



Peripherally inserted central catheter (PICC) drug administration

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■ Introduction

The most common use for a peripherally inserted central catheter (PICC) in adults is administration of drugs, such as opioids, analgesics, antibiotics, parenteral nutrition, and chemotherapy.^{[1][2]} When administering drugs through the PICC of an older adult, a nurse must keep certain considerations in mind. First, such a patient commonly has a compromised cardiac, hepatic, or renal system and is therefore at greater risk for complications associated with parenteral drug administration. Second, an older adult might not be able to articulate symptoms because of an underlying condition, such as stroke, intubation, tracheotomy, dementia, or delirium. Third, if an older adult receives a large volume of fluid or receives fluid at a rapid rate, circulatory overload can occur.^[1] Thus, frequent monitoring during infusions is essential. An older adult is also at risk for speed shock, a condition that results from rapid administration of a bolus medication or infusion. An older adult may be unable to articulate such adverse effects as dizziness or headache because of their rapid onset. These early symptoms can rapidly progress to chest tightness, hypotension, irregular pulse, and cardiac arrest.^[3] Careful control of the rate of administration and close monitoring are necessary to reduce the risk of speed shock.^[1]

To prevent vascular catheter-associated bloodstream infections, sterile no-touch technique is necessary when administering medications through a PICC.^{[4][5][6]}

◆ **Hospital-acquired condition alert:** Keep in mind that the Centers for Medicare and Medicaid Services considers a vascular catheter-associated infection a hospital-acquired condition *because it can be reasonably prevented using a variety of best practices*. Make sure to follow evidence-based infection-prevention techniques, such as performing hand hygiene, maintaining sterile no-touch technique, limiting catheter manipulations, and performing a vigorous mechanical scrub of the needleless connectors, when administering drugs through a PICC to reduce the risk of vascular catheter-associated infections.^{[4][5][7][8][9]}◆

■ Equipment

- Gloves
- Prescribed medication in an IV container with IV administration set (for infusion) or in a syringe (for IV bolus)
- 10-mL syringes prefilled with preservative-free normal saline solution (or a syringe specifically designed to generate lower injection pressure)
- Antiseptic pads (chlorhexidine-based, povidone iodine, or alcohol)
- Optional: vital signs monitoring equipment, locking solution, electronic infusion device, pulse oximeter and probe, capnography equipment, facility-approved standardized sedation scale, disinfectant-containing end cap, automated blood pressure monitoring equipment

■ Preparation of Equipment


Inspect all IV equipment and supplies. If a product is expired, is defective, or has compromised integrity, remove it from patient use, label it as expired or defective, and report the expiration or defect as directed by your facility.^[10]

■ Implementation

- Avoid distractions and interruptions when preparing and administering medications to prevent medication errors.^{[6][11][12]}
- Review the practitioner's order to make sure that the prescribed infusion solution or medication, dose, rate, and route of administration are appropriate for the patient's age, condition, and access device and that the infusion or medication is compatible with other solutions or medications. Make sure that the order includes any test results that require monitoring.^{[1][2][6][13][14][15][16][17]} Address concerns about the order with the practitioner, the pharmacist, your supervisor, or the risk management department or as directed by your facility.^{[6][17]}
- Check the patient's medical record for an allergy or a contraindication to the prescribed medication. If one exists, don't administer the medication and notify the practitioner.^{[13][14][15][16]}
- Review the patient's medical record for confirmation of catheter type, size, and tip location. Review laboratory test results and assess the appropriateness of therapy.^[1]

- Reconcile the patient's medications when the practitioner orders a new medication *to reduce the risk of medication errors, including omissions, duplications, dosing errors, and drug interactions.*^{[6] [17]}
- Gather and prepare the necessary equipment and supplies, including a prefilled syringe or a prepared infusion container of the prescribed medication.
- Compare the medication label to the practitioner's order *to verify the correct medication, indication, dose, route, and time of administration.*^{[6] [13] [14] [15] [16]}
- Check the expiration date on the medication. If the medication is expired, return it to the pharmacy and obtain new medication.^{[6] [13] [14] [15] [16]}
- Visually inspect the solution for particles, discoloration, or other loss of integrity; don't administer the medication if integrity is compromised.^{[6] [13] [14] [15] [16]}
- Discuss any unresolved concerns about the medication with the patient's practitioner.^{[13] [14] [15] [16]}
- Perform hand hygiene.^{[4] [18] [19] [20] [21] [22] [23] [24]}
- Confirm the patient's identity using at least two patient identifiers.^[25]
- Provide privacy.^{[26] [27] [28] [29]}
- Explain the procedure to the patient and family (if appropriate) according to their individual communication and learning needs *to increase their understanding, allay their fears, and enhance cooperation.*^[30]
- If the patient is receiving the medication for the first time, teach the patient or family (if appropriate) about potential adverse reactions and other concerns related to the medication.^{[13] [14] [15] [16] [31]}
- Raise the bed to waist level before providing patient care *to prevent caregiver back strain.*^[32]
- Perform hand hygiene.^{[4] [18] [19] [20] [21] [22] [23] [24]}
- Obtain the patient's vital signs and assess the patient's condition if applicable.^{[1] [2]}
- Verify that you're administering the medication at the proper time, in the prescribed dose, and by the correct route *to reduce the risk of medication errors.*^{[6] [13] [14] [15] [16]}
- If your facility uses bar-code technology, use it as directed by your facility.^[6]

◆ **Clinical alert:** Some medications may be considered high-alert medications *because they can cause significant patient harm when used in error.*^{[33] [34]} ◆

- If required by your facility, before beginning an infusion or administering a bolus injection, have another nurse perform an independent double-check *to verify the patient's identity and to make sure that you have the correct medication in the prescribed strength or concentration; the medication's indication corresponds with the patient's diagnosis; the dosage calculations are correct and the dosing formula used to derive the final dose is correct; the prescribed route of administration is safe and proper for the patient; the prescribed time and frequency of administration are safe and proper for the patient; and, if using an infusion, the pump settings are correct and the infusion line is attached to the correct port.*^{[6] [17] [34]}
- After comparing results of the independent double-check with the other nurse, administer the medication if there are no discrepancies. If discrepancies exist, rectify them before administering the medication.^[34]
- Perform hand hygiene.^{[4] [18] [19] [20] [21] [22] [23] [24]}
- Put on gloves *to comply with standard precautions.*^{[1] [2] [35] [36] [37]}
- If a disinfectant-containing end cap is covering the end of the needleless connector, remove and discard it.^{[38] [39]}
- Perform a vigorous mechanical scrub of the needleless connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.^{[5] [39]}
- While maintaining sterility of the syringe tip, attach a prefilled 10-mL syringe or a syringe specifically designed to generate lower injection pressure containing preservative-free normal saline solution to the needleless connector. Unclamp the catheter and aspirate slowly for a blood return that is the color and consistency of whole blood. If you don't obtain a blood return, take steps to locate an external cause of obstruction.^{[1] [2] [40]}
- If you obtain a blood return, inject preservative-free normal saline solution slowly into the catheter. Use a minimum volume of twice the internal volume of the catheter system. Don't forcibly flush the device; further evaluate the device if you meet resistance.^{[1] [2] [40]}
- Remove and discard the syringe in an appropriate container.^{[35] [41]} 
- Perform a vigorous mechanical scrub of the needleless connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.^{[5] [39]}

Administering an IV bolus injection

- Attach the syringe containing the prescribed medication for IV bolus injection to the needleless connector.¹²
- ♦ **Clinical alert:** After using a 10-mL syringe (or a syringe designed specifically to generate lower injection pressure) filled with preservative-free normal saline solution to confirm patency of the vascular access device, you can administer the medication by IV bolus injection in a syringe of appropriate size to measure and administer the required medication dose.⁴⁰⁴² Don't transfer the medication to a larger syringe.⁴⁰♦
- Inject the medication into the PICC at the rate indicated on the medication label. Consult with the pharmacist if the label doesn't specify a rate.¹²
- Remove and discard the syringe in an appropriate container.³⁵⁴¹

Administering an infusion

- Spike the IV infusion container and prime the IV administration set tubing, as directed. (See the "[IV administration set priming](#)" procedure.) Insert the IV administration set tubing into an electronic infusion device. (See the "[IV pump use](#)" procedure.)
- Perform a vigorous mechanical scrub of the needleless connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.⁵³⁹
- Clamp the PICC.
- Connect the IV administration set tubing to the PICC.
- Trace the IV administration set tubing from the patient to its point of origin *to make sure that you're connecting the tubing to the correct port*. Route the tubing in a standardized direction if the patient has other tubing and catheters that have different purposes. If you'll be using multiple IV lines, label the tubing at both the distal (near the patient connection) and proximal (near the source container) ends *to reduce the risk of misconnection*.⁶⁴³⁴⁴
- Set the electronic infusion device according to the practitioner's order. Make sure that alarm limits are set appropriately and that alarms are turned on, functioning properly, and audible to staff.⁴⁵⁴⁶⁴⁷
- Unclamp the PICC and IV administration set tubing. Begin the infusion, as ordered.
- When the infusion is complete, clamp the catheter and disconnect the IV administration set tubing.

Completing the procedure

- Proceed with flushing the device *to prevent mixing of incompatible medications and solutions*:
 - Perform a vigorous mechanical scrub of the needleless connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.⁵³⁹
 - While maintaining sterility of the syringe tip, attach a syringe containing preservative-free normal saline solution to the needleless connector. (Use a 10-mL syringe or a syringe specifically designed to generate lower injection pressure.) Unclamp the catheter and inject preservative-free normal saline solution into the catheter at the same rate of injection as the prescribed medication. Use the amount of flush solution needed to adequately clear the medication from the administration set lumen and catheter. Don't forcibly flush the device; further evaluate the device if you meet resistance. Consider a pulsatile flushing technique because short boluses of flush solution interrupted by short pauses may be more effective at removing deposits (such as fibrin, drug precipitate, and intraluminal bacteria) than a continuous low-flow technique. Alternatively, if the medication is incompatible with normal saline solution, use dextrose 5% in water (D₅W), followed by preservative-free normal saline solution. Don't allow D₅W to remain in the catheter lumen *because it provides nutrients for biofilm growth*.¹²⁴⁰
 - Remove and discard the syringe in the appropriate receptacle.³⁵⁴¹
- If necessary, proceed with locking the device:
 - Perform a vigorous mechanical scrub of the needleless connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.⁵³⁹
 - Maintaining sterility of the syringe tip, attach a syringe containing locking solution to the needleless connector.¹²⁴⁰
 - Inject the locking solution slowly into the PICC.¹²⁴⁰
 - Clamp the PICC according to the type of needleless connector. Follow the manufacturer's directions for use. Use the following sequence if directions aren't available:³⁹
 - For a positive-pressure needleless connector, clamp the device after disconnecting the syringe.

- For a negative-pressure needleless connector, maintain pressure on the syringe plunger while closing the PICC clamp and then disconnect the syringe.
- For a neutral displacement needleless connector or for an anti-reflux needleless connector, clamp the PICC before or after syringe disconnection; a specific clamping sequence isn't required.^[39]
- If available at your facility, place a disinfectant-containing end cap on the needleless connector *to reduce the risk of vascular catheter-associated infection*.^{[38] [39]}
- Return the bed to the lowest position *to prevent falls and maintain the patient's safety*.^[48]
- Discard used supplies in appropriate receptacles.^{[35] [41]}
- Remove and discard your gloves.^{[35] [41]}
- Perform hand hygiene.^{[4] [18] [19] [20] [21] [22] [23] [24]}
- Monitor the patient closely for adverse reactions to the prescribed medication.^{[6] [49] [50]}
- If the patient is receiving IV opioid medication, frequently monitor the patient's respiratory rate, oxygen saturation level by pulse oximetry, end-tidal carbon dioxide level by capnography (if available), and sedation level using a facility-approved standardized sedation scale *to decrease the risk of adverse events associated with IV opioid use*.^{[49] [50]}
- For a patient receiving IV opioid medication, explain to the patient and family members about the assessment and monitoring process and tell them to alert staff if breathing problems or sedation occurs.^{[49] [50]}
- Perform hand hygiene.^{[4] [18] [19] [20] [21] [22] [23] [24]}
- Document the procedure.^{[51] [52] [53] [54] [55]}

■ Special Considerations

- The Joint Commission issued a sentinel event alert concerning medical device alarm safety *because alarm-related events have been associated with permanent loss of function or death*. Among the major contributing factors were improper alarm settings, alarm settings turned off inappropriately, and alarm signals that were inaudible to staff. Make sure that alarm limits are set appropriately and that alarms are turned on, functioning properly, and audible to staff. Follow facility guidelines for preventing alarm fatigue.^{[45] [46] [47]}
- The Joint Commission has issued a sentinel event alert related to managing risk during transition to new International Organization for Standardization tubing standards designed to prevent dangerous tubing misconnections, which can lead to serious patient injury and death. During the transition, be sure to trace the tubing and catheter from the patient to the point of origin before connecting or reconnecting any device or infusion, at any care transition (such as a new setting or service), and as part of the handoff process; route tubes and catheters with different purposes in different standardized directions; when there are different access sites or several bags hanging, label the tubing at the distal and proximal ends; use tubing and equipment only as intended; and store medications for different delivery routes in separate locations.^[44]
- Administer IV contrast media according to the PICC manufacturer's instructions.^[56]

■ Complications

Complications associated with drug administration through a PICC may include:

- adverse reactions to the particular drug that you administer
- catheter tip migration with vigorous flushing
- infection
- thrombosis
- air embolism.^{[57] [58]}

■ Documentation

Documentation associated with drug administration through a PICC includes:

- type of therapy
 - drug
 - strength
 - dose
 - rate

- time
- route
- method of administration
- condition and patency of the site before and after administration
- which solutions and medications are infusing through each lumen (if using a multilumen catheter)
- patient's response to infusion therapy, including:
 - symptoms
 - adverse effects
 - adverse events
 - laboratory tests (as appropriate)
- adverse reactions to the prescribed medication
 - date and time the practitioner was notified
 - prescribed interventions
 - patient's response to those interventions⁵⁹
- any complications and your interventions⁵⁵
- teaching provided to the patient and family (if applicable)
- understanding of that teaching
- follow-up teaching needed.

This procedure has been reviewed by the Academy of Medical-Surgical Nurses.



■ Related Procedures

- [Calculating and setting an IV drip rate](#)
- [Chemotherapy administration, intravascular \(IV\), pediatric](#)
- [IV alteplase administration for acute ischemic stroke](#)
- [IV alteplase administration for acute myocardial infarction](#)
- [IV cardiovascular drug administration](#)
- [IV cardiovascular drug administration, pediatric](#)
- [IV EPINEPHrine administration](#)
- [IV epoprostenol administration](#)
- [IV factor administration, home care](#)
- [IV inotropic medication administration, home care](#)
- [IV insulin administration](#)
- [IV propofol administration](#)
- [IV treprostinil administration](#)
- [Midline catheter flushing and locking](#)
- [Oxytocin administration during labor and delivery](#)
- [Oxytocin administration, postpartum](#)
- [Patient-controlled analgesia](#)
- [Patient-controlled analgesia, pediatric](#)
- [Peripherally inserted central catheter \(PICC\) blood sampling](#)
- [Peripherally inserted central catheter \(PICC\) blood sampling, pediatric](#)

- [Peripherally inserted central catheter \(PICC\) continuous infusion, home care](#)
- [Peripherally inserted central catheter \(PICC\) dressing change](#)
- [Peripherally inserted central catheter \(PICC\) dressing change, home care](#)
- [Peripherally inserted central catheter \(PICC\) dressing change, neonatal](#)
- [Peripherally inserted central catheter \(PICC\) dressing change, pediatric](#)
- [Peripherally inserted central catheter \(PICC\) flushing and locking](#)
- [Peripherally inserted central catheter \(PICC\) flushing and locking, pediatric](#)

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([Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions](#))

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[Abstract](#) | [Complete Reference](#)

Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions

The following leveling system is from *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice* (2nd ed.) by Bernadette Mazurek Melnyk and Ellen Fineout-Overholt.

Level I: Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)

Level II: Evidence obtained from well-designed RCTs

Level III: Evidence obtained from well-designed controlled trials without randomization

Level IV: Evidence from well-designed case-control and cohort studies

Level V: Evidence from systematic reviews of descriptive and qualitative studies

Level VI: Evidence from single descriptive or qualitative studies

Level VII: Evidence from the opinion of authorities and/or reports of expert committees

Modified from Guyatt, G. & Rennie, D. (2002). Users' Guides to the Medical Literature. Chicago, IL: American Medical Association; Harris, R.P., Helfand, M., Woolf, S.H., Lohr, K.N., Mulrow, C.D., Teutsch, S.M., et al. (2001). Current Methods of the U.S. Preventive Services Task Force: A Review of the Process. American Journal of Preventive Medicine, 20, 21-35.

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