeling solutions and tubing, and documenting your nursing interventions.

Practice, practice, practice

Perhaps the most challenging aspect of peripheral I.V. therapy is performing the venipuncture itself. You need steady hands and a sharp eye, plus lots of practice — it’s worth the effort, both in terms of positive outcome and patient satisfaction. As you gain experience, you’ll learn to perform even difficult venipunctures confidently and successfully.
Basics of peripheral I.V. therapy

Peripheral I.V. therapy is ordered whenever venous access is needed; for example, when a patient requires surgery, transfusion therapy, or emergency care. You may also use peripheral I.V. therapy to maintain hydration, restore fluid and electrolyte balance, provide fluids for resuscitation, or administer I.V. drugs, blood and blood components, and nutrients for metabolic support.

Quick and easy

Peripheral I.V. therapy offers easy access to veins and rapid administration of solutions, blood, and drugs. It allows continuous administration of drugs to produce rapid systemic changes. It’s also easy to monitor.

Peripheral concerns — and cost

Peripheral I.V. therapy is an invasive vascular procedure that carries such associated risks as bleeding, infiltration, and infection. Rapid infusion of some drugs can produce hearing loss, bone marrow depression, kidney or heart damage, and other irreversible adverse effects. Finally, peripheral I.V. therapy can’t be used indefinitely and costs more than oral, subcutaneous, or I.M. drug therapy.

A mainstay and crucial contributor

Despite its risks, peripheral I.V. therapy remains a mainstay of modern medicine and a crucial contribution that nurses make to their patients’ well being. The key is to do it well, and that starts with preparation.

Preparing for venipuncture and infusion

Before performing a venipuncture, talk with the patient, select and prepare the proper equipment, and choose the best access site and venous access device.

Preparing the patient

Before approaching the patient, check his medical record for allergies, his medical history, and his current diagnosis and care plan. Review the practitioner’s orders, noting pertinent laboratory
studies that might affect the administration or outcome of the prescribed therapy.

Care + confidence = a relaxed, cooperative patient

Keep in mind that the patient may be apprehensive. Among other things, this anxiety may cause vasoconstriction, making the venipuncture more difficult for you and more painful for the patient. Careful patient teaching and a confident, understanding attitude will help the patient relax and cooperate during the procedure. (See Teaching a patient about peripheral I.V. therapy.)

Teaching a patient about peripheral I.V. therapy

Many patients feel apprehensive about peripheral I.V. therapy. So, before you begin therapy, teach your patient what to expect before, during, and after the procedure. Thorough patient teaching can reduce his anxiety, making therapy easier. Follow the guidelines below.

Describe the procedure
• Tell the patient that “intravenous” means inside the vein and that a plastic catheter (plastic tube) will be placed in his vein. Explain that fluids containing certain nutrients or medications will flow from an I.V. bag or bottle through a length of tubing, and then through the plastic catheter into his vein.
• Tell the patient approximately how long the I.V. catheter will stay in place (if known). Explain that the practitioner will decide how much and what type of fluid he needs.
• Mention that he may feel some pain during insertion but that the discomfort will stop once the catheter is in place.
• Tell him that the I.V. fluid may feel cold at first, but this sensation should last only a few minutes.

Do’s and Don’ts
• Tell the patient to report any discomfort after the catheter has been inserted and the fluid has begun to flow.
• Explain any restrictions, as ordered. If appropriate, tell the patient that he can walk while receiving I.V. therapy. Depending on the insertion site and the device, he may also be able to shower or take a tub bath during therapy.
• Teach the patient how to assist in the care of the I.V. system. Tell him not to pull at the insertion site or tubing and not to remove the container from the I.V. pole. Also, tell him not to kink the tubing or lie on it. Explain that he should call a nurse if the flow rate suddenly slows down or speeds up.

The worst (and it wasn’t that bad) is over
• Explain that removing a peripheral I.V. line is a simple procedure. Tell the patient that pressure will be applied to the site until the bleeding stops. Reassure him that, once the device is out and the bleeding stops, he’ll be able to use his arm as usual.
What goes on behind drawn curtains

After you complete your teaching, ensure the patient's privacy by asking visitors to leave and drawing the curtains around the bed if another patient is present. However, if the patient requests that his family stay during the procedure, respect his wishes. Have him put on a gown if he isn’t already wearing one, and remove any jewelry from the arm where the I.V. catheter will be inserted. When the patient is ready, position him comfortably in the bed, preferably on his back. Make sure that the area is well lit and that the bed is in a position that allows you to maneuver easily when inserting the device.

Selecting the equipment

Besides the venous access device, peripheral I.V. therapy requires a solution container, an administration set (sometimes with an in-line filtration system) and, if needed, an infusion pump.

Solution containers

Some health care facilities use glass I.V. solution containers; however, most use plastic bags for the routine administration of I.V. fluids. Glass must be used to deliver medications that are absorbed by plastic (such as nitroglycerin) and for albumin and immune globulin preparations.

Plastic or glass?

Because they’re available in soft, flexible bags or semi-rigid rectangular containers, plastic solution containers allow easy storage, transportation, and disposal. Unlike glass bottles, they collapse as fluid flows out and don’t require air venting, thus reducing the risk of air embolism or airborne contamination. In addition, plastic containers aren’t likely to break.

In contrast, glass containers don’t collapse as fluid flows out and require vented tubing. A vented I.V. administration set has an extra filtered port near the spike that allows air to enter and displace fluid. This helps the solution flow correctly.

Administration sets

There are three major types of I.V. administration sets:

- basic, or primary
- add-a-line, or secondary line
- volume-control.
Comparing I.V. administration sets

I.V. administration sets come in three major types: basic (also called primary), add-a-line (also called secondary), and volume-control. The basic set is used to administer most I.V. solutions. An add-a-line set delivers an intermittent secondary infusion through one or more additional Y-sites, or Y-ports. A volume-control set delivers small, precise amounts of solution. All three types come with vented or nonvented drip chambers.

All three have drip chambers that may be vented or nonvented (Glass containers require venting, plastic ones don't.) and two drip systems: macrodrip and microdrip. (See Comparing I.V. administration sets.)

Drip, drip, drip...

A macrodrip system delivers a solution in large quantities at rapid rates. A microdrip system delivers a smaller amount of solution with each drop and is used for pediatric patients and adults who need small or closely regulated amounts of I.V. solution.

A macrodrip system delivers a solution in large quantities at rapid rates.

A microdrip system delivers a smaller amount of solution with each drop.
Sizing up the situation

Selecting the correct set requires knowing the type of solution container and comparing the set’s flow rate with the nature of the I.V. solution — the more viscous the solution, the larger the drops and, thus, the fewer drops per milliliter. Also, make sure that the intended solution can be infused using a filtration system; otherwise, you’ll need an infusion set without the filtration component.

Supplemental supplies

Depending on the type of therapy ordered, you may need to supplement the administration set with other equipment, such as stopcocks, extension loops, and needleless systems.

Back to basics

Basic I.V. administration sets range from 70” to 110” (178 to 279 cm) long. They’re used to deliver an I.V. solution or to infuse solutions through an intermittent infusion device. The Y-site provides a secondary injection port for a separate or simultaneous infusion of two compatible solutions. A macrodrip set generally delivers 10, 15, or 20 gtt/ml. A microdrip set always delivers 60 gtt/ml.

Add-a-line? Here’s Y…

Add-a-line sets can deliver intermittent secondary infusions through one or more additional Y-sites. A backcheck valve prevents backflow of the secondary solution into the primary solution. After the secondary solution has been infused, the set automatically resumes infusing the primary one.

Down to the milliliter

Volume-control sets — used primarily for pediatric patients — deliver small, precise amounts of fluid and medication from a volume-control chamber that’s calibrated in milliliters. This chamber is placed at the top of the I.V. tubing, just above the drip chamber. Also called burette sets or Buretrols, volume-control sets are available with or without an in-line filter. They may be attached directly to the venous access device or connected to the Y-site of a primary I.V. administration set. Macrodrip and microdrip systems are available.

In-line filters

In-line filters are located in a segment of the I.V. tubing through which the fluid passes. In-line filters remove pathogens and particles, thus reducing the risk of infection and phlebitis. Filters also help prevent air from entering the patient’s vein by venting it through the filter housing. Filters range in size from 0.2 micron (the most common) to 170 microns. Some are built into the line; others need to be added.
Keeping in line with in-line filters

Most facilities have guidelines for using in-line filters; these guidelines usually include the following instructions:
• When using a filter with an infusion pump, make sure that it can withstand the pump’s infusion pressure. Some filters are made for use only with gravity flow and may crack if the pressure exceeds a certain level.
• The filter should be distal in the tubing and located close to the patient.
• Carefully prime the in-line filter to eliminate all the air from it, following the manufacturer’s directions.
• Be sure to change the filter according to the manufacturer’s recommendation to prevent bacteria from accumulating and releasing endotoxins and pyrogens small enough to pass through the filter into the bloodstream.

Is there a filter in your future?

Routine use of filters increases costs. Therefore, filters may not be indicated in all situations. When can you expect to use an in-line filter? Usually in situations when:
• treating an immunosuppressed patient
• administering total parenteral nutrition
• using additives composed of many separate particles (such as antibiotics that require reconstitution) or when administering several additives
• the risk of phlebitis is high.

Don’t expect to use a 0.2-micron filter if you’re administering blood, blood components, or lipid emulsions; the larger particles in these solutions could clog the filter. The same is true of low-dose (less than 5 mcg/ml), low-volume medications because the filter membrane may absorb them.

Preparing the equipment

After you select and gather the infusion equipment, you’ll need to prepare it for use. Preparation involves inspecting the I.V. container and solution, preparing the solution, attaching and priming the administration set, and setting up the controller or infusion pump.

Inspecting the container and solution

Check that the container size is appropriate for the volume to be infused and that the type of I.V. solution is correct. Note the expiration date; discard an outdated solution.
When in doubt, throw it out

Make sure that the solution container is intact. Examine a glass container for cracks or chips and a plastic container for tears or leaks. (Plastic bags commonly come with an outer wrapper, which you must remove before inspecting the container.) Discard a damaged container, even if the solution appears clear. If the solution isn’t clear, discard the container and notify the pharmacy or dispensing department. Solutions may vary in color, but they should never appear cloudy, turbid, or separated.

Preparing the solution

Make sure that the container is labeled with the following information: your name; the patient’s name, identification number, and room number; the date and time the container was hung; any additives; and the container number (if such information is required by your facility). For a pediatric patient, you may label the volume-control set instead of the container.

After the container is labeled, use sterile technique to remove the cap or pull tab. Be careful not to contaminate the port or the spike from the administration set.

Attaching the administration set

Make sure that the administration set is correct for the patient and the type of I.V. container and solution you’re using. Also make sure that the set has no cracks, holes, or missing clamps. If the solution container is glass, check whether it’s vented or nonvented to determine how to prepare it before attaching it to the administration set. (Plastic containers are prepared differently.)

Nonvented bottle

When attaching a nonvented bottle to an administration set, take the following steps:

1. Remove the metal cap and inner disk, if necessary.
2. Place the bottle on a stable surface, and wipe the rubber stopper with an alcohol swab.
3. Close the flow clamp on the administration set.
4. Remove the protective cap from the spike.
5. Push the spike through the center of the rubber stopper.

Avoid twisting or angling the spike to prevent pieces of the stopper from breaking off and falling into the solution.
Invert the bottle. Hang the bottle on the I.V. pole, about 36" (91 cm) above the venipuncture site.

**Vented bottle**
When attaching a vented bottle to an administration set, take the following steps:
- Remove the metal cap and latex diaphragm to release the vacuum. If the vacuum isn’t intact, discard the bottle (unless a medication has been added).
- Place the bottle on a stable surface, and wipe the rubber stopper with an alcohol swab.
- Close the flow clamp on the administration set.
- Remove the protective cap from the spike.
- Push the spike through the insertion port, which is located next to the air vent.
- Hang the bottle on the I.V. pole about 36" above the venipuncture site.

**Plastic bag**
When attaching a plastic bag to an administration set, take the following steps:
- Place the bag on a flat, stable surface or hang it on an I.V. pole.
- Remove the protective cap or tear the tab from the tubing insertion port.
- Slide the flow clamp up close to the drip chamber, and close the clamp.
- Remove the protective cap from the spike.
- Hold the port carefully and firmly with one hand, and then quickly insert the spike with your other hand.
- Hang the bag about 36" above the venipuncture site.
Priming the administration set
Before you prime an administration set, label it with the date and time you opened it. Make sure that you have also labeled the container. When priming a set with an electronic infusion device, the procedure is similar to priming other infusion sets. (See Electronic infusion devices.)

Basic training
When priming a basic set, take the following steps:
- Close the roller clamp below the drip chamber.
- Squeeze the drip chamber until it's half full.
- Aim the distal end of the tubing at a receptacle.
- Open the roller clamp, and allow the solution to flow through the tubing to remove the air. (Most distal tube coverings allow the solution to flow without having to remove the protective end.)
- Close the clamp after the solution has run through the line and all the air has been purged from the system.

My sweet add-a-line
Follow the same steps you would use to prime a basic set, along with these additional steps:
- As the solution flows through the tubing, invert the backcheck valves so that the solution can flow into them. Tap the backcheck valve to release any trapped air bubbles.
- Straighten the tubing and continue purging air in the usual manner.

Taking control
To prime a volume-control set, take the following steps:
- Attach the set to the solution container, and close the lower clamp on the I.V. tubing below the drip chamber.
- Open the clamp between the solution container and the fluid chamber, and allow about 50 ml of the solution to flow into the chamber.
- Close the upper clamp.
- Open the lower clamp, and allow the solution in the chamber to flow through the remainder of the tubing. Make sure that some fluid remains in the chamber so that air won’t fill the tubing below it.

Best practice
Electronic infusion devices
An electronic infusion device, such as a pump, helps regulate the rate and volume of infusions, improving the safety and accuracy of drug and fluid administration.

Priming the set
Follow the steps below to prime an infusion set with an electronic infusion device:
1. Fill the drip chamber to the halfway mark.
2. Slowly open the roller clamp.
3. As gravity assists the flow, invert the chambered sections of the tubing to expel the air and fill them with the I.V. fluid or infusate. The chambered sections fit into the pump of the electronic infusion device; they must be filled exactly so they won’t activate the air-in-line alarm during use.
4. Reinvert the pump chamber, continuing to purge the air along the fluid path and out of the tubing.
Close the lower clamp.

Fill the chamber with the desired amount of solution.

**What about a filter?**

If you’re using a filter on any of these sets and it isn’t an integral part of the infusion path, attach it to the primed distal end of the I.V. tubing and follow the manufacturer’s instructions for filling and priming it. Most filters are positioned with the distal end of the tubing facing upward so the solution will wet the filter membrane completely and the line will be purged of all air bubbles.

**Setting up and monitoring an infusion pump**

Infusion pumps help maintain a steady flow of liquid at a set rate over a specified period. After gathering your equipment, follow these steps:

- Attach the pump to the I.V. pole. Insert the administration spike into the I.V. container.
- Fill the drip chamber completely to prevent air bubbles from entering the tubing. To avoid fluid overload, clamp the tubing whenever the pump door is open.
- Follow the manufacturer’s instructions for priming and placing the I.V. tubing.
- Be sure to flush all of the air out of the tubing before connecting it to the patient to lower the risk of an air embolism.
- Place the infusion pump on the same side of the bed as the I.V. setup and the venipuncture site.
- Set the appropriate controls to the desired infusion rate or volume.
- Connect the tubing to the venous access site, watch for infiltration, and monitor the accuracy of the infusion rate.

**Don’t alarm the patient**

Be sure to explain the alarm system to the patient so he isn’t frightened when a change in the infusion rate triggers the alarm. Also, be prepared to disengage the device if infiltration occurs, otherwise the pump may continue to infuse medication in the infiltrated area.
Frequently check the infusion pump to make sure that it’s working properly — specifically, note the flow rate. Monitor the patient for signs of infiltration and other complications such as infection.

Change the tubing

After the equipment is up and running, you’ll also need to change the tubing according to the manufacturer’s instructions and your facility’s policy.

Selecting the insertion site

Here are general suggestions for selecting the vein:
• Keep in mind that the most prominent veins aren’t necessarily the best veins — they’re frequently sclerotic from previous use.
• Never select a vein in an edematous or impaired arm.
• Never select a vein in the arm closest to an area that’s surgically compromised — for example, veins compromised by a mastectomy or placement of dialysis access.
• Never select a vein in the affected arm of a patient following a stroke.
• Select a vein in the nondominant arm or hand when possible.
• For subsequent venipunctures, select sites above the previously used or injured vein.
• Make sure that you rotate access sites.
• Try to avoid areas of flexion.

Commonly used veins

The veins commonly used for placement of venipuncture devices include the metacarpal, cephalic, and basilic veins, along with the branches or accessory branches that merge with them. (See Comparing peripheral venipuncture sites.)

Superficial advice: Try the hand and forearm

Generally, the superficial veins in the dorsum of the hand and forearm offer the best choices. The dorsum of the hand is well supplied with small, superficial veins that can be dilated easily and accommodate a catheter. The dorsum of the forearm has long, straight veins with fairly large diameters, making them convenient sites for introducing the large-bore long catheters used in prolonged I.V. therapy.

Alternatives: Upper arms, legs, feet, and more

Veins of the hand and forearm are suitable for most drugs and solutions. For irritating drugs and solutions with a high osmolarity, the cephalic and basilic veins in the upper arm are more suitable.
Comparing peripheral venipuncture sites

Venipuncture sites located in the hand, forearm, foot, and leg offer various advantages and disadvantages. This chart includes some of the major benefits and drawbacks of common venipuncture sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital veins</strong></td>
<td>• May be used for short-term therapy</td>
<td>• Requires splinting fingers with a tongue blade, which decreases ability to use hand</td>
</tr>
<tr>
<td>Along lateral and dorsal portions of fingers</td>
<td>• May be used when other means aren’t available</td>
<td>• Uncomfortable for patient</td>
</tr>
<tr>
<td></td>
<td>• Easily accessible</td>
<td>• Significant risk of infiltration</td>
</tr>
<tr>
<td></td>
<td>• Lie flat on back of hand; more difficult to dislodge</td>
<td>• Not used if veins in dorsum of hand already used</td>
</tr>
<tr>
<td></td>
<td>• In adult or large child, bones of hand act as splint</td>
<td>• Won’t accommodate large volumes or fast I.V. rates</td>
</tr>
<tr>
<td></td>
<td>• Large vein excellent for venipuncture</td>
<td>• Wrist movement limited unless short catheter is used</td>
</tr>
<tr>
<td></td>
<td>• Readily accepts large-gauge catheters</td>
<td>• Painful insertion likely because of large number of nerve endings in hands</td>
</tr>
<tr>
<td></td>
<td>• Doesn’t impair mobility</td>
<td>• Phlebitis likely at site</td>
</tr>
<tr>
<td></td>
<td>• Doesn’t require an arm board in an older child or adult</td>
<td></td>
</tr>
<tr>
<td><strong>Metacarpal veins</strong></td>
<td>• Large vein excellent for venipuncture</td>
<td>• Some difficulty positioning catheter flush with skin</td>
</tr>
<tr>
<td>On dorsum of hand; formed by union of digital veins between knuckles</td>
<td>• Readily accepts large-gauge catheters</td>
<td>• Discomfort during movement due to location of device at bend of wrist</td>
</tr>
<tr>
<td></td>
<td>• Doesn’t impair mobility</td>
<td>• Danger of radial nerve injury</td>
</tr>
<tr>
<td></td>
<td>• Wrist movement limited unless short catheter is used</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Painful insertion likely because of large number of nerve endings in hands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Phlebitis likely at site</td>
<td></td>
</tr>
<tr>
<td><strong>Accessory cephalic vein</strong></td>
<td>• Large vein excellent for venipuncture</td>
<td>• Some difficulty positioning catheter flush with skin</td>
</tr>
<tr>
<td>Along radial bone as a continuation of metacarpal veins of thumb</td>
<td>• Readily accepts large-gauge catheters</td>
<td>• Discomfort during movement due to location of device at bend of wrist</td>
</tr>
<tr>
<td></td>
<td>• Doesn’t impair mobility</td>
<td>• Danger of radial nerve injury</td>
</tr>
<tr>
<td></td>
<td>• Large vein excellent for venipuncture</td>
<td>• High risk of infiltration in this area</td>
</tr>
<tr>
<td></td>
<td>• Readily accepts large-gauge catheters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Doesn’t impair mobility</td>
<td></td>
</tr>
<tr>
<td><strong>Cephalic vein</strong></td>
<td>• Large vein excellent for venipuncture</td>
<td>• Decreased joint movement due to proximity of device to elbow</td>
</tr>
<tr>
<td>Along radial side of forearm and upper arm</td>
<td>• Readily accepts large-gauge catheters</td>
<td>• Possible difficulty stabilizing vein</td>
</tr>
<tr>
<td></td>
<td>• Doesn’t impair mobility</td>
<td></td>
</tr>
<tr>
<td><strong>Median antebrachial vein</strong></td>
<td>• Holds winged catheters well</td>
<td>• Painful insertion or infiltration damage possible due to large number of nerve endings in area</td>
</tr>
<tr>
<td>Rising from palm and along ulnar side of forearm</td>
<td>• A last resort when no other means are available</td>
<td>• High risk of infiltration in this area</td>
</tr>
<tr>
<td><strong>Basilic vein</strong></td>
<td>• Straight, strong vein suitable for venipuncture</td>
<td>• Inconvenient position for patient during insertion</td>
</tr>
<tr>
<td>Along ulnar side of forearm and upper arm</td>
<td>• Takes large-gauge catheter easily</td>
<td>• Painful insertion due to penetration of dermal layer of skin where nerve endings are located</td>
</tr>
<tr>
<td></td>
<td>• Straight, strong vein suitable for venipuncture</td>
<td>• Possible difficulty stabilizing vein</td>
</tr>
</tbody>
</table>

(continued)
When leg or foot veins must be used, the saphenous vein of the inner aspect of the ankle and the veins of the dorsal foot network are best—but only as an absolute last resort. Venous access in the lower extremities can cause thrombophlebitis. In infants younger than age 6 months, scalp veins are commonly used. Veins in the feet are commonly used in nonambulatory children and infants. In neonates, the umbilical veins may be accessed; for example, in an emergency situation.

The lowdown on the upper arm

An upper arm vein may seem like an excellent site for a venous access device—it's comfortable for the patient and reasonably safe from accidental dislodging. Even so, it has a serious drawback. When an upper arm vein has a venous access device in place, the use of sites distal to the upper arm is compromised. Moreover, upper arm veins can be difficult to locate in obese patients and in those with shorter arms such as pediatric patients.

You aren't an artery, are you?

Before choosing a vein as an I.V. site, make sure that it's actually a vein—not an artery. Arteries are located deep in soft tissue and muscles; veins are superficial. Arteries contain bright red blood that flows away from the heart; veins contain dark red blood that flows toward the heart.

<table>
<thead>
<tr>
<th>Site</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antecubital veins</td>
<td>• Large vein; facilitates drawing blood</td>
<td>• Difficult to splint elbow area with arm board</td>
</tr>
<tr>
<td></td>
<td>• Commonly visible or palpable in children when other veins won't dilate</td>
<td>• Veins may be small and scarred if blood has been drawn frequently from this site</td>
</tr>
<tr>
<td></td>
<td>• May be used in an emergency or as a last resort</td>
<td></td>
</tr>
<tr>
<td>Dorsal venous network</td>
<td>• Suitable for infants and toddlers</td>
<td>• Difficult to see or find vein if edema is present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Difficult to walk with device in place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increased risk of deep vein thrombosis</td>
</tr>
<tr>
<td>Scalp veins</td>
<td>• Suitable for infants</td>
<td>• Difficult to stabilize</td>
</tr>
<tr>
<td></td>
<td>• Commonly visible and palpable in infants</td>
<td>• May require clipping hair at site</td>
</tr>
<tr>
<td></td>
<td>• May be used as a last resort</td>
<td>• Increased infiltration risk due to vein fragility</td>
</tr>
</tbody>
</table>

Comparing peripheral venipuncture sites (continued)
PREPARING FOR VENIPUNCTURE AND INFUSION

A single artery supplies a large area; many veins supply and remove blood from the same area. If you puncture an artery (which is difficult to do because of the artery’s depth), the blood pulsates from the site; if you puncture a vein, the blood flows slowly. (See Reviewing skin and vein anatomy, page 50.)

Avoid valves

All veins have valves, but they’re usually apparent only in long, straight arm veins or in large, well-developed veins that have good tone. If the tip of the venous access device terminates near a valve, the flow rate may be affected. Look for a vein that’s straight and smooth for about 1” (2.5 cm). Sclerosed valves appear as painless knots within veins. Insert the venous access device above the knot.

Selection guidelines

When selecting an I.V. site, choose distal veins first, unless the solution is very irritating (for example, potassium chloride). Generally, your best choice is a peripheral vein that’s full and pliable and appears long enough to accommodate the length of the intended catheter (about 1”). It should be large enough to allow blood flow around the catheter to minimize venous lumen irritation. If the patient has an area that’s bruised, tender, or phlebitic, choose a vein proximal to it. Avoid flexion areas, such as the wrist and antecubital fossa.

Refrain from these veins

Some veins are best to avoid, including those in:
• legs (Circulation may be easily compromised.)
• inner wrist and arm (They’re small and uncomfortable for the patient.)
• affected arm of a mastectomy patient
• arm with an arteriovenous shunt or fistula
• arm being treated for thrombosis or cellulitis
• arm that has experienced trauma (such as burns or scarring from surgery).

How long?

The size and health (tone) of the vein help determine how long the venous access device can remain in place before irritation develops. However, the key to determining how long the venous access device will remain functional is the effect of the fluid or drug on the vein. Drugs and solutions with high osmolality and high or low pH will cause vein irritation sooner. Concentrated solutions of drugs and rapid infusion rates can also affect how long the I.V. site remains symptom-free.
Reviewing skin and vein anatomy

Understanding the anatomy of skin and veins can help you locate appropriate venipuncture sites and perform venipunctures with minimal patient discomfort.

Layers of the skin

Epidermis
- Top layer that forms a protective covering for the dermis
- Varied thickness in different parts of the body — usually thickest on palms of hands and soles of feet, thinnest on inner surface of limbs
- Varied thickness depending on age; possibly thin in elderly people
- Contains about 25 layers of cells with bacteria located in the top 5 layers

Dermis
- Highly sensitive and vascular because it contains many capillaries
- Location of thousands of nerves, which react to temperature, touch, pressure, and pain
- Varied number of nerve fibers throughout the body, some I.V. sites more painful than others (for example, the inner aspect of the wrist is more painful than the dorsum of the hand or the forearm)

Subcutaneous tissue
- Located below the two layers of skin
- Site of superficial veins
- Varied thickness that loosely covers muscles and tendons
- Potential site of cellulitis if strict aseptic technique isn’t observed during venipuncture and care of I.V. site

Layers of veins

Tunica intima (inner layer)
- Inner elastic endothelial lining made up of layers of smooth, flat cells, which allow blood cells and platelets to flow smoothly through the blood vessels (unnecessary movement of the venous access device may scratch or roughen this inner surface, causing thrombus formation)
- Valves in this layer located in the semilunar folds of the endothelium (valves prevent backflow and ensure that blood flows toward the heart)

Tunica media (middle layer)
- Muscular and elastic tissue
- Location of vasoconstrictor and vasodilator nerve fibers that stimulate the veins to contract and relax (these fibers are responsible for venous spasm that can occur as the result of anxiety or infusion of I.V. fluids that are too cold)

Tunica adventitia (outer layer)
- Connective tissue that surrounds and supports the vessel and holds it together
- Reduced thickness and amount of connective tissue with age, resulting in fragile veins
Selecting the venous access device

Basically, you should select the device with the shortest length and the smallest diameter that allows for proper administration of the therapy. Other considerations include:

- length of therapy or time the device will stay in place
- type of therapy
- type of procedure or surgery to be performed
- patient’s age and activity level
- type of solution used (blood, for instance, will require a larger-gauge device)
- condition of veins.

Venous access devices

The two most commonly used devices are plastic catheter sets and winged-set type infusion sets. As a rule, plastic catheters allow more patient movement and activity and are less prone to infiltration than winged-set type infusion sets. However, they’re more difficult to insert. (See Comparing basic venous access devices, page 52.)

Let’s go over this needle

An over-the-needle catheter is the most commonly used device for peripheral I.V. therapy. It consists of a plastic outer tube and an inner needle that extends just beyond the catheter. It’s available in lengths of ¾” to 3”, with gauges ranging from 14 to 26. Longer-length models, used mainly in the operating room, are for insertion into a deep vein. (See Guide to needle and catheter gauges, page 53.)

The needle is removed after insertion, leaving the catheter in place. Typically, you should change an over-the-needle catheter every 2 to 3 days, depending on your facility’s policy and procedures. If a patient has poor venous access and therapy is to be continued indefinitely, consult with the practitioner about line placement alternatives.

Taking wing

Winged-set type infusion sets have flexible wings you can grasp when inserting the device. When the device is in place, the wings lie flat and can be taped to the surrounding skin.

Winged-set type infusion sets have short, small-bore tubing between the catheter and hub. The catheter stays in place after the needle is removed. This type of catheter is available in a ¾” length for wider gauges. It’s especially useful for hard veins and for insertion in an elderly patient or child.
Comparing basic venous access devices

Use the chart below to compare the two major types of venous access devices. To improve I.V. therapy and guard against accidental needlesticks, you should use a needle-free system and a shielded or retracting peripheral I.V. catheter.

**Over-the-needle catheter**

*Purpose*
- Long-term therapy for the active or agitated patient

*Advantages*
- Inadvertent puncture of vein less likely than with a winged-set type infusion set
- More comfortable for the patient
- Radiopaque thread for easy location
- Safety needles that prevent accidental needlesticks
- Activity-restricting device, such as arm board, rarely required

*Disadvantages*
- Difficult to insert
- Extra care required to ensure that needle and catheter are inserted into vein

**Winged-set type**

*Purpose*
- Short-term therapy for cooperative adult patient
- Therapy of any duration for an infant or child or for an elderly patient with fragile or sclerotic veins

*Advantages*
- Easiest intravascular device to insert because needle is thin-walled and extremely sharp
- Ideal for nonirritating I.V. push drugs

*Disadvantage*
- Infiltration easily caused if rigid needle winged infusion device is used
An intermittent adaptation

Any venous access device that includes a catheter can be made into an intermittent infusion device by placing an access cap over the catheter’s adapter end. These caps are commonly called “locks,” and a saline solution is flushed into them to keep the device patent. The cap is a luer-locking attachment or add-on. Intermittent venous access devices should be flushed with saline solution before and after each use, at least once per day, or according to the facility’s policy and procedures.

Guide to needle and catheter gauges

How do you know which gauge needle and catheter to use for your patient? The answer depends on the patient’s age, his condition, and the type of infusion he’s receiving. This chart lists the uses and nursing considerations for various gauges.

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Uses</th>
<th>Nursing considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>• Adolescents and adults&lt;br&gt;• Major surgery&lt;br&gt;• Trauma&lt;br&gt;• Whenever large amounts of fluids must be infused rapidly</td>
<td>• Painful insertion&lt;br&gt;• Requires large vein</td>
</tr>
<tr>
<td>18</td>
<td>• Older children, adolescents, and adults&lt;br&gt;• Administration of blood and blood components and other viscous infusions&lt;br&gt;• Routinely used preoperatively</td>
<td>• Painful insertion&lt;br&gt;• Requires large vein</td>
</tr>
<tr>
<td>20</td>
<td>• Children, adolescents, and adults&lt;br&gt;• Suitable for most I.V. infusions, blood, blood components, and other viscous infusions</td>
<td>• Commonly used</td>
</tr>
<tr>
<td>22</td>
<td>• Toddlers, children, adolescents, and adults (especially elderly)&lt;br&gt;• Suitable for most I.V. infusions</td>
<td>• Easier to insert into small veins&lt;br&gt;• Commonly used for most infusions</td>
</tr>
<tr>
<td>24, 26</td>
<td>• Neonates, infants, toddlers, school-age children, adolescents, and adults (especially elderly)&lt;br&gt;• Suitable for most infusions, but flow rates are slower</td>
<td>• For extremely small veins—for example, small veins of fingers or veins of inner arms in elderly patients&lt;br&gt;• Possible difficulty inserting into tough skin</td>
</tr>
</tbody>
</table>

PREPARING FOR VENIPUNCTURE AND INFUSION
Performing venipuncture

To perform a venipuncture, you need to dilate the vein, prepare the access site, and insert the device. After the infusion starts, you can complete the I.V. placement by securing the device with tape or a transparent semipermeable dressing.

Dilating the vein

To dilate or distend a vein effectively, you may need to use a tourniquet, which traps blood in the veins by applying enough pressure to impede venous flow. A properly distended vein should appear and feel round, firm, and fully filled with blood as well as rebound when gently compressed. Because the amount of trapped blood depends on circulation, a patient who’s hypotensive, very cold, or experiencing vasomotor changes (such as septic shock) may have inadequate filling of the peripheral blood vessels.

Pretourniquet prep

Before applying the tourniquet, place the patient’s arm in a dependent position to increase capillary flow to the lower arm and hand. If his skin is cold, warm it by rubbing and stroking his arm or by covering the entire arm with warm moist towels for 5 to 10 minutes. As soon as you remove the warm towels, apply the tourniquet and continue to perform the insertion procedure.

Applying a tourniquet

The ideal tourniquet is one that can be secured easily, doesn’t roll into a thin band, stays relatively flat, and releases easily. The most common type is a soft rubber band about 2 1/2 (5 cm) wide. (To tie a tourniquet, follow the steps outlined in Applying a tourniquet, page 55.)

Intend to distend

After you have applied the tourniquet about 6” to 8” (15 to 20 cm) above the intended site, have the patient open and close his fist tightly four to six times to distend the vein. If necessary, gently flick the skin over the vein with one or two short taps of your forefinger. This is less traumatic than slapping the skin, but it achieves the same result. If the vein still feels small and uniform, release the tourniquet, reapply it, and reassess the intended access site. If the vein still isn’t well distended, remove the tourniquet; apply a warm, moist towel for 5 minutes; then reapply the tourniquet. This step is especially helpful if the patient’s skin feels cool.
PERFORMING VENIPUNCTURE

**Best practice**

**Applying a tourniquet**

To safely apply a tourniquet, follow these steps:

1. Place the tourniquet under the patient’s arm, about 6” (15 cm) above the venipuncture site.
2. Position the arm on the middle of the tourniquet.
3. Bring the ends of the tourniquet together, placing one on top of the other.
4. Holding one end on top of the other, lift and stretch the tourniquet and tuck the top tail under the bottom tail. Don’t allow the tourniquet to loosen.
5. Tie the tourniquet smoothly and snugly; be careful not to pinch the patient’s skin or pull his arm hair.

**No more than 2 minutes**

Leave the tourniquet in place for no more than 2 minutes. If you can’t find a suitable vein and prepare the venipuncture site in this amount of time, release the tourniquet for a few minutes. Then reapply it and continue the procedure. You may need to apply the tourniquet, find the vein, remove the tourniquet, prepare the site, and then reapply the tourniquet for the venipuncture.

**As flat as possible**

Keep the tourniquet as flat as possible. It should be snug but not uncomfortably tight. If it’s too tight, it will impede arterial as well as venous blood flow. Check the patient’s radial pulse. If you can’t feel it, the tourniquet is too tight and must be loosened. Also loosen and reapply the tourniquet if the patient complains of severe tightness.

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**Top tourniquet technique**

A tourniquet that’s kept in place too long or is applied too tightly may cause increased bruising, especially in elderly patients whose veins are fragile. Release the tourniquet as soon as you have placed the venous access device in the vein. You’ll know the device is in the vein when you see blood in the flashback chamber.

**Infection control**

For infection control reasons, tourniquets should be discarded after use on one patient. When available, use latex-free tourniquets to reduce the chance of an allergic reaction.

**Preparing the access site**

Before performing the venipuncture, you’ll need to clean the site and stabilize the vein; you may also need to administer a local anesthetic.
Cleaning the venipuncture site

Wash your hands and then put on gloves. If necessary, clip the hair over the insertion site to make the veins and the site easier to see and reduce pain when the tape is removed. Avoid shaving the patient because it can cause microabrasion of the skin, which increases the risk of infection.

Clean the skin with 2% chlorhexidine. Using a swab, start at the center of the insertion site and move outward in a back-and-forth motion. Be careful not to go over an area you have already cleaned. Allow the solution to dry thoroughly.

Using a local anesthetic

If an anesthetic is ordered, first check with the patient and review his record for an allergy to lidocaine, iodine, or other drugs. Then describe the procedure to him and explain that it will reduce the discomfort of the venipuncture.

Next, administer the local anesthetic as ordered. The anesthetic will begin to work in 2 to 3 seconds. Lidocaine anesthetizes the site to pain but allows the patient to feel touch and pressure. Also, normal saline solution has proven effective. (See Administering a local anesthetic, page 57.)

Creaming the pain

Transdermal analgesic cream may also be used before accessing a peripheral vein. Like injectable anesthetics, transdermal analgesic cream reduces pain, but the patient still feels pressure and touch. To be effective, a transdermal analgesic cream should be applied at least 30 minutes before insertion of the venous access device. The cream form is a good choice for anesthetizing I.V. sites in children.

It’s electric

Another option is to use iontophoresis, a technique that delivers dermal analgesia in 10 to 20 minutes with minimal discomfort and without distorting the tissue. A handheld device with two electrodes uses a mild electric current to deliver charged ions of lidocaine 2% and epinephrine 1:100,000 solution into the skin. Because iontophoresis acts quickly, it’s an excellent choice for numbing an I.V. injection site in a child.
PERFORMING VENIPUNCTURE

Stabilizing the vein

Stabilizing the vein helps ensure a successful venipuncture the first time and decreases the chance of bruising. If the tip of the venous access device repeatedly probes a moving vein wall, it can nick the vein and cause it to leak blood. When a vein gets nicked, it can’t be reused immediately and a new venipuncture site must be found. Thus, the patient will experience the discomfort of another needle puncture.

Hold still, vein

To stabilize the vein, stretch the skin and hold it taut, and then lightly press it with your fingertips about 1 1/2” (3.5 cm) from the insertion site. (Never touch the prepared site or you’ll recontaminate it.) The vein should feel round, firm, fully engorged, and resilient. Remove your fingertips. If the vein returns to its original position and appears larger than it did before you applied the tourniquet, it’s adequately distended.
To help prevent the vein from “rolling,” apply adequate traction with your nondominant hand to hold the skin and vein in place. This traction is particularly helpful in those with poor skin turgor or loosely anchored veins. (See How to stabilize veins, page 59.)

Insertion

Once you’ve prepared the venipuncture site, you’re ready to insert the venous access device. The process involves two steps: inserting and advancing.

Inserting the venous access device

While still wearing gloves, grasp the plastic hub with your dominant hand, remove the cover, and examine the device. If the edge isn’t smooth, discard the device and obtain another.

You need-to know this

Tell the patient that you’re about to insert the device. Ask him to remain still and to refrain from pulling away. Explain that the initial needle stick will hurt but will quickly subside. Then insert the device, using the direct approach.

Steady and direct

Keeping the bevel up, enter the skin directly over the vein at a 5- to 15-degree angle. (Deeper veins require a wider angle.) Make sure to use a steady, smooth motion while keeping the skin taut. As soon as the device enters the vein, lower the distal portion of the adapter until it’s almost parallel with the skin. Doing so lifts the tip of the needle so it doesn’t penetrate the opposite wall of the vein. Then advance the device to at least half its length, at which point you should see blood in the flashback chamber, indicating that you’re in the vein. (You may not see a rapid blood return with a small vein.)

We’re in!

Sometimes you’ll feel a “pop” or a sense of release when the device enters the vein. However, this usually occurs only when a venous access device enters a large, thick-walled vein or when the patient has good tissue tone. You’ll know for sure that the device is in the vein when you see a blood return in the flashback chamber.
How to stabilize veins

To help ensure successful venipuncture, you need to stabilize the patient’s vein by stretching the skin and holding it taut. The stretching technique you’ll use varies with the venipuncture site. This chart lists the various venipuncture sites along with a description of the stretching technique used for each.

<table>
<thead>
<tr>
<th>Vein</th>
<th>Stretching technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacarpal (hand) veins</td>
<td>Stretch the patient’s hand and wrist downward, and hold the skin taut with your thumb.</td>
</tr>
<tr>
<td>Cephalic vein above wrist</td>
<td>Stretch the patient’s fist laterally downward, and immobilize the skin with the thumb of your other hand.</td>
</tr>
<tr>
<td>Basilic vein at outer arm</td>
<td>Have the patient flex his elbow. While standing behind the flexed arm, retract the skin away from the site, and anchor the vein with your thumb. As an alternative, rotate the patient’s extended lower arm inward, and approach the vein from behind the arm. (This position may be difficult for the patient to maintain.)</td>
</tr>
<tr>
<td>Inner aspect of wrist</td>
<td>Extend the patient’s open hand backward from the wrist. Anchor the vein with your thumb below the insertion site.</td>
</tr>
<tr>
<td>Inner arm</td>
<td>Anchor the vein with your thumb above the wrist.</td>
</tr>
<tr>
<td>Antecubital fossa</td>
<td>Have the patient extend his arm completely. Anchor the skin with your thumb, about 2” to 3” (5 to 7.5 cm) below the antecubital fossa.</td>
</tr>
<tr>
<td>Saphenous vein of ankle</td>
<td>Extend the patient’s foot downward and inward. Anchor the vein with your thumb, about 2” to 3” below the ankle.</td>
</tr>
<tr>
<td>Dorsum of foot</td>
<td>Pull the patient’s foot downward. Anchor the vein with your thumb, about 2” to 3” below the vein (usually near the toes).</td>
</tr>
<tr>
<td>Scalp</td>
<td>Hold the skin taut with your thumb and forefinger.</td>
</tr>
</tbody>
</table>

Don’t wing it, follow these steps... 

If you’re using a winged-set type infusion set, hold the edges of the wings between your thumb and forefinger, with the bevel facing upward. Then squeeze the wings together. Remove the protective cover from the needle, being careful not to contaminate the needle or the catheter. Then insert the device in the same manner as a standard I.V. catheter.
Advancing the venous access device

To advance the catheter before starting the infusion, first release the tourniquet. While stabilizing the vein with one hand, use the other to advance the catheter up to the hub. Be sure to advance only the catheter to avoid puncturing the vein with the needle. Next, remove the inner needle. Apply digital pressure to the catheter (to minimize blood exposure) and, using aseptic technique, attach the primed I.V. tubing or flush the inserted device with saline solution. The advantage of this method is that it usually results in less blood being spilled.

In the midst of infusion

To advance the catheter while infusing the I.V. solution, release the tourniquet and remove the inner needle. Using aseptic technique, attach the I.V. tubing and begin the infusion. While stabilizing the vein with one hand, use the other to advance the catheter into the vein. When the catheter is advanced, slow the I.V. flow rate. The advantage of using this method for advancing the catheter is that it reduces the risk of puncturing the vein wall because the catheter is advanced without the needle and the rapid flow dilates the vein. However, this method increases the risk of infection. A winged-set type infusion set is advanced using the same method.

Wrapping it up

After the venous access device has been successfully inserted, secure the device using a commercial catheter securement device or sterile tape or sterile surgical strips. Dispose of the inner needle in a nonpermeable receptacle. Finally, regulate the flow rate, and then remove your gloves and wash your hands.

Intermittent infusion device

Also called a saline lock, an intermittent infusion device may be used when venous access must be maintained for intermittent use and a continuous infusion isn’t necessary. This device keeps the access device sterile and prevents blood and other fluids from leaking from an open end. Much like the administration set injection port, the intermittent injection cap is self-sealing after the needle or needleless injector is removed. The ends of these devices are universal in size and fit the female end of any catheter or tubing designed for infusion therapy. Caps should have a luer-lock design to prevent disconnections.
Continuous infusion not required
The intermittent infusion device can be flushed with diluted saline solution to expel air from the equipment. Doing so makes it possible to maintain venous access in patients who must receive I.V. medications regularly or intermittently but don’t require continuous infusion.

Less means more
The intermittent infusion device has many benefits. It minimizes the risks of fluid overload and electrolyte imbalance that may be associated with a keep-vein-open infusion. By eliminating the continuous use of I.V. solution containers and administration sets, it reduces the risk of contamination and lowers costs. Finally, it allows for patient mobility, which helps reduce anxiety.

Flush before and after
Occlusion is possible if the device isn’t flushed to ensure patency before and after medication is infused.

Two tips
Here are two tips related to intermittent infusion devices:

If the patient feels a burning sensation as you inject the saline solution, stop the injection and check the catheter place-

From continuous to intermittent
The male adapter plug shown below allows you to convert an existing I.V. line into an intermittent infusion device.

To make the conversion:
1. Prime the male adapter plug with saline solution.
2. Clamp the I.V. tubing and remove the administration set from the catheter or needle hub.
3. Insert a male adapter plug.
4. Flush the access with the remaining solution to prevent occlusion.

The male luer-lock adapter plug twists into place.
ment. If it’s in the vein, inject the solution at a slower rate to minimize irritation.

If the practitioner orders discontinuation of an I.V. infusion, you can convert the existing line from a continuous to an intermittent venous access device. Just disconnect the I.V. tubing and insert an adapter plug into the device that’s already in place. (See From continuous to intermittent, page 61.)

Insertion into deep veins

If a superficial vein isn’t available, you may have to insert the venous access device into a deep vein that isn’t visible. Here’s how. First, put on gloves. Then palpate the area with your fingertips until you feel the vein. Next, clean the skin over the vein with chlorhexidine, using a back-and-forth motion. Then aim the device directly over the intended vein, stretch the skin with your gloved fingertips, and insert the venous access device at a 15-degree angle to the skin.

Making sure

Expect to insert the device one-half to two-thirds its length; that way you’ll make sure that the needle and the catheter are in the vein lumen. When you see blood in the flashback chamber, remove the tourniquet and inner needle and advance the catheter with or without infusing fluid.

Take this sample

To smoothly and safely collect a blood sample, follow these step-by-step techniques after assembling your equipment and making the venipuncture:

- Place a pad underneath the site to protect the bed linens.
- When the venous access device is correctly placed, remove the inner needle.
- Leave the tourniquet tied.
- Attach the syringe to the venous access device’s hub, and withdraw the appropriate amount of blood.
- Release the tourniquet and disconnect the syringe.
- Quickly attach the saline lock or I.V. tubing, regulate the flow rate, and stabilize the device.
- Attach a needleless device to the syringe, and transfer the blood into the laboratory tubes.
- Properly dispose of the equipment, and then complete I.V. catheter placement.
Collecting a blood sample
If a blood sample is ordered, you can collect it while performing the venipuncture. First, gather the necessary equipment: one or more laboratory tubes, an appropriate-size syringe without a needle, a needleless device, and a protective pad. Then follow the steps outlined in Take this sample. The Infusion Nurses Society and the Centers for Disease Control and Prevention recommend only drawing a blood sample from an I.V. catheter when it’s inserted, not at any other time.

Securing the venous access device
After the infusion begins, secure the venous access device at the insertion site using a catheter securement device, sterile tape or sterile surgical strips, or a transparent semipermeable dressing. A stretch net or an arm board may also be used.

Applying a catheter securement device
A catheter securement device decreases the risk of infiltration, phlebitis, and I.V. line dislodgment. After inserting the venous access device, use an alcohol pad to wipe the skin near the insertion site. Place an adhesive strip, which usually comes with the device, over the catheter hub. Then apply a skin preparation solution and let it dry. Place the device under the luer lock of the venous access device and press it into place. A catheter securement device should be changed as often as the I.V. site, or every 7 days.

Applying tape
Stabilize the device and keep the hub from moving by using a standard taping method, such as the chevron, U, or H method. (See Taping techniques.)

Taping technique
Use as little tape as possible, and don't let the tape ends meet. Doing so reduces the risk of a tourniquet effect if infiltration occurs. Clip any hair from around the access area. Besides improving visibility and reducing pain when the tape is removed, clipping hair helps decrease colonization by bacteria present on the hair. Don’t let the tape cover the patient’s skin too far beyond the infusion device’s entry site because it could obscure swelling and redness, signs of impending complications.
Taping techniques
If you use sterile tape to secure the venous access device to the insertion site, use one of these methods.

Chevron method
1. Cut a long strip of ½” tape. Place it sticky side up under the hub.
2. Cross the ends of the tape over the hub, and secure the tape to the patient’s skin on the opposite sides of the hub, as shown at left.
3. Apply a piece of 1” tape across the two wings of the chevron. Loop the tubing and secure it with another piece of 1” tape. Once a dressing is secured, apply a label. On the label, write the date and time of insertion, type and gauge of the needle, and your initials.

U method
1. Cut a strip of ½” tape. With the sticky side up, place it under the hub of the catheter.
2. Bring each side of the tape up, folding it over the wings of the catheter, as shown at left. Press it down, parallel to the hub.
3. Next, apply tape to stabilize the catheter. After a dressing is secured, apply a label. On the label, write the date and time of insertion, type and gauge of the catheter, and your initials.

H method
1. Cut three strips of ½” tape.
2. Place one strip of tape over each wing, keeping the tape parallel to the catheter.
3. Place the third strip of tape perpendicular to the first two, as shown at left. Put the tape directly on top of the wings. Make sure that the catheter is secure, and then apply a dressing and label. On the label, write the date and time of insertion, type and gauge of the catheter, and your initials.
Tale of the tape

If the patient has had a previous sensitivity reaction to tape, use a nonallergenic tape, preferably one that's lightweight and easy to remove. Paper tape usually isn't satisfactory for I.V. sites because it shreds and is difficult to remove after prolonged contact with skin and body heat.

Applying a transparent dressing

To prevent infection, nurses in many health care facilities cover the insertion site with a transparent, semipermeable dressing. This dressing allows air to pass through but is impervious to microorganisms. (For instructions, see How to apply a transparent semipermeable dressing.)

The benefits are transparent

If this dressing remains intact, daily changes aren't necessary. Other advantages include fewer skin reactions and a clearly visible insertion site (especially helpful in detecting early signs of phlebitis and infiltration). The dressing is waterproof, so it protects the site.

Best practice

How to apply a transparent semipermeable dressing

Here's how to apply a transparent semipermeable dressing, which allows for visual assessment of the catheter insertion site:

• Make sure the insertion site is clean and dry.
• Remove the dressing from the package and, using aseptic technique, remove the protective seal. Avoid touching the sterile surface.
• Place the dressing directly over the insertion site and the hub, as shown. Don’t cover the tubing. Also, don’t stretch the dressing; doing so may cause itching.
• Tuck the dressing around and under the catheter hub to make the site occlusive to microorganisms.

Grasp, lift, stretch
To remove the dressing, grasp one corner, stabilize the catheter, and then lift and stretch.
from contamination if it gets wet. In addition, because the dressing adheres well to the skin, the venous access device is less likely to accidentally dislodge.

Using a stretch net
You can make the venous access device more secure by applying a stretch net to the affected limb. (If you'll be using the net on the patient's hand, cut a hole in the net sleeve for his thumb.) The net reduces the risk of accidental dislodgment, especially with patients who are confused or very active, and cuts down on the amount of tape needed to prevent dislodgment, which works particularly well for children.

Using an arm board
An arm board is an immobilization device that helps secure correct venous access device positioning and prevent unnecessary motion that could cause infiltration or inflammation. This immobilization device is sometimes necessary when the insertion site is near a joint or in the dorsum of the hand. An arm board may be used with a restraint in certain situations (for example, if the patient is confused or disoriented).

Arms restrictions
Because it's an immobilization device, the use of an arm board may be restricted by state or facility policies — so check first. Better yet, don't place the tip of the infusion device in a flexion area. Then you won't need an arm board.

The range-of-motion test
To determine whether an arm board is called for, move the patient's arm through its full range of motion (ROM) while watching the I.V. flow rate. If the flow stops during movement, you may need to use the arm board to prevent flexion of the extremity. Choose one that's long enough to prevent flexion and extension at the tip of the device. If necessary, cover it with a soft material before you secure it to the patient's arm. Make sure that you can still observe the insertion site.

Keep in mind that an arm board applied too tightly can cause nerve and tendon damage. If you need to use an arm board, remove it periodically according to facility policy so the patient can perform ROM activities and you can better observe for complications from restricted activity and infusion therapy.
Documenting the venipuncture

When you start an I.V. line, be sure to document:
• date and time of the venipuncture
• number of the solution container (if required by facility policy and procedures)
• type and amount of solution
• name and dosage of additives in the solution
• type of venipuncture device used, including length and gauge
• venipuncture site
• number of insertion attempts, if more than one
• flow rate
• adverse reactions and the actions taken to correct them
• patient teaching and evidence of patient understanding
• name of the person initiating the infusion.

Remember to document this information in all areas required by your facility’s policy, such as the progress notes, intake and output flow sheets, the patient’s chart, and medication sheets.

Maintaining peripheral I.V. therapy

After the I.V. infusion starts, focus on maintaining therapy and preventing complications. Doing so involves routine and special care measures as well as discontinuing the infusion when therapy is completed. Also, you should be prepared to meet the special needs of pediatric, elderly, and home care patients who require I.V. therapy.

Routine care

Routine care measures help prevent complications. They also give you an opportunity to observe the I.V. site for signs of inflammation or infection — two of the most common complications. Perform these measures according to your facility’s policy and procedures. Wash your hands and wear gloves whenever you work near the venipuncture site.

Changing the dressing

The insertion site should be inspected and palpated for tenderness daily, through the intact dressing.
Time to change

Depending on your facility’s policy, gauze dressings should be changed routinely every 48 hours. A transparent semipermeable dressing should be changed whenever its integrity is compromised because it has become soiled, wet, or loose or every 7 days.

Getting ready

Before performing a dressing change, gather this equipment:
- alcohol swab or other approved solution
- catheter securement device, sterile tape, or sterile surgical strips
- transparent semipermeable dressing
- sterile gloves.

To change a dressing, follow the steps outlined in Changing a peripheral I.V. dressing. Of course, use aseptic technique.

Changing the I.V. solution

To avoid microbial growth, don’t allow an I.V. container to hang for more than 24 hours. Before changing the I.V. container, check the new one for cracks, leaks, and other damage. Also check the solution for discoloration, turbidity, and particulates. Note the date and time the solution was mixed and the expiration date.

Changing a peripheral I.V. dressing

To change a peripheral I.V. dressing, follow these steps:

- Wash your hands and put on sterile gloves.
- Hold the catheter in place with your nondominant hand to prevent movement or dislodgment that could lead to infiltration; then gently remove the tape and the dressing.
- Assess the venipuncture site for signs of infection (redness and tenderness), infiltration (coolness, blanching, edema), and thrombophlebitis (redness, firmness, pain along the path of the vein, edema).
- If you detect these signs, apply pressure to the area with a sterile gauze pad and remove the catheter. Maintain pressure on the area until the bleeding stops, and then apply an adhesive bandage. Using new equipment, insert the I.V. access device at another site.
- If you don’t detect complications, hold the catheter at the hub and carefully clean around the site with an alcohol swab or other approved solution. Work in a swiping motion to avoid introducing pathogens into the cleaned area. Allow the area to dry completely.
- Resecure the device and apply a transparent semipermeable dressing.
**Cleanliness is key**

After washing your hands, clamp the line, remove the spike from the old container, and quickly insert the spike into the new one. Then hang the new container and adjust the flow rate as prescribed.

**Changing the administration set**

Change the administration set according to your facility’s policy (usually every 72 hours if it’s a primary infusion line) and whenever you note or suspect contamination. If possible, change the set when you start a new venous access device during routine site rotation.

**Getting equipped again**

Before changing the set, gather:

- I.V. administration set
- sterile 2" x 2" gauze pad
- adhesive tape for labeling or appropriate labeling tapes supplied by your facility
- gloves.

Then follow the guidelines set out in *A change in administration*.

---

**A change in administration**

To quickly change the administration set for a peripheral infusion, follow these steps:

1. Wash your hands and put on gloves.
2. Reduce the I.V. flow rate. Then remove the old spike from the container, and place the cover of the new spike over it loosely.
3. Keeping the old spike upright and above the patient’s heart level, insert the new spike into the I.V. container and prime the system.
4. Place a sterile gauze pad under the hub of the plastic catheter to create a sterile field.
5. Disconnect the old tubing from the venous access device, being careful not to dislodge or move the device. If you have trouble disconnecting the old tubing, try one of these techniques: Use a pair of hemostats to hold the hub securely while twisting and removing the end of the tubing, or grasp the venous access device with one pair of hemostats and the hard plastic of the luer-lock end of the administration set with another pair and pull the hemostats in opposite directions. *Don’t clamp the hemostats shut; this may crack the tubing adapter or the venous access device.*
6. Using aseptic technique, quickly attach the new primed tubing to the device.
7. Adjust the flow to the prescribed rate.
8. Label the new tubing with the date and time of the change.
Changing the I.V. site
As a standard of care, rotate the I.V. site every 72 hours, according to facility policy. Sometimes, limited venous access will prevent you from changing sites this often. If that's the case, notify the practitioner of the situation and discuss alternatives for long-term insertion.

A complete change may be in order
Be prepared to change the entire system, including the venous access device, if you detect signs of thrombophlebitis, cellulitis, or I.V. therapy-related bacteremia.

Documentation
Record dressing, tubing, and solution changes, and note the condition of the venipuncture site. If you obtain a blood sample for culture and sensitivity testing, record the date and time and the practitioner's name.

Special care procedures
In addition to your routine care procedures, be prepared to handle special situations such as administering additive infusions. Also, when peripheral venous access is no longer possible, you may need to assist the practitioner with other venous access interventions such as insertion of a central line.

Additive infusions
To piggyback an I.V. drug into a primary line, use an add-a-line administration set. To infuse two compatible solutions simultaneously, connect an administration set with an attached needleless access catheter to the secondary solution container and prime the tubing. Hang the container at the same level as the primary solution.

“Y” marks the site
Next, clean a Y-site in the lower part of the primary tubing using an alcohol swab. Attach the secondary infusion set to the Y-site and secure it. Adjust each infusion rate independently. Remember that, with this setup, you may not have a backcheck valve above the Y-site, so one solution may flow back into the other.

Complications of therapy
Complications of peripheral I.V. therapy can arise from the venous access device, the infusion, or the medication being administered and can be local or systemic.
Local trouble? It may become systemwide...

Local complications include:
- infiltration
- phlebitis
- cellulitis
- catheter dislodgment (extravasation)
- occlusion
- vein irritation or pain at the I.V. site
- severed or fractured catheter
- hematoma
- venous spasm
- vasovagal reaction
- thrombosis
- thrombophlebitis
- nerve, tendon, or ligament damage.

Systemic complications include air embolism and allergic reactions. A complication may begin locally and become systemic—as when an infection at the venipuncture site progresses to septicemia. (For a complete description of local and systemic complications, see *Risks of peripheral I.V. therapy*, pages 73 to 77.)

Infiltrated!

Perhaps the greatest threat to a patient receiving I.V. therapy is infiltration (infused fluid leaking into the surrounding tissues). Infiltration occurs when the venous access device punctures the vein wall or migrates out of the vein. Infiltration is more likely to occur one or more days later, usually because the flexible tip of the catheter has penetrated the vein wall.

A joint risk

The risk of infiltration increases whenever you insert it near a joint. If the tip of the venous access device isn’t inserted far enough into the vein lumen, part of the tip remains outside the vein and infiltration develops quickly.

More complications

Infiltration of a drug or solution can result in extravasation or breakdown of tissue (necrosis) because of the drug or solution’s vesicant properties.

The fluid factor

The type of fluid being infused determines how much discomfort the patient feels during infiltration. Isotonic fluids usually don’t cause much discomfort. Fluids with an acidic or alkaline pH, or those that are more than slightly hypertonic, are usually more irritating. Don’t depend on the patient to complain of discomfort;
large amounts of I.V. fluid — as much as 1 L — can escape into the surrounding tissues without the patient knowing it.

**It’s in your hands**

Fortunately, you can minimize or prevent most complications by using proper insertion techniques and carefully monitoring the patient. I.V. sites should be checked by a nurse every 2 to 4 hours, or according to facility policy.

**Always document — thoroughly document!**

If complications do occur, document the signs and symptoms, patient complaints, name of the practitioner notified, and treatment. If the patient develops a severe infusion-related problem — for instance, vesicant infiltration (extravasation), circulatory compromise, a skin tear, fluid overload, or a severe allergic reaction — fill out an incident report according to your facility’s policy and procedures. For legal purposes, document the details of the complication as well as any medical and nursing interventions provided.

**Discontinuing the infusion**

To discontinue the infusion, first clamp the infusion line and then remove the venous access device using aseptic technique. Here’s how to proceed:

- After putting on gloves, lift the tape from the skin to expose the insertion site. You don’t need to remove the tape or dressing as long as you can peel it back to expose the venous access device and skin.
- Be careful to avoid manipulating the device in the skin to prevent skin organisms from entering the bloodstream. Moving the device may also cause discomfort, especially if the insertion site has become phlebitic.
- Apply a sterile 2” × 2” dressing directly over the insertion site, and then quickly remove the device. (Never use an alcohol pad to clean the site when discontinuing an infusion; this may cause bleeding and a burning sensation.)
- Maintain direct pressure on the I.V. site for several minutes, and then tape a dressing over it, being careful not to encircle the limb. If possible, hold the limb upright for about 5 minutes to decrease venous pressure.
- Tell the patient to restrict his activity for about 10 minutes and to leave the site dressing in place for at least 8 hours. If he feels lingering tenderness at the I.V. site, apply warm, moist packs.
- Dispose of the used venipuncture equipment, tubing, and solution containers in a receptacle designated by your facility.

(Text continues on page 79.)
Complications of peripheral I.V. therapy may be local or systemic. This chart lists some common complications along with their signs and symptoms, possible causes, and nursing interventions, including preventive measures.

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Possible causes</th>
<th>Nursing interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local complications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phlebitis</td>
<td>• Poor blood flow around device</td>
<td>• Remove the device.</td>
</tr>
<tr>
<td>• Tenderness at tip of device and above</td>
<td>• Friction from catheter movement in vein</td>
<td>• Apply a warm pack.</td>
</tr>
<tr>
<td>• Redness at tip of catheter and along vein</td>
<td>• Device left in vein too long</td>
<td>• Notify the practitioner.</td>
</tr>
<tr>
<td>• Puffy area over vein</td>
<td>• Clotting at catheter tip (thrombophlebitis)</td>
<td>• Document the patient's condition and your interventions.</td>
</tr>
<tr>
<td>• Vein hard on palpation</td>
<td>• Solution with high or low pH or high osmolarity</td>
<td><strong>Prevention:</strong></td>
</tr>
<tr>
<td>• Elevated temperature</td>
<td></td>
<td>• Restart the infusion in a different vein using a larger vein for irritating infusate, or restart with a smaller-gauge device to ensure adequate blood flow.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Tape device securely to prevent motion.</td>
</tr>
<tr>
<td>Infiltration</td>
<td>• Device dislodged from vein</td>
<td>• Remove the device.</td>
</tr>
<tr>
<td>• Swelling at and around I.V. site (may extend along entire limb)</td>
<td>• Perforated vein</td>
<td>• Apply warm soaks to aid absorption.</td>
</tr>
<tr>
<td>• Discomfort, burning, or pain at site</td>
<td></td>
<td>• Elevate the limb.</td>
</tr>
<tr>
<td>• Feeling of tightness at site</td>
<td></td>
<td>• Notify the practitioner if severe.</td>
</tr>
<tr>
<td>• Decreased skin temperature around site</td>
<td></td>
<td>• Periodically assess circulation by checking for pulse, capillary refill, and numbness or tingling.</td>
</tr>
<tr>
<td>• Blanching at site</td>
<td></td>
<td>• Restart the infusion, preferably in another limb or above the infiltration site.</td>
</tr>
<tr>
<td>• Continuing fluid infusion even when vein is occluded, although rate may decrease</td>
<td></td>
<td>• Document the patient's condition and your interventions.</td>
</tr>
<tr>
<td>• Absent backflow of blood</td>
<td></td>
<td><strong>Prevention:</strong></td>
</tr>
<tr>
<td>• Slower flow rate</td>
<td></td>
<td>• Check the I.V. site frequently, especially when using an I.V. pump.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Don't obscure area above site with tape.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Teach the patient to report discomfort, pain, or swelling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Prevention:</strong></td>
</tr>
<tr>
<td>Catheter dislodgment</td>
<td>• Loosened tape or tubing snagged in bedclothes, resulting in partial retraction of catheter</td>
<td>• If no infiltration occurs, retape without pushing catheter back into vein.</td>
</tr>
<tr>
<td>• Catheter partly backed out of vein</td>
<td></td>
<td><strong>Prevention:</strong></td>
</tr>
<tr>
<td>• Infusate infiltrating</td>
<td></td>
<td>• Tape the device securely on insertion.</td>
</tr>
</tbody>
</table>
### Risks of peripheral I.V. therapy (continued)

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Possible causes</th>
<th>Nursing interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local complications (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oclusion</strong></td>
<td>I.V. flow interrupted&lt;br&gt;Intermittent device not flushed&lt;br&gt;Blood backup in line when patient walks&lt;br&gt;Hypercoagulable patient&lt;br&gt;Line clamped too long</td>
<td>Use a low flush pressure syringe during injection. Don’t use force. If resistance is met, stop immediately. If unsuccessful, reinsert the I.V. device.&lt;br&gt;<em>Prevention:</em>&lt;br&gt;• Maintain the I.V. flow rate.&lt;br&gt;• Flush promptly after intermittent piggyback administration.&lt;br&gt;• Have the patient walk with his arm below heart level to reduce the risk of blood backup.</td>
</tr>
<tr>
<td><strong>Vein irritation or pain at I.V. site</strong></td>
<td>Solution with high or low pH or high osmolarity, such as potassium chloride, phenytoin, and some antibiotics (vancomycin and nafcillin)</td>
<td>Slow the flow rate.&lt;br&gt;• Try using an electronic flow device to achieve a steady regulated flow.&lt;br&gt;<em>Prevention:</em>&lt;br&gt;• Dilute solutions before administration. For example, give antibiotics in 250-ml rather than 100-ml solution.&lt;br&gt;• If long-term therapy is planned, ask the practitioner to use central access device.</td>
</tr>
<tr>
<td><strong>Severed catheter</strong></td>
<td>Catheter inadvertently cut by scissors&lt;br&gt;Reinsertion of needle into catheter</td>
<td>If the broken part is visible, attempt to retrieve it. If unsuccessful, notify the practitioner.&lt;br&gt;• If a portion of the catheter enters the bloodstream, place a tourniquet above the I.V. site to prevent progression.&lt;br&gt;• Notify the practitioner and radiology.&lt;br&gt;• Document the patient’s condition and your interventions.&lt;br&gt;<em>Prevention:</em>&lt;br&gt;• Don’t use scissors around the I.V. site.&lt;br&gt;• Never reinsert a needle into catheter.&lt;br&gt;• Remove the unsuccessfully inserted catheter and needle together.</td>
</tr>
</tbody>
</table>
### Risks of peripheral I.V. therapy (continued)

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
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</thead>
<tbody>
<tr>
<td><strong>Local complications (continued)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Hematoma** | • Vein punctured through ventral wall at time of venipuncture  
• Leakage of blood from needle displacement | • Remove the venous access device.  
• Apply pressure and warm soaks to the affected area.  
• Recheck for bleeding.  
• Document the patient's condition and your interventions.  
*Prevention:*  
• Choose a vein that can accommodate the size of the intended device.  
• Release the tourniquet as soon as successful insertion is achieved. |
| **Venous spasm** | • Severe vein irritation from irritating drugs or fluids  
• Administration of cold fluids or blood  
• Very rapid flow rate (with fluids at room temperature) | • Apply warm soaks over the vein and surrounding area.  
• Slow the flow rate.  
*Prevention:*  
• Use blood warmer for blood or packed red blood cells when appropriate. |
| **Thrombosis** | • Injury to endothelial cells of vein wall, allowing platelets to adhere and thrombus to form | • Remove the device; restart the infusion in the opposite limb if possible.  
• Apply warm soaks.  
• Watch for I.V. therapy-related infection. (Thrombi provide an excellent environment for bacterial growth.)  
*Prevention:*  
• Use proper venipuncture techniques to reduce injury to the vein. |
| **Thrombophlebitis** | • Thrombosis and inflammation | • Remove the device; restart the infusion in the opposite limb if possible.  
• Apply warm soaks.  
• Notify the practitioner.  
• Watch for I.V. therapy-related infection. (Thrombi provide an excellent environment for bacterial growth.)  
*Prevention:*  
• Check the site frequently. Remove the device at the first sign of redness and tenderness. |
### Risks of peripheral I.V. therapy (continued)

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Local complications (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nerve, tendon, or ligament damage</strong></td>
<td>Improper venipuncture technique, resulting in injury to surrounding nerves, tendons, or ligaments</td>
<td>Stop procedure and remove the device.</td>
</tr>
<tr>
<td></td>
<td>Numbness and muscle contraction</td>
<td>Prevention:</td>
</tr>
<tr>
<td></td>
<td>Delayed effects, including paralysis, numbness, and deformity</td>
<td>Don’t repeatedly penetrate tissues with the venous access device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Don’t apply excessive pressure when taping or encircle the limb with tape.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pad the arm board and, if possible, pad the tape securing the arm board.</td>
</tr>
</tbody>
</table>

| **Systemic complications** | | |
| **Circulatory overload** | Roller clamp loosened to allow run-on infusion | Raise the head of the bed. |
| | Flow rate too rapid | Slow the infusion rate (but don’t remove the venous access device). |
| | Miscalculation of fluid requirements | Administer oxygen as needed. |
| | | Notify the practitioner. |
| | | Administer medications (probably furosemide) as ordered. |
| | | Prevention: |
| | | Use a pump, volume-control set, or rate minder for elderly or compromised patients. |
| | | Recheck calculations of fluid requirements. |
| | | Monitor the infusion frequently. |

| **Systemic infection (septicemia or bacteremia)** | Failure to maintain aseptic technique during insertion or site care | Notify the practitioner. |
| | Severe phlebitis, which can set up ideal conditions for organism growth | Administer medications as prescribed. |
| | Poor taping that permits venous access device to move, which can introduce organisms into bloodstream | Culture the site and the device. |
| | Prolonged indwelling time of device | Monitor the patient’s vital signs. |
| | Immunocompromised patient | Prevention: |
| | | Use scrupulous aseptic technique when handling solutions and tubings, inserting the venous access device, and discontinuing the infusion. |
| | | Secure all connections. |
| | | Change I.V. solutions, tubing, and venous access device at recommended times. |
### Risks of peripheral I.V. therapy (continued)

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<tr>
<td><strong>Systemic complications (continued)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Air embolism** | • Empty solution container  
• Solution container empties; next container pushes air down line  
• Tubing disconnected from venous access device or I.V. bag | • Discontinue the infusion.  
• Place the patient in Trendelenburg’s position on his left side to allow air to enter the right atrium and disperse through the pulmonary artery.  
• Administer oxygen.  
• Notify the practitioner.  
• Document the patient’s condition and your interventions.  
**Prevention:**  
• Purge the tubing of air completely before the infusion.  
• Use an air-detection device on the pump or an air-eliminating filter proximal to the I.V. site.  
• Secure all connections. |
| **Allergic reaction** | • Allergens such as medications | • If a reaction occurs, stop the infusion immediately and infuse normal saline solution.  
• Maintain a patent airway.  
• Notify the practitioner.  
• Administer an antihistaminic steroid, an anti-inflammatory, and antipyretic drugs, as ordered.  
• Give 0.2 to 0.5 ml of 1:1,000 aqueous epinephrine subcutaneously. Repeat at 3-minute intervals and as needed, as ordered.  
• Administer cortisone if ordered.  
**Prevention:**  
• Obtain the patient’s allergy history. Be aware of cross-allergies.  
• Assist with test dosing.  
• Monitor the patient carefully during the first 15 minutes of administration of a new drug. |
### Basics of peripheral I.V. therapy
Peripheral I.V. therapy involves:
- checking the practitioner's orders
- ordering supplies and equipment
- labeling solutions and tubing
- documenting nursing interventions.

Peripheral I.V. therapy is ordered when venous access is needed for:
- surgery
- transfusions
- emergency care
- maintaining hydration
- restoring fluid and electrolyte balance
- providing fluids for resuscitation
- administering I.V. medications or nutrients.

### Preparing for venipuncture and infusion
- Check the patient's medical record for allergies, disease history, and his current diagnosis and care plan.
- Review the practitioner’s orders and the patient's laboratory studies.
- Describe the procedure to the patient and provide patient teaching.
- Provide privacy, and then have the patient put on a gown and remove all jewelry.
- Position the patient comfortably.
- Select the appropriate insertion site, venous access device, solution container, and administration set according to the therapy required.
- Then obtain an infusion pump.
- Label the container correctly and attach the administration set as appropriate.

### Performing a venipuncture
- Dilate the vein, apply a tourniquet as appropriate, and prepare the access site.
- Stabilize the vein, and then position the venous access device with the bevel side up.
- Insert the device using a smooth, steady motion.
- Collect blood samples using appropriate equipment, and secure the venous access device.
- Document the procedure in the appropriate areas (such as the progress notes, intake and output flowsheets, or the patient’s chart or medication sheet) according to your facility’s policy.

### Maintaining peripheral I.V. therapy
- Focus on preventing complications.
- Discontinue the infusion when therapy is completed.
- Change a gauze dressing every 48 hours.
- Change the I.V. solution container when due or every 24 hours.
- Change administration sets according to facility policy or every 72 hours.
- Change the I.V. site every 72 hours according to facility policy.
- Document dressing, tubing, and solution changes, and the condition of the venipuncture site.

### Patients with special needs
- Infant I.V. sites include the hands, feet, antecubital fossa, dorsum of hand, and scalp. Scalp veins are used for infants ages 6 months and younger.
- Intraosseous access is used for fluid resuscitation, medication administration, and blood transfusions until a vein can be accessed.
- Veins in elderly patients are more fragile and less elastic. Remove the tourniquet promptly to prevent increased vascular pressure.

---

**That's a wrap!**

**Peripheral I.V. therapy review**

**Basics of peripheral I.V. therapy**
- Peripheral I.V. therapy involves:
  - checking the practitioner’s orders
  - ordering supplies and equipment
  - labeling solutions and tubing
  - documenting nursing interventions.

**Preparing for venipuncture and infusion**
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- Intraosseous access is used for fluid resuscitation, medication administration, and blood transfusions until a vein can be accessed.
- Veins in elderly patients are more fragile and less elastic. Remove the tourniquet promptly to prevent increased vascular pressure.
• Document the time of removal, the catheter length and integrity, and the condition of the site. Also, record how the patient tolerated the procedure and any nursing interventions.

**Quick quiz**

1. The first step in performing a routine venipuncture is to:
   A. prepare the venipuncture site.
   B. dilate the vein.
   C. use a local anesthetic.
   D. attach the tubing to the device.
   
   **Answer:** B. The sequence in performing the venipuncture is to dilate the vein and then prepare the site. An anesthetic may or may not be used.

2. When applying a transparent dressing, it’s important to:
   A. stretch the dressing as much as possible.
   B. cover the site and the tubing.
   C. tuck the dressing around and under the hub.
   D. always use a gauze dressing with the transparent dressing.
   
   **Answer:** C. Tucking the dressing in this manner will make the site occlusive to microorganisms. Stretching the dressing will cause itching, and the tubing should never be covered.

3. Which of the following is the preferred and most accessible site for a venous access device in the infant under age 6 months?
   A. Foot
   B. Hand
   C. Antecubital fossa
   D. Scalp

**Peripheral I.V. therapy review** *(continued)*

**Complications of therapy**

• Local complications include infiltration, phlebitis, cellulitis, catheter dislodgment, occlusion, vein irritation or pain at the I.V. site, severed or fractured catheter, hematoma, venous spasm, vasovagal reaction, thrombosis, thrombophlebitis, and damage to the nerves, tendons, or ligaments.

• Systemic complications include air embolism, allergic reactions, and septicemia.
Answer: D. Although all of these sites are favorable, the scalp veins are the most accessible.

4. Your patient has swelling at the I.V. site, discomfort, burning, decreased skin temperature, and blanching around the site. These are signs of which of the following I.V. complications?
   A. Phlebitis
   B. Infiltration
   C. Occlusion
   D. Air embolism

Answer: B. Swelling at the I.V. site, discomfort, burning, decreased skin temperature, and blanching around the site may indicate infiltration.

5. Which peripheral venipuncture site should be used as a last resort when no other veins are available?
   A. Cephalic vein
   B. Median antebrachial vein
   C. Metacarpal vein
   D. Basilic vein

Answer: B. The median antebrachial vein should only be used as a last resort, when no other means are available. It rises from the palm and runs along the ulnar side of the forearm. All of the other veins listed are suitable for venipuncture.

6. An in-line filter may be used for which patient?
   A. A patient receiving antibiotics I.V. every 6 hours
   B. A patient with a history of phlebitis
   C. A patient receiving normal saline solution
   D. A patient scheduled for surgery

Answer: B. In-line filters aren’t normally used because of the increased costs. However, you can expect to use an in-line filter for an immunosuppressed patient, when administering total parenteral nutrition, when using additives composed of many separate particles, and when the risk of phlebitis is high.

Scoring

★★★★ If you answered all six questions correctly, take a bow! At this juncture, fear no venipuncture.

★★★ If you answered four to five questions correctly, congratulations! For the most part, you delivered the correct solutions.

★★ If you answered fewer than four questions correctly, don’t get discouraged! Your quiz score is a peripheral matter. Review the chapter and try again.