PICC and Midline Catheters: Selection, Safe Insertion, Troubleshooting, and Maintenance

A practical lecture for clinicians who assess, insert, access, and maintain vascular access devices

Educational use only. This lecture supports clinical education and does not replace organizational policy, manufacturer instructions, medication-specific guidance, or competency validation. Insertion and management must be performed by trained, authorized clinicians. If a patient is unstable or a serious complication is suspected, stop the procedure or infusion and activate the appropriate emergency or escalation pathway.

Learning Objectives

- Differentiate a peripherally inserted central catheter (PICC) from a midline catheter by tip location, intended therapy, and risk.
- Select the least invasive device that safely meets the prescribed therapy and anticipated duration.
- Perform a focused pre-insertion assessment and identify contraindications or conditions requiring consultation.
- Apply maximal sterile barrier precautions and evidence-based CLABSI-prevention practices.
- Recognize and respond to insertion, post-insertion, and maintenance complications.
- Teach patients how to protect the device and when to seek help.

1. Device Fundamentals

Feature	PICC	Midline
Classification	Central venous access device	Peripheral vascular access device
Insertion	Usually through an upper-arm vein	Usually through an upper-arm vein
Tip	Terminates in the central circulation in the facility-approved target location	Terminates in a peripheral vein at or near the axillary region; it does not enter the central circulation
Typical role	Central-only infusates, prolonged or complex therapy, or reliable central access	Intermediate-duration, peripherally compatible therapy when a short peripheral catheter is unsuitable
Key risks	CLABSI, venous thrombosis, malposition, occlusion, breakage, air embolism	Infiltration or extravasation, phlebitis, thrombosis, occlusion, dislodgement, local or bloodstream infection

CLABSI surveillance	May meet central-line surveillance criteria when the tip qualifies as central	Not a central line; infection remains clinically serious even though it is not reported as a CLABSI

2. Indications and Contraindications

PICC: Common Indications

- Infusates that require central administration under pharmacy, manufacturer, and organizational guidance, such as many vesicants, parenteral nutrition, or solutions unsuitable for peripheral veins.
- Reliable venous access for prolonged or complex therapy when the benefit outweighs infection and thrombosis risk.
- Repeated intermittent infusions, frequent blood sampling when the selected device supports it, or poor peripheral access when a safer peripheral option will not meet the treatment plan.
- Outpatient or home infusion when the patient, caregiver, and care environment can support safe maintenance.

Midline: Common Indications

- Peripherally compatible fluids or medications expected to continue beyond the practical life of a short peripheral catheter, often for approximately 6–14 days and sometimes longer according to assessment and policy.
- Difficult peripheral access when central circulation is not required.
- A stable treatment plan that does not require vesicant therapy, parenteral nutrition, or another central-only infusion.

Contraindications and Conditions Requiring Consultation

- **Do not place through:** local infection, burn, wound, compromised skin, or unsuitable vessel at the proposed site.
- **Avoid the affected extremity or obtain specialist guidance for:** known or suspected venous thrombosis, severe edema, impaired circulation, paralysis, trauma, prior vascular surgery, dialysis access, or other anatomy that threatens device function or limb safety.
- **Kidney disease:** in advanced chronic kidney disease or when future hemodialysis is plausible, obtain nephrology or vascular-preservation input before an upper-extremity PICC or midline.
- **Bleeding risk:** review platelet count, coagulation status, anticoagulants, and the urgency of therapy.
- **Past breast cancer procedures:** assess the actual history, lymphatic impairment, and current policy; coordinate with the treating team when risk is uncertain.
- **No suitable vein, inability to position safely, inability to tolerate the procedure, or lack of informed consent:** pause and choose an alternative.

- **Midline-specific:** do not use for an infusate that is not appropriate for peripheral administration. Confirm every medication with pharmacy and current policy.
- **PICC-specific:** avoid for convenience alone, very short peripherally compatible therapy, or when another device offers lower risk.

Decision principle: Match the device to the infusate, anticipated duration, vessel health, patient specific risk, and care setting. Use the fewest lumens needed and reassess necessity every day.

3. Infusate pH, Osmolality, and Device Selection

Critical safety point: A PICC is a central catheter; a midline is peripheral. Infusates with extreme pH or high osmolality, continuous vesicants, and all parenteral nutrition formulas should generally be avoided through a midline. pH and osmolality are screening factors—not stand-alone permission to use a device. Final selection must account for the exact formulation and concentration, dilution, infusion rate, duration, vesicant or irritant status, patient vessels, manufacturer labeling, pharmacy review, and organizational policy.

Representative Infusates Commonly Requiring a PICC or Other Central Device

Medication or solution	Why it raises concern	Usual device-selection implication
Phenytoin sodium injection	Strongly alkaline formulation; commercial labeling describes pH approximately 12. It also carries substantial local tissue-injury risk if infiltration occurs.	Do not use a midline solely because it lasts longer than a short peripheral catheter. When ongoing IV therapy is required, use a PICC or other central device if consistent with the current label, pharmacy protocol, clinical urgency, and monitoring requirements.
Adult parenteral nutrition formulated for central administration	Often hyperosmolar; central PN commonly exceeds 900 mOsm/L. Dextrose and amino-acid concentration, electrolytes, and additives change final osmolality.	Use a PICC or other central venous access device after confirmed central tip location. Avoid all PN formulations through a midline.
Concentrated dextrose solutions used for ongoing infusion, such as D10W or stronger formulations	Increasing dextrose concentration increases osmolality and risk of phlebitis or tissue injury. The final product may	Obtain the pharmacy-calculated final osmolality. Use central access when the formulation is hyperosmolar, prolonged, continuous, or otherwise unsuitable for peripheral administration.
	approach or exceed peripheral tolerance.	

Hypertonic saline, especially 3% sodium chloride	Hyperosmolar and potentially damaging if infiltration occurs; risk varies with concentration, rate, duration, and vein quality.	Central access is commonly preferred for sustained therapy. Emergency or limited peripheral administration may be allowed only under a specific monitored protocol; a midline should not be assumed safe.
Concentrated electrolytes, including concentrated potassium chloride, potassium phosphate, sodium bicarbonate, calcium chloride, and concentrated magnesium solutions	May be hyperosmolar, irritating, vesicant, or capable of severe injury when extravasated. Risk depends heavily on final concentration and rate.	Use a PICC or other central device when concentrations or rates exceed peripheral policy. Never rely on drug name alone; pharmacy must verify the final preparation.
Continuous vasoactive infusions, such as norepinephrine, epinephrine, dopamine, phenylephrine, and vasopressin	Vesicant potential and risk of ischemic tissue injury with extravasation; pH or osmolality may not be the main hazard.	Central access is preferred when therapy is ongoing. Short-term peripheral use may be permitted under a tightly monitored emergency protocol, but a midline is not a default substitute for central access.
Selected antineoplastic vesicants and irritants	Can cause severe tissue necrosis or functional injury after extravasation; risk is based on vesicant properties rather than pH alone.	Use the oncology-approved central device and verify blood return and protocol requirements. Avoid midline administration.
Selected acidic or alkaline antiinfectives and other irritants, including vancomycin, acyclovir, amphotericin B formulations, erythromycin, and trimethoprimsulfamethoxazole	Some formulations have nonphysiologic pH, high osmolality, irritant or vesicant characteristics, or concentration-dependent phlebitis risk.	Do not classify the whole group as automatically safe or unsafe. For prolonged, concentrated, frequent, or high-risk therapy, central access may be preferred. Midline use requires an agent-specific pharmacy and policy decision.

Midline Use: What May Be Considered

A midline may be considered only for **peripherally compatible** therapy after the final preparation is reviewed. Examples often evaluated under local protocols include 0.9% sodium chloride, balanced crystalloids, selected cephalosporins such as cefazolin or ceftriaxone, piperacillin-tazobactam, ertapenem, daptomycin, and fluconazole. This is not a universal approved list: concentration, diluent, pH, osmolality, vesicant status, frequency, duration, and patient-specific vein condition may change the

decision. Vancomycin is especially policy dependent and should not be considered automatically suitable for a midline.

Practical Screening Checklist

- Identify the exact product, concentration, diluent, total volume, infusion rate, frequency, and expected duration.
- Ask pharmacy for the final pH and osmolality when these are not available in the current product information.
- Determine whether the medication is a vesicant, irritant, vasoconstrictor, or known cause of endothelial injury.
- Historical thresholds such as pH below 5 or above 9 and osmolality above 900 mOsm/L remain useful warning flags, but contemporary decisions require the whole infusate and patient assessment.
- For a midline, avoid continuous vesicants, all PN formulas, and infusates with extremes in pH or osmolality.
- For a PICC, verify central tip location before central-only therapy and use the fewest lumens necessary.
- If the product changes, reassess the device before the first dose. When evidence or policy is unclear, pause and consult pharmacy and the vascular-access team.

3. Pre-Insertion Patient Assessment

1. **Validate the order and treatment plan.** Identify each infusate, concentration, administration method, compatibility, frequency, expected duration, and need for blood sampling or power injection.
2. **Confirm device necessity.** Ask whether a short peripheral catheter, ultrasound-guided peripheral catheter, or another device can meet the need with less risk.
3. **Review history.** Previous access failures, catheter infection or thrombosis, allergies, renal disease, central venous stenosis, vascular or lymphatic procedures, implanted devices, and prior catheter locations.
4. **Assess current status.** Vital signs, fever or suspected bacteremia, hemodynamic stability, respiratory tolerance of positioning, cognition, anxiety, ability to cooperate, and pain-management needs.
5. **Review bleeding and thrombosis risk.** Laboratory results when indicated, anticoagulants, malignancy, hypercoagulability, past venous thromboembolism, and arm asymmetry.
6. **Examine both upper extremities.** Skin integrity, edema, color, temperature, pulses as appropriate, sensation, strength, range of motion, infection, wounds, scars, and existing devices.
7. **Perform ultrasound assessment.** Confirm vessel patency and compressibility; identify vein course, depth, diameter, nearby artery and nerve, and select the safest site. Use a catheter-to-vein ratio consistent with policy and evidence.

8. **Plan for the full episode of care.** Discharge setting, caregiver ability, hygiene, supplies, follow-up, line access frequency, and likelihood that the therapy will change.
9. **Educate and obtain consent.** Explain purpose, alternatives, steps, benefits, material risks, expected sensations, aftercare, and the patient's role in speaking up.
10. **Document the decision.** Indication, device and lumen choice, side and vessel, risk review, education, consent, and consultations.

4. CLABSI Prevention and Maximum Sterile Precautions

CLABSI Prevention Across the Device Life Cycle

- Use a central line only for a valid indication; remove it promptly when no longer essential.
- Ensure inserter and maintainer training, demonstrated competency, and access to a standardized checklist.
- Perform hand hygiene before and after every insertion, dressing change, assessment, and access.
- For PICC insertion, use maximal sterile barrier precautions and antiseptic skin preparation according to current policy; allow antiseptic to dry completely.
- Minimize lumens and access frequency. Keep the system closed, organized, and secured.
- Disinfect the needleless connector before every entry using the approved product, friction, and dry time; use a new sterile device for each access.
- Keep dressings clean, dry, intact, and dated. Replace promptly if damp, loose, visibly soiled, or compromised.
- Assess the site, limb, catheter function, indication, and systemic signs of infection every shift or encounter and before use.
- Never routinely replace a functioning PICC solely to prevent infection. Follow policy for scheduled components and clinically indicated device removal.
- Empower any team member to stop a non-emergent procedure when asepsis is breached.

Maximum Sterile Barrier Checklist for PICC Insertion

1. Verify patient, procedure, indication, device, site, consent, allergies, and emergency readiness; conduct a time-out.
2. Remove unnecessary clutter, control traffic, disinfect the work surface, and position the patient safely.
3. Perform hand hygiene. The inserter wears a cap, mask, sterile gown, and sterile gloves; the patient wears a mask when tolerated. Cover facial hair as required by policy.
4. Use a full-body sterile drape and a sterile ultrasound probe cover with sterile gel. Keep all supplies within the sterile field.
5. Prepare clean skin with the organization-approved chlorhexidine-alcohol product unless contraindicated. Use the approved alternative for allergy, age, or clinical condition. Do not palpate the prepared site unless sterility is maintained, and let the antiseptic dry fully.

6. Maintain sterile technique through access, guidewire and catheter advancement, trimming if applicable, securement, connector placement, flushing, and dressing application.
7. If contamination is suspected, stop, replace contaminated items, repeat hand hygiene or skin preparation as indicated, and re-establish the field. If asepsis cannot be restored, abandon the attempt.
8. Confirm PICC tip location using an approved method before use for therapies requiring central placement. Document confirmation and any restriction.

Midline note: A midline is peripheral, but insertion still requires meticulous aseptic no-touch technique and the barrier precautions specified by organizational policy. Never downgrade technique because the catheter is not central.

5. Complications During Insertion and Immediate Troubleshooting

Finding	Likely concern	Immediate response
Arterial pulsation, bright blood, or ultrasound uncertainty	Arterial puncture or cannulation	Stop. Do not dilate or advance. Remove the needle if appropriate, apply direct pressure, assess perfusion, notify the provider, and escalate immediately if a dilator or large catheter may have entered an artery.
Sharp, shooting, electric pain; numbness; loss of function	Nerve contact or injury	Stop and withdraw the needle or wire. Reassess neurovascular status and select a different site. Do not advance through pain.
Resistance to guidewire or catheter	Valve, vessel narrowing, spasm, tortuosity, malposition, or obstruction	Never force. Stop, reassess the needle and wire under ultrasound, change arm or head position if appropriate, and use another vessel or tip-navigation method according to scope and policy.
Swelling, pain, leakage, or poor blood return during placement	Infiltration, perforation, or malposition	Stop. Assess with ultrasound, withdraw as appropriate, apply pressure, and abandon or restart at a new site if safety is uncertain.
Palpitations or rhythm change during PICC advancement	Tip advanced too far	Stop advancement and withdraw to the prior safe position while monitoring the patient. Follow the facility's dysrhythmia and tip confirmation pathway.
Sudden dyspnea, chest pain, hypoxia, altered	Potential air embolism, embolic event, or other emergency	Clamp or occlude the system, prevent further air entry, activate emergency response,
consciousness, or hemodynamic change		support airway and circulation and notify the responsible provider immediately.

Persistent bleeding or hematoma	Vessel injury or coagulopathy	Stop, remove the device if indicated, apply continuous pressure, reassess distal circulation, review anticoagulation and laboratory factors, and escalate persistent or expanding bleeding.
Sterile-field breach	Contamination and infection risk	Stop. Replace contaminated supplies and reestablish sterility. Abandon the procedure if sterility cannot be assured.

6. Post-Insertion Complications and Troubleshooting

Problem or clue	Action
No blood return or sluggish infusion	Stop forceful flushing. Check clamps, tubing, connectors, pump settings, dressing tension, and external kinks; reposition the arm and patient. Assess for pain, swelling, leakage, resistance, or catheter migration. If unresolved, stop use and follow the approved occlusion pathway. Use a prescribed thrombolytic only after mechanical and tip location causes are considered.
Resistance to flushing	Never use excessive pressure or a small syringe to overcome resistance. Stop, assess for clamp or kink, medication precipitate, fibrin, malposition, and thrombosis; escalate according to policy.
Arm, shoulder, neck, or chest swelling; collateral veins; pain	Suspect catheter-associated thrombosis or malposition. Stop nonessential infusion, notify the provider, and obtain diagnostic evaluation. Do not massage the limb or remove the catheter solely on suspicion without a treatment plan unless an emergency requires it.
Erythema, warmth, tenderness, drainage, fever, chills, or hypotension	Possible local infection or bloodstream infection. Stop and assess promptly; notify the provider and follow the sepsis, culture, and catheter management pathway. Do not delay urgent treatment. Do not remove a central catheter solely to send the tip for culture unless clinically indicated and ordered.
Pain, burning, swelling, coolness, blanching, leakage, or slowed infusion	Suspect infiltration or extravasation, especially with a midline. Stop infusion immediately; leave the catheter in place initially if aspiration or an antidote may be required; disconnect tubing, notify the provider and pharmacy, and follow the agent-specific extravasation protocol. Do not flush.
External length change, inability to flush, unusual blood return, or new symptoms	Possible migration or malposition. Stop use, secure the catheter, compare documented external length, and obtain tip evaluation before resuming therapy that depends on correct position. Never push an exposed catheter segment back into the patient.

Crack, leak, or damaged hub	Clamp between the patient and the defect using a non-damaging clamp, stop use, cover with sterile dressing, and notify the vascular access team. Repair only if the device is designed for repair and policy permits.
Catheter pulled out or completely dislodged	Do not reinsert. Apply pressure and an occlusive sterile dressing, assess the patient, measure the removed catheter if policy requires, and notify the provider. If the catheter appears incomplete, immobilize the limb and escalate urgently for possible retained fragment.
Bleeding or oozing at the site	Apply gentle pressure without compromising the catheter, assess the dressing and coagulation status, and use an appropriate sterile dressing. Escalate persistent bleeding.
Contact dermatitis or adhesive injury	Assess whether the reaction is to antiseptic, adhesive, securement, or dressing; protect skin and use an approved alternative while maintaining securement and visibility. Distinguish irritation from infection.

7. PICC and Midline Care and Maintenance

Assessment Before Every Use

- Confirm patient, order, device type, lumen, allergies, and that the prescribed solution is appropriate for the device.
- Inspect the entire system and exposed limb. Ask about pain, burning, pressure, dyspnea, palpitations, chills, or difficulty with prior infusions.
- Check the site and surrounding skin for redness, tenderness, drainage, swelling, bleeding, leakage, and dressing or securement failure.
- Compare external catheter length with baseline when required for the device. Never use the line if migration is suspected until evaluated.
- Assess patency using a gentle pulsatile flush in the approved syringe size. Confirm blood return when required by therapy, policy, or device instructions. Never force.

Access, Flushing, and Locking

- Perform hand hygiene and use aseptic no-touch technique.
- Scrub the needleless connector with the approved antiseptic for the required friction time and allow it to dry completely before every access.
- Use a sterile needleless connector or access device and maintain a closed system.
- Flush before and after intermittent medications, after blood sampling, between incompatible medications, and at the prescribed interval when not in use.
- Use 0.9% sodium chloride and the volume, technique, and locking solution required by the device manufacturer and organizational policy. A pulsatile flush and appropriate positive-pressure sequence may reduce reflux.

- Use a syringe size that produces safe pressure according to device instructions; do not force against resistance.
- Verify medication compatibility. Never attempt to clear a suspected precipitate without identifying the cause and following a pharmacy-approved protocol.

Dressing, Securement, and Tubing

- Use a sterile transparent semipermeable dressing or sterile gauze dressing appropriate to the site. Change it at the policy-defined interval and immediately if damp, loose, soiled, or non-occlusive.
- During a dressing change, wear a mask and appropriate gloves, stabilize the catheter, remove the old dressing toward the insertion site, perform hand hygiene as required, don sterile gloves, assess the site and external length, cleanse with the approved antiseptic, allow it to dry, apply sterile securement, and cover without obscuring needed assessment.
- Use the least traumatic securement that prevents pistoning and migration. Avoid routine sutures when a safer approved alternative is available.
- Replace needleless connectors, administration sets, and add-on devices at evidence-based intervals and after contamination, blood exposure, or disconnection as required by policy and type of infusion.
- Label dressing and tubing according to policy. Keep connections visible and closed; minimize manipulations.
- Protect the device during bathing. Do not submerge it. Follow facility guidance for a water-resistant cover.

Blood Sampling

Use the catheter for blood sampling only when the device is designed for it and policy allows. Pause incompatible infusions, disinfect the connector, use the approved discard or waste-minimizing method, collect specimens in the correct order, flush thoroughly, and restart therapy safely. If blood cultures are required, follow the facility's paired peripheral and catheter specimen protocol; do not collect casually through a line.

Daily Necessity and Documentation

- Is the catheter still necessary today?
- Could the patient safely step down to a lower-risk device or oral therapy?
- Document indication, site and limb findings, dressing and securement condition, external length when applicable, patency and blood return, access or flush performed, patient symptoms, education, and escalation.
- Remove promptly when therapy is complete, the device is no longer required, or a complication makes continued use unsafe. Follow policy for removal, hemostasis, catheter integrity, dressing, and post-removal monitoring.

8. Patient and Caregiver Teaching

- Know the device name, purpose, and who to call at all hours.

- Keep the dressing clean, dry, intact, and secured. Do not pick at the dressing, open clamps, disconnect tubing, or handle the connector without training.
- Avoid submersion, pulling, constricting clothing or jewelry, and activities that could damage or dislodge the catheter. Follow clinician guidance regarding lifting, repetitive arm motion, blood pressure cuffs, and tourniquets.
- Report fever, chills, drainage, redness, warmth, pain, swelling of the arm, shoulder, neck, or chest, new shortness of breath, chest pain, palpitations, leaking, cracking, resistance, or a change in external length.
- For severe shortness of breath, chest pain, fainting, uncontrolled bleeding, or a catheter that breaks or is pulled out, clamp if trained and safe, cover the area, and seek emergency help.
- Use teach-back: ask the patient or caregiver to explain and demonstrate how they will protect the device and respond to warning signs.

9. Case Study Examples

Case Study 1: Choosing a Midline or PICC

A stable adult requires nine more days of an antibiotic that pharmacy confirms is appropriate for peripheral administration. The patient has difficult peripheral access, no history of thrombosis, intact upper-extremity skin, and suitable compressible veins on ultrasound. There is no expected need for parenteral nutrition, vesicant therapy, or frequent blood sampling.

Discussion questions

1. Which device is most appropriate?
2. What findings must be verified before insertion?
3. What change in the treatment plan would trigger reconsideration?

Suggested response: A midline is a reasonable option because the therapy is intermediate in duration and peripherally compatible. Confirm medication properties with pharmacy, expected duration, vessel patency and size, skin condition, thrombosis and bleeding risks, patient preferences, discharge support, and local policy. Reconsider the device if therapy changes to a central-only infusate, duration extends substantially, complications occur, or vessel preservation concerns arise.

Case Study 2: Vessel Preservation in Kidney Disease

An adult with advanced chronic kidney disease is referred for a PICC for several weeks of therapy. The patient is not currently receiving dialysis but may require future hemodialysis. **Discussion questions**

1. What is the principal concern?
2. What should happen before upper-extremity placement?
3. What factors should the team compare?

Suggested response: Upper-extremity PICCs and midlines may jeopardize veins that could be needed for future dialysis access. Pause routine placement and obtain nephrology or vein-preservation

consultation. Compare the prescribed therapy, urgency, duration, peripheral compatibility, anatomy, infection and thrombosis risks, and alternatives that preserve future access.

Case Study 3: Palpitations During PICC Advancement

During PICC advancement, the patient reports sudden palpitations, and the monitor shows new ectopy.

Discussion questions

1. What complication is most likely?
2. What action comes first?
3. When may the PICC be used?

Suggested response: The catheter or guidewire may have advanced too far and irritated the heart. Stop advancement, withdraw to the prior safe position, monitor the patient, and follow the dysrhythmia and tip-confirmation pathway. Do not use the PICC for central therapy until approved tip location and device function are confirmed.

Case Study 4: Midline Infiltration or Extravasation

Thirty minutes after an infusion starts through a midline, the patient reports burning. The upper arm is swollen and cool, and the infusion has slowed.

Discussion questions

1. What complication should be suspected?
2. What should the nurse avoid?
3. Which teams should be involved?

Suggested response: Suspect infiltration or extravasation. Stop the infusion immediately and do not flush. Leave the catheter in place initially if aspiration or an antidote may be required, disconnect the tubing, assess the limb, and notify the provider and pharmacy. Follow the medication-specific extravasation protocol and document the event.

Case Study 5: Possible PICC-Associated Infection

A patient with a PICC develops fever and chills during an infusion. The insertion site is tender with drainage, and the patient becomes hypotensive.

Discussion questions

1. What are the immediate priorities?
2. Should treatment wait for culture results?
3. What device decision requires a clinical plan?

Suggested response: Stop the infusion, assess airway, breathing, circulation, and vital signs, activate the sepsis or emergency pathway, and notify the responsible provider. Obtain cultures as ordered without delaying urgent treatment. Catheter removal or retention should follow the clinical management plan; do not remove it merely to culture the tip unless clinically indicated and ordered.

Case Study 6: Occlusion Versus Thrombosis

A PICC flushes poorly and has no blood return. Repositioning does not help. The patient also reports new arm and shoulder swelling.

Discussion questions

1. Why should the line not simply be treated as an uncomplicated lumen occlusion?
2. What actions are unsafe?
3. What evaluation is needed?

Suggested response: New limb swelling raises concern for catheter-associated thrombosis or malposition. Stop nonessential use, assess the limb and catheter, notify the provider, and obtain diagnostic evaluation. Do not force a flush, massage the limb, or administer a thrombolytic until mechanical, positional, and thrombotic causes are considered under the approved pathway.

10. Key Takeaways

- Choose the least invasive vascular access device that safely supports the prescribed therapy.
- A PICC is central; a midline is peripheral. Tip location determines what can be infused and which complications matter.
- Patient assessment and vessel preservation are part of device selection, not separate tasks.
- Maximal sterile barriers, chlorhexidine-based preparation when appropriate, connector disinfection, intact dressings, minimum lumens, and daily necessity review form the core of CLABSI prevention.
- Never force a wire, catheter, flush, or infusion. Stop, assess, and escalate.
- Early recognition of infection, thrombosis, infiltration or extravasation, migration, occlusion, and device damage prevents harm.

11. Post-Test

Instructions: Select the single best answer. Use local policy when a question describes an operational detail. Suggested passing score: 80%; pair the written test with observed competency before independent practice.

1. Which statement correctly distinguishes a PICC from a midline? A. Both tips terminate in the central circulation.
   B. A PICC is central; a midline terminates in a peripheral vein.
   C. A midline is appropriate for every vesicant.
   D. A PICC carries no risk of CLABSI.
2. Which treatment plan most strongly supports consideration of a midline? A. Peripherally compatible therapy for approximately 10 days.
   B. Parenteral nutrition.
   C. A central-only vesicant infusion.
   D. An emergency infusion when no assessment has occurred.
3. Before placing an upper-extremity PICC in a patient with advanced chronic kidney disease, the clinician should first: A. Place the catheter in the smallest visible vein.
   B. Request nephrology or vein-preservation review.

C. Insert two lumens for future convenience.
D. Avoid documenting the treatment duration.

4. Which group represents maximal sterile barrier precautions for PICC insertion? A. Clean gloves and a small fenestrated drape only.
   B. Mask and clean gloves only.
   C. Cap, mask, sterile gown, sterile gloves, and full-body sterile drape.
   D. Sterile gloves only when ultrasound is used.
5. During guidewire advancement, the patient reports electric, shooting pain with numbness. What is the best immediate action?
   A. Advance quickly through the discomfort.
   B. Stop and withdraw the needle or wire, then reassess neurovascular status.
   C. Flush forcefully.
   D. Complete the insertion and assess later.
6. A patient develops palpitations during PICC advancement. What is the most likely concern? A. The tip or wire has advanced too far.
   B. The dressing is loose.
   C. The catheter lumen is too large.
   D. The connector requires disinfection.
7. Which action is correct when a midline infusion causes burning, swelling, and coolness? A. Increase the pump rate.
   B. Flush to test patency.
   C. Stop the infusion and follow the agent-specific infiltration or extravasation pathway.
   D. Push the catheter farther into the vein.
8. A PICC has no blood return and meets resistance when flushed. What should the clinician do first? A. Use a smaller syringe and greater force.
   B. Check clamps, tubing, connectors, kinks, position, symptoms, and external length.
   C. Instill a thrombolytic before assessment.
   D. Remove the catheter immediately without evaluation.
9. Which practice best reduces contamination during routine catheter access?
   A. Disinfect the needleless connector using approved friction and allow it to dry before every entry.
   B. Reuse the same access device throughout the shift.
   C. Touch the disinfected connector to confirm dryness.
   D. Leave a loose dressing in place until the scheduled change day.
10. Which finding requires prompt evaluation for catheter-associated thrombosis? A. New arm, shoulder, neck, or chest swelling.
    B. A clean and intact dressing.
    C. Easy flushing with no symptoms.
    D. Stable external length.
11. Which daily question is essential for a patient with a PICC? A. Can another lumen be added?
    B. Is the central line still necessary today?
    C. Can the dressing change be delayed indefinitely?
    D. Can all medications be given without compatibility review?
12. Which patient statement shows correct understanding of home care?
    A. “I can push an exposed catheter segment back in.”
    B. “I will report fever, swelling, drainage, leaking, or a change in external length.”
    C. “I can submerge the dressing if I dry it afterward.”
    D. “I should force a flush if the line feels blocked.”

Post-Test Answer Key and Rationales

1. **B.** A PICC terminates centrally; a midline remains peripheral.

2. **A.** A midline may suit intermediate-duration, peripherally compatible therapy after full assessment.
3. **B.** Consultation helps preserve vessels that may be required for future dialysis access.
4. **C.** Maximal sterile barrier precautions include cap, mask, sterile gown, sterile gloves, and a full-body sterile drape.
5. **B.** Sharp electric pain or numbness may indicate nerve contact; never advance through it.
6. **A.** Palpitations or ectopy may occur when the catheter or wire advances too far.
7. **C.** Stop immediately and do not flush a suspected infiltration or extravasation.
8. **B.** Exclude simple mechanical and positional causes and assess for migration or complications before treatment.
9. **A.** Connector disinfection with adequate friction and drying is required before every access.
10. **A.** New limb or chest-area swelling may indicate thrombosis or malposition.
11. **B.** Daily necessity review supports prompt removal and reduces avoidable exposure.
12. **B.** These warning signs require timely clinical review; the catheter should never be forced, pushed back in, or submerged.

Resources and References

- **Centers for Disease Control and Prevention (CDC).** *Guidelines for the Prevention of Intravascular Catheter-Related Infections* and the associated *Summary of Recommendations*. Use for catheter selection, insertion barriers, skin antisepsis, dressing care, education, and infection-prevention recommendations.
- **CDC National Healthcare Safety Network (NHSN).** *Patient Safety Component Manual, Chapter 4: Bloodstream Infection Event*, January 2026. Use for current CLABSI and non-central-line bloodstream-infection surveillance definitions, reporting rules, and central-line eligibility.
- **Infusion Nurses Society.** Nickel B, Gorski L, Kleidon T, et al. *Infusion Therapy Standards of Practice*. 9th ed. *Journal of Infusion Nursing*. 2024;47(1S Suppl 1):S1–S285. doi:10.1097/NAN.0000000000000532. Use for vascular-access planning, insertion, infusion administration, complication management, and device maintenance.
- **Chopra V, Flanders SA, Saint S, et al.** The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): results from a multispecialty panel using the RAND/UCLA Appropriateness Method. *Annals of Internal Medicine*. 2015;163:S1–S39. doi:10.7326/M15-0744. Use for appropriateness of PICCs, midlines, and alternative vascular access devices by prescribed therapy, duration, and patient population.
- **Agency for Healthcare Research and Quality (AHRQ).** *Prevention of Central Line-Associated Bloodstream Infections* and *Toolkit for Reducing Central Line-Associated Blood Stream Infections*. Use for insertion checklists, maintenance audits, daily line-necessity rounds, state education, teamwork, and quality improvement.
- **Local resources.** Current organizational vascular-access and CLABSI policies; infection-prevention procedures; pharmacy compatibility and extravasation guidance; laboratory blood-culture procedures; device manufacturer instructions for use; nephrology vein-preservation pathway; and emergency-response protocols.

Resource-use note: Verify the current edition, update date, and local requirements before using any recommendation in practice. Where sources differ, follow applicable law, organizational policy, pharmacy guidance, manufacturer instructions, and the patient's individualized clinical plan.