

# Short peripheral and midline catheter complications

## The nurse's role at point of care

By Dawn Berndt, DNP, RN, CRNI®, and Marlene Steinheiser, PhD, RN, CRNI®

*EDITOR'S NOTE: This article was developed in partnership with the Infusion Nurses Society ([ins1.org](http://ins1.org)), and the Infusion Therapy Standards of Practice, published in the Journal of Infusion Nursing (2016), were used as a guiding reference. Watch for an article on complications of central vascular access devices in our October issue.*

**PERIPHERAL** vascular access device (VAD) use is widespread in inpatient and outpatient settings. Short peripheral catheters (SPCs), commonly called “I.V.s,” are the most widely used VADs worldwide. International data indicate that more than 1 billion SPCs are used annually in hospitalized patients. A resurgence in the use of midline catheters provides yet another option for peripheral venous access. In the United States, at least 85% of hospitalized patients receive some form of I.V. therapy. Although the use of peripheral VADs allows patients to receive I.V. therapy, which can be life-sustaining or even life-saving, the devices also present a challenge when managing associated complications.

### Sequelae and complications

SPCs and midline catheters are two devices used to obtain peripheral venous access. SPCs are catheters less than 3" (7.6 cm) long. Midlines are catheters inserted into the up-

per arm via the basilic, cephalic, or brachial vein, with the internal tip located level to or near the level of the axilla and distal to the shoulder.

The sequelae of peripheral VAD complications, including tissue injury, infection, emboli, and extravasations, can lead to impaired quality of life and increased morbidity and mortality. All peripheral venous access catheter types are subject to complications that can occur at any juncture in the life of the device.

Peripheral VAD-associated complications can be attributed to a number of patient-related risk factors, such as age, developmental stage, disease state, presence of immunosuppression or immunodeficiency, type of therapy and infusate,

prolonged hospitalization, and the presence of concurrent infections. Practice-related risk factors include multiple venipuncture attempts, poor insertion technique/traumatic insertion, inappropriate catheter size and length in relationship to the vessel, failure to adequately secure the catheter, inadequate maintenance, poor hand hygiene, and poor sterile technique.

### Preventing and mitigating complications

Nurses play an important role at specific points of care in the life of peripheral VADs:

- insertion
- care, use, and maintenance
- discontinuation.

Ongoing assessment to detect complication onset and to initiate corrective action and therapeutic management when complications occur are essential at each point.

### Insertion complications

Skillful insertion of a peripheral VAD ensures patient safety and proper device functioning. A poor insertion technique can place the patient at risk for insertion-related complications, including infection, tissue or vessel damage, therapy delay, and, rarely, catheter embolism. Failures or complications at the point of insertion also may require additional insertions, increasing the risk for infection and vessel depletion.



#### LEARNING OBJECTIVES

1. Describe how to prevent peripheral vascular access device (VAD) complications.
2. Discuss how to manage VAD complications.

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# Peripheral VAD insertion-related complications

Nurses must recognize the risk factors, signs, and symptoms of peripheral venous access device (VAD) insertion-related complications and apply prevention techniques and interventions as needed.

Complication	Risk factors	Signs and symptoms	Prevention and management
<b>Hematoma (and/or tissue damage)</b>	<ul style="list-style-type: none"> <li>Multiple venipuncture attempts/traumatic insertion</li> <li>Fragile veins</li> <li>Inappropriately placed tourniquet</li> <li>Venipuncture in patients with a blood dyscrasia or in those who bruise easily</li> <li>Patients taking steroids or anticoagulants</li> <li>Accidental arterial puncture</li> </ul>	<ul style="list-style-type: none"> <li>Tissue discoloration from blood infiltrating the area</li> <li>Swelling as hematoma forms</li> <li>Hematoma onset is immediate or slow depending on the amount of subcutaneous tissue between the vein and epidermis</li> </ul>	<p><b>Prevention:</b></p> <ul style="list-style-type: none"> <li>Venipuncture should be performed by a clinician with validated competency.</li> <li>Limit insertion attempts to one or two without “digging” or repositioning the needle.</li> <li>Use visualization technologies to aid in vessel and surrounding structure identification and VAD insertion.</li> <li>Use a stabilization device on all VADs or apply a dressing with an integral stabilization feature.</li> </ul> <p><b>Interventions:</b></p> <ul style="list-style-type: none"> <li>Remove the catheter immediately and apply direct pressure to the area.</li> <li>Elevate the extremity until bleeding stops.</li> <li>Apply a dry sterile dressing to the site.</li> <li>Monitor the site for breakthrough bleeding.</li> <li>Monitor the extremity for circulatory neurologic and motor function.</li> </ul>
<b>Catheter embolism</b>	<ul style="list-style-type: none"> <li>Defective catheter</li> <li>Needle reinsertion during placement of over-the-needle catheters</li> </ul>	<ul style="list-style-type: none"> <li>Signs and symptoms vary depending on location of catheter fragment; often, no signs are apparent</li> <li>When VAD removed, tip fragmentation noted or entire catheter not intact</li> </ul>	<p><b>Prevention:</b></p> <ul style="list-style-type: none"> <li>Inspect the catheter for defects before insertion.</li> <li>Prohibit reinsertion of over-the-needle catheters (for example, pulled backward then advanced forward, causing the catheter to be pierced or severed).</li> </ul> <p><b>Interventions:</b></p> <ul style="list-style-type: none"> <li>Notify the provider immediately.</li> <li>If the catheter breaks during removal, apply a tourniquet above the insertion site and place the patient on bedrest.</li> <li>Obtain radiographic images as ordered.</li> <li>Monitor the patient for distress or other noticeable changes.</li> </ul>
<b>Infection</b>	<ul style="list-style-type: none"> <li>Immunosuppression or immunodeficiency</li> <li>Severe chronic illness</li> <li>Multiple infusions</li> <li>Extended hospitalization</li> <li>Concurrent infection</li> <li>Leukopenia</li> <li>Patient’s age, medical condition, and acuity</li> <li>Burns</li> </ul>	<p><b>Local:</b></p> <ul style="list-style-type: none"> <li>Pain, swelling, or inflammation at insertion site</li> <li>Discolored tissue of surrounding area, purulent drainage</li> </ul> <p><b>Systemic:</b></p> <ul style="list-style-type: none"> <li>Fever</li> <li>Chills</li> <li>General malaise</li> <li>Headache</li> <li>Increased pulse</li> <li>Flushed face</li> <li>Backache</li> <li>Nausea</li> <li>Vomiting</li> <li>Hypotension</li> </ul>	<p><b>Prevention:</b></p> <ul style="list-style-type: none"> <li>Perform hand hygiene before all patient contact as described in the organization’s policy or guidelines.</li> <li>Prepare the workspace before performing clean aseptic technique.</li> <li>Perform skin antisepsis at the intended insertion site and surrounding skin.</li> <li>Maintain aseptic technique throughout the insertion and dressing processes.</li> </ul> <p><b>Interventions:</b></p> <ul style="list-style-type: none"> <li>Culture drainage (if present) at the site before removing the catheter.</li> <li>Remove the catheter and culture it to determine if it’s the source of infection.</li> <li>Administer antibiotics as ordered.</li> <li>Monitor the site until the infection resolves.</li> </ul>

Source: Alexander et al. 2014

## Skillful insertion of a peripheral VAD ensures patient safety and proper device functioning.

Insertion-related infection can result from inadequate handwashing, workspace preparation, or skin antisepsis before insertion and failing to maintain aseptic technique throughout the process. Vessel, nerve, and tissue damage can occur if the catheter isn't adequately secured or if probing or multiple insertion attempts occur. Hematomas arise when an adjacent vessel is pierced or when the vein is penetrated through the vessel's back wall. Catheter embolism can occur if the needle is reinserted into over-the-needle catheters during cannulation, shearing or severing the catheter. In addition to patient injury, these failures add to the overall financial impact for the patient and the health-care organization. (See *Peripheral VAD insertion-related complications*.)

### Care, use, and maintenance complications

Detecting and preventing care-, use-, and maintenance-related SPC and midline catheter complications require nursing vigilance. Routine patient and peripheral VAD assessment is necessary to help ensure the patient doesn't experience any of the many use-associated complications. However, extended SPC and midline catheter use and patient-related risk factors can increase the challenge of preventing complications such as catheter occlusion, infection, infiltration or extravasation, skin injury, and phlebitis.

**Occlusion.** Catheter occlusions typically are associated with central VADs, but SPCs and midline catheters also can be affected. Occlusions can increase the risk of catheter-related bloodstream infections (CR-BSI) and cause delays in the therapeutic regimen. All catheters must be flushed and locked appropriately to maintain patency and decrease the risk of CR-BSI.

**Infection.** Infection is a serious, potentially life-threatening peripheral VAD complication, and prevention is essential to patient safety. Peripheral VAD-related infections

present as localized site infections or systemically as bacteremia or septicemia, which are considered catheter-related if the same microorganism is isolated both in the blood and on the catheter surface. CR-BSIs are frequently considered exclusive to central VAD use; however, patients with SPCs and midline catheters also are vulnerable.

### Infiltration and extravasation.

Infiltration is the inadvertent instillation of infusate into the tissues external to the vessel; extravasation is the inadvertent instillation of vesicant solution into the tissues external to the vessel. Infusates (infusions) are all parenteral solutions administered into the vascular system. Vesicants are defined as agents or infusions capable of causing tissue damage. Infiltration or extravasation can be caused by damage to the vein intima, fragile patient vasculature, catheter migration external to the vessel, or thrombus formation that causes vessel rupture or retrograde flow exiting through the catheter insertion site. Catheter malpositioning external to the vessel may occur during or after insertion.

**Skin injury.** Loss of skin integrity occurs for a variety of reasons, including patient age and disease state. Some patients are sensitive to skin-preparation agents or elements contained in dressing materials. Nurses should assess for allergies and must follow manufacturer instructions when using any products on the patient's skin. To help prevent skin injury, special attention should be paid to the dry time required for antiseptic and site-preparation solutions, careful application of the transparent dressing by not stretching, and gentle dressing removal.

**Phlebitis.** Phlebitis is inflammation of the vein, which may be

accompanied by pain, erythema, edema, streak formation, and/or palpable cord. It's caused by endothelial cell inflammation of the vessel and is classified as chemical (chemicals in the infusate), mechanical (presence of the catheter within the vessel, catheter pistoning or movement, inadequate vein-to-catheter ratio, or traumatic insertion), or bacterial (presence of infection and inflammation affecting the vein wall). (See *Peripheral VAD care, use, and maintenance complications*.)

### Discontinuation complications

Complications associated with peripheral VAD discontinuation include excessive bleeding, infection at the catheter insertion site after catheter removal, and, although rare, catheter embolism. Of these, infection and catheter embolism present the greatest risk for mortality or significant injury. Nurses and other healthcare personnel must be knowledgeable and diligent when discontinuing a VAD and never deviate from standards of practice.

### Vigilant care

Peripheral VAD-associated complications pose serious risks for patients, the extent of which may result in prolonged illness, extended lengths of stay in a healthcare setting, permanent physical damage, or even death. Knowledgeable, highly skilled nurses are instrumental in mitigating and preventing peripheral VAD-associated complications. Vigilant assessment and intervention at the point of catheter insertion, throughout the duration of catheter use, and at catheter discontinuation help ensure the safe care patients deserve. ★

The authors work at the Infusion Nurses Society in Norwood, Massachusetts. Dawn Berndt is the clinical education and publications manager and Marlene Steinheiser is the director of clinical education.

Visit [americannursetoday.com/?p=57908](http://americannursetoday.com/?p=57908) for a list of selected references.

# Peripheral VAD care, use, and maintenance complications

Nurses should recognize the risk factors, signs, and symptoms for peripheral vascular access device (VAD) care-, use-, and maintenance-related complications and apply prevention techniques and interventions as needed.

Complication	Risk factors (or causes)	Signs and symptoms	Prevention and interventions
<b>Loss of skin integrity</b>	<ul style="list-style-type: none"> <li>Fragile skin due to age, disease state, or medication regimen</li> <li>Patient sensitivity or allergy to glue or skin-preparation agents used during vascular access and dressing</li> </ul>	<ul style="list-style-type: none"> <li>Redness</li> <li>Excoriation</li> <li>Blisters</li> <li>Weeping</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Allow antiseptic and skin-preparation agents to dry completely before placing the dressing.</li> <li>Follow the manufacturer's instructions for dressing supplies.</li> <li>Check the patient for allergies or sensitivities to dressing and skin-preparation agents before use.</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Consult the provider and/or wound and skin specialist.</li> <li>Consider using dressing supplies manufactured for sensitive skin.</li> </ul>
<b>Catheter embolism</b>	<ul style="list-style-type: none"> <li>Catheter placement at site of flexion without joint stabilization device</li> <li>Catheter defect</li> </ul>	<ul style="list-style-type: none"> <li>Signs and symptoms vary depending on location of catheter fragment</li> <li>When VAD removed, tip fragmentation noted or entire catheter not intact</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Inspect the catheter for defects before insertion.</li> <li>Prohibit reinsertion of over-the-needle catheters (for example, pulling backward then advancing forward, causing the catheter to be pierced or severed).</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Notify the provider immediately.</li> <li>If the catheter breaks during removal, apply a tourniquet above the insertion site and place the patient on bedrest.</li> <li>Obtain radiographic images as ordered.</li> <li>Monitor the patient for distress or other noticeable changes.</li> </ul>
<b>Occlusion</b>	<ul style="list-style-type: none"> <li>Solution container completely empties</li> <li>Inadequate flushing when administering medications, drawing blood, or locking the VAD</li> <li>Administration of incompatible medications</li> <li>Kinked catheter or administration set</li> </ul>	<ul style="list-style-type: none"> <li>Sluggish infusion or flushing</li> <li>Inability to infuse or flush</li> <li>Inability to obtain a blood return</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Regularly assess VAD patency.</li> <li>Follow the organization's flushing and locking guidelines.</li> <li>Ensure incompatible infusates aren't administered through the same catheter without adequate flushing between each instillation.</li> </ul> <p><b>Intervention</b></p> <ul style="list-style-type: none"> <li>Remove catheter.</li> </ul>
<b>Phlebitis (mechanical, chemical, bacterial)</b>	<p><b>Mechanical</b></p> <ul style="list-style-type: none"> <li>Inappropriate site selection (e.g., area of flexion)</li> <li>Inadequate vein size for catheter gauge</li> <li>Inadequate securement</li> <li>Traumatic insertion</li> </ul> <p><b>Chemical</b></p> <ul style="list-style-type: none"> <li>Rapid infusion rate</li> <li>Particulate matter</li> <li>Extended catheter dwell time</li> <li>Irritating medications or solutions</li> <li>Medications improperly mixed or diluted</li> </ul> <p><b>Bacterial</b></p> <ul style="list-style-type: none"> <li>Poor hand hygiene</li> <li>Poor aseptic technique when preparing venipuncture site</li> <li>Poor catheter insertion technique</li> <li>Inadequate catheter securement</li> </ul>	<ul style="list-style-type: none"> <li>Erythema at access site with or without pain</li> <li>Pain at access site with erythema or edema</li> <li>Streak formation</li> <li>Palpable venous cord</li> <li>Purulent drainage</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Do not place the VAD in an area of flexion without joint stabilization.</li> <li>Select the catheter gauge appropriate for vein size.</li> <li>Adhere to aseptic techniques for insertion, care, use, and maintenance.</li> <li>Secure the catheter with an engineered stabilization device.</li> <li>Use caution with infusion rates and potential irritants.</li> <li>Administer properly diluted medications.</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Initiate prompt removal of the VAD if the vessel is warm to the touch, painful, or red, or if it has a palpable cord.</li> <li>Use a standardized phlebitis assessment tool.</li> <li>Consult the provider if phlebitis is suspected.</li> <li>Apply a thermal compress to the phlebotic area for 20 minutes three to four times per day per the provider's order.</li> <li><b>Chemical:</b> Evaluate the infusion therapy and need for different vascular access or slower rate of infusion; determine if catheter removal is needed.</li> <li><b>Mechanical:</b> Stabilize the catheter, apply heat, elevate the limb, and monitor for 24 to 48 hours; if signs and symptoms persist after 48 hours, consider removing the catheter.</li> <li><b>Bacterial:</b> If bacterial phlebitis is suspected, remove the catheter.</li> </ul>
<b>Infiltration/extravasation</b>	<ul style="list-style-type: none"> <li>Multiple manipulations of infusion delivery system</li> <li>Large catheter gauge and length</li> <li>Failure to adequately stabilize VAD</li> <li>Patient's age, medical condition, and acuity</li> </ul>	<ul style="list-style-type: none"> <li>Pain, burning, stinging during infusion</li> <li>Changes in skin color, blanching, bruising, or redness near insertion site or on same extremity</li> <li>Tight, taut skin</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Use the smallest catheter in the largest vessel to accommodate the infusion.</li> <li>Avoid placing a catheter in areas of flexion and lower extremities in adults. (Lower extremities may be cannulated in infants and toddlers when appropriate.)</li> </ul>

*continued*



# Peripheral VAD care, use, and maintenance complications

continued

Complication	Risk factors (or causes)	Signs and symptoms	Prevention and interventions
	<ul style="list-style-type: none"> <li>Irritating infusate administration</li> <li>Poor VAD insertion technique</li> <li>Inadequate care and maintenance practices</li> <li>Extended dwell time</li> <li>Damage to vein intima</li> <li>Erosion of vessel by catheter</li> <li>Thrombus formation around catheter</li> <li>Catheter migration out of the vessel</li> </ul>	<ul style="list-style-type: none"> <li>Swelling or edema in any direction from insertion site</li> <li>Changes in skin temperature on extremity</li> <li>Numbness, tingling</li> <li>Fluid leaking from insertion site</li> <li>Slow capillary refill</li> <li>Impaired ability to move extremity or digits</li> <li>Blisters</li> </ul>	<ul style="list-style-type: none"> <li>Avoid subsequent cannulations distal to a previous catheter site.</li> <li>Stabilize the catheter to prevent movement at the insertion site.</li> <li>Infuse irritating infusates in larger peripheral veins or consider central vascular access.</li> <li>Assess catheter patency before and during medication administration.</li> <li>Compare the insertion site extremity size with same area on the opposite side.</li> <li>Assess the patient for pain.</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Stop the infusion immediately if infiltration/extravasation is suspected.</li> <li>Aspirate fluid from the catheter with a small syringe.</li> <li>Instill an antidote when warranted (e.g., sodium thiosulfate, dexrazoxane, phentolamine, hyaluronidase) as ordered by the provider.</li> <li>Remove the catheter before or after antidote instillation as appropriate for the antidote order.</li> <li>Elevate and apply thermal applications as appropriate.</li> <li>Observe and assess the site for other complications such as compartment syndrome, nerve injury, blisters, and tissue necrosis.</li> <li>Notify the provider as appropriate based on symptom severity.</li> </ul>
<b>Peripheral site infection</b>	<ul style="list-style-type: none"> <li>Poor hand hygiene</li> <li>Break in aseptic technique at the time of insertion</li> <li>Use of contaminated equipment</li> <li>Inappropriate catheter securement</li> </ul>	<ul style="list-style-type: none"> <li>Pain, swelling, and/or inflammation at the insertion site</li> <li>Discolored tissue of surrounding area</li> <li>Purulent drainage</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Perform hand hygiene as directed in the organization's policy.</li> <li>Maintain aseptic technique when accessing the VAD.</li> <li>Maintain a clean, dry, and intact VAD dressing.</li> <li>Maintain a closed infusion system.</li> <li>Assess the VAD site regularly for warmth, redness, drainage, and pain.</li> <li>Assess the patient for signs of infection (elevated temperature, confusion in elderly).</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Notify the provider if an infection is suspected.</li> <li>Remove the catheter and culture if ordered to determine if it's the source of the infection.</li> <li>If there is drainage at the site, culture it before removing the catheter.</li> <li>Initiate anti-infective therapy as ordered.</li> </ul>
<b>Bacteremia/septicemia</b>	<ul style="list-style-type: none"> <li>Immunosuppression or immunodeficiency</li> <li>Severe chronic illness</li> <li>Administration of multiple infusions</li> <li>Extended hospitalization</li> <li>Concurrent infection</li> <li>Leukopenia</li> <li>Patient's age, medical condition, and acuity</li> <li>Burns</li> </ul>	<ul style="list-style-type: none"> <li>Fever</li> <li>Chills</li> <li>General malaise</li> <li>Headache</li> <li>Increased pulse rate</li> <li>Flushed face</li> <li>Backache</li> <li>Nausea</li> <li>Vomiting</li> <li>Hypotension</li> </ul>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>Perform hand hygiene before placement and before providing VAD-related interventions.</li> <li>Disinfect needleless connectors before access.</li> <li>Maintain aseptic technique during all infusion therapy administrations and VAD care.</li> <li>Remove VADs that are no longer needed.</li> <li>Change administration set and add-on devices at recommended intervals.</li> <li>Minimize the use of add-on devices.</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Notify the provider if infection is suspected.</li> <li>Remove the catheter and culture to determine if it is the source of infection.</li> <li>Obtain blood cultures as ordered.</li> <li>Administer antibiotics as ordered.</li> </ul>

Source: Alexander et al. 2014

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**Please mark the correct answer online.****1. Which of the following could cause a hematoma to occur during venipuncture?**

- a. Reinserting a needle into an over-the-needle catheter
- b. Shearing or severing of the catheter
- c. Penetrating through the vessel's back wall
- d. Failing to properly cleanse the insertion area

**2. Hematoma prevention includes all of the following except**

- a. having only clinicians with validated competency perform venipuncture.
- b. using a stabilization device or a dressing with an integral stabilization feature.
- c. limiting the number of insertion attempts to three or four and avoiding "digging."
- d. using visualization technologies to aid in vessel identification during VAD insertion.

**3. A peripheral VAD catheter breaks as you are removing it. You should**

- a. apply a tourniquet below the insertion site.
- b. apply a tourniquet above the insertion site.
- c. assist the patient to sit in a chair.
- d. provide walking assistance to the patient.

**4. Which of the following statements about infection of a peripheral VAD is correct?**

- a. Signs and symptoms of infection include decreased heart rate.
- b. Signs and symptoms of infection include hypertension.

- c. Drainage at the site of insertion should be cultured after removing the catheter.
- d. Drainage at the site of insertion should be cultured before removing the catheter.

**5. When you discontinue your patient's midline catheter, you find that the tip is fragmented. The first complication you would suspect is**

- a. infection.
- b. catheter embolism.
- c. hematoma.
- d. phlebitis.

**6. Inadequate flushing of a peripheral VAD when administering medications or drawing blood could lead to**

- a. hematoma.
- b. phlebitis.
- c. embolism.
- d. occlusion.

**7. A risk factor for chemical phlebitis is**

- a. improperly mixed medications.
- b. slow infusion rate.
- c. inadequate securement.
- d. wrong catheter gauge.

**8. To help prevent phlebitis in your patient who needs a short peripheral catheter (SPC), you plan to**

- a. choose a catheter gauge appropriate to vein size.
- b. secure the catheter with hypoallergenic tape.
- c. place the catheter in an area of flexion.
- d. use half the recommended amount of medication diluent.

**9. Which statement about extravasation and infiltration is correct?**

- a. Extravasation is the inadvertent instillation of infusate into the tissues external to the vessel.
- b. Extravasation is the inadvertent instillation of vesicant solution into the tissues external to the vessel.
- c. Infusate is a solution that can cause tissue damage.
- d. Vesicant is an agent administered into the vascular system.

**10. An SPC is**

- a. less than 3" (7.6 cm) long.
- b. less than 6" (15.2 cm) long.
- c. inserted into the upper arm.
- d. located with its tip level to the axilla.

**11. Which statement about infection and peripheral VADs is correct?**

- a. Infections related to peripheral VADs are exclusively localized.
- b. Infections related to peripheral VADs can be localized or systemic.
- c. Pre-existing leukocytosis is a risk factor for infection.
- d. The number of infusions does not affect risk of infection.

**12. To avoid skin problems in your patient who will receive a midline catheter, you plan to**

- a. avoid sensitive skin dressing supplies.
- b. use standard dressing supplies.
- c. allow antiseptic and skin-preparation agents to dry completely before placing the dressing.
- d. avoid allowing antiseptic and skin-preparation agents to dry completely before placing the dressing.