Implanted port accessing

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Introduction

An implanted port, also known as a *vascular access device* or *vascular access port*, is a type of central venous access device that's surgically implanted by a surgeon or an interventional radiologist using local anesthesia. It consists of a Silastic or polyurethane catheter attached to a reservoir covered with a self-sealing silicone septum. The practitioner places the catheter in the central venous system, typically implanting the reservoir in a subcutaneous pocket in the upper anterior chest wall. When use of the anterior chest wall isn't feasible, alternative sites for implantation include the trapezius, femoral vein, and upper arm.[1]

An implanted port is most commonly used when a patient requires some type of long-term IV therapy and an external central venous device isn't appropriate or desirable.[2] An implanted port is also an option for a patient who requires infrequent or intermittent vascular access.[1] The port may have one or two lumens, depending on the patient's needs.[2,3] The port can be used immediately after placement has been confirmed; however, some edema and tenderness may persist for about 72 hours, making the device initially difficult to palpate and slightly uncomfortable for the patient. (See *Understanding implanted ports*.) Compared with externalized tunneled catheters, implantable ports have a decreased risk of infection, require minimal maintenance, and have a more discrete design, resulting in a high level of patient acceptance.[4]

A patient requiring repeated computed tomography scanning with contrast may receive an implanted port specially developed to withstand the high pressures of power injectors. Use of a power injector requires a specialized access needle and tubing approved for power injection to ensure that the tubing and connections won't rupture or separate.[3]

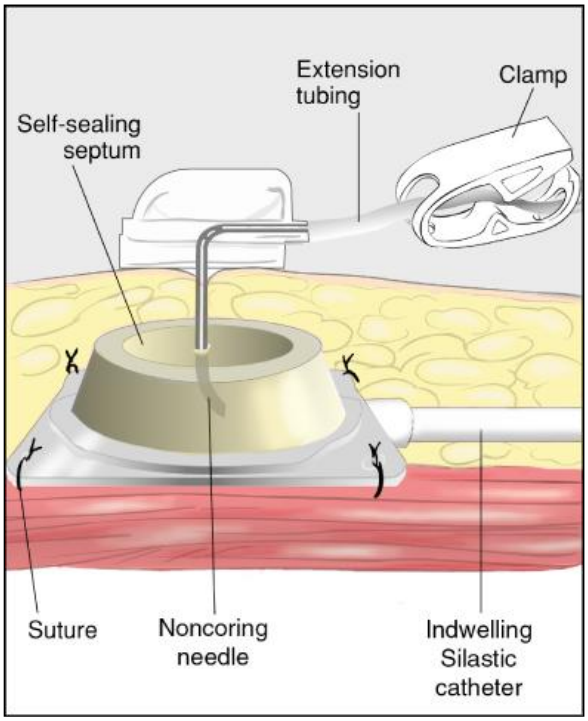
When a patient requires IV therapy, catheter flushing, or blood withdrawal, an implanted port is accessed using a noncoring needle. This type of needle has a deflected point, which slices the port's septum. A nurse, a practitioner, or an appropriately trained patient or caregiver may perform implanted port access, site care, and infusion.[5] Accessing the port requires sterile no-touch technique to reduce the risk of vascular catheter–associated infection.[6]

◆ ***Hospital-acquired condition alert:*** Keep in mind that the Centers for Medicare and Medicaid Services considers vascular catheter–associated infection a hospital-acquired condition, *because a variety of best practices can reasonably prevent it.* Be sure to follow evidence-based infection prevention practices, such as performing hand hygiene, preparing the access site properly, and maintaining sterile no-touch technique, *to reduce the risk of vascular catheter–associated infections.*[7,8,9,10,11] ◆

EQUIPMENT

UNDERSTANDING IMPLANTED PORTS

Typically, an implanted port helps deliver intermittent infusions of medication, parenteral nutrition, chemotherapy, and blood products.[10,12] The patient's skin completely covers the device, reducing the risk of extrinsic contamination.[1] An implanted port consists of a catheter connected to a small reservoir. A septum designed to withstand multiple punctures seals the reservoir. Accessing the port requires insertion of a special noncoring needle perpendicular to the reservoir (as shown below).



Equipment

- Gloves
- Masks
- Sterile gloves
- Sterile drape
- Safety-engineered noncoring needle (smallest-gauge necessary to accommodate the prescribed therapy and length that allows external components to sit level with the skin and securely within the port) with attached extension set tubing[6]
- Antiseptic pad or applicator (chlorhexidine-based, povidone iodine, or alcohol)
- Antiseptic swabs or applicators (alcohol-based chlorhexidine preferred; if contraindicated, use an iodophor, such as povidone-iodine or 70% alcohol)[13]
- Sterile 10-mL syringes (or syringes specifically designed to generate lower injection pressure) prefilled with preservative-free normal saline solution[14]
- Sterile transparent semipermeable dressing (may be chlorhexidine-impregnated)
- Sterile needleless connector
- Securement device
- Labels
- Optional: prescribed local anesthetic agent and administration equipment, prescribed locking solution such as prefilled heparinized saline flush solution syringe (10 units/mL), ordered IV fluid, primed IV administration set, sterile 2" × 2" (5- × 5-cm) gauze, sterile tape, chlorhexidine-impregnated sponge dressing, disinfectant-containing end cap, needle assistive device, sterile alcohol-free skin barrier product[15] [16]

Some facilities use an implantable port access kit, which contains most of the necessary 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.[17]

Implementation

- Review the patient's medical record *to determine the type (such as a power-injectable device or single or double port) and location of the implanted port, whether previous access occurred, and the patient's response to the procedure.*[6]
- Ensure confirmation of catheter tip placement.[18]
- If required by your facility, verify the practitioner's order.
- Determine whether the patient has an allergy or contraindication to the antiseptic, anesthetic, or prescribed solution.[13] [19]
- Gather and prepare the necessary equipment and supplies.
- Perform hand hygiene.[10] [20] [21] [22] [23] [24] [25] [26]
- Confirm the patient's identity using at least two patient identifiers.[27]
- Provide privacy.[28] [29] [30] [31]
- Explain the procedure to the patient and family (if appropriate) according to their individual learning and communication needs *to increase their understanding, allay their fears, and enhance cooperation.*[32] [33]
- Assess the patient's pain tolerance, and discuss preferences for using a local anesthetic before accessing the port.[6] [15] [16]
- Administer a local anesthetic agent, as necessary and prescribed, following safe medication administration practices.[15] [16] [34] [35] [36] [37] [38] (See *Easing the pain of accessing an implanted port*.) Also implement nonpharmacologic pain management strategies, such as distraction, relaxation techniques, and breathing exercises, as appropriate.[34] (See the "Pain management" procedure.)

EASING THE PAIN OF ACCESSING AN IMPLANTED PORT

You can ease the pain of accessing the implanted port by administering an anesthetic agent before accessing the port following these steps:

- Obtain and review the practitioner's order.
- Review the patient's medical record for any history of an allergy to the prescribed anesthetic.[15] [16]
- Perform hand hygiene.[20] [21] [22] [23] [24] [25] [26]
- Confirm the patient's identity using at least two patient identifiers.[27]
- Provide privacy.[28] [29] [30] [31]
- Provide the patient with information about the selected local anesthetic agent, including the benefits, potential complications, and management.
- Perform hand hygiene.[20] [21] [22] [23] [24] [25] [26]
- Put on gloves, as necessary, *to comply with standard precautions*.[39] [40] [41]

For anesthetic cream

- Apply the recommended amount of anesthetic cream to the implanted port access site.[15] [16]
- Cover the area with a transparent semipermeable dressing.[15] [16]
- Note the time of application on the dressing with a marking pen.
- After the recommended application time, remove the dressing, wipe off the cream, evaluate the effectiveness of the anesthetic, and assess for any adverse reactions to the anesthetic.[15] [16]
- Disinfect the site with an antiseptic solution and then access the port as usual.[15] [16]

For an anesthetic dermal patch

- Apply the dermal patch to the intended access site.[15] [16]
- Leave the patch on the skin for the recommended application time.[15] [16]
- Remove the patch, evaluate the effectiveness of the anesthetic, and assess the site for any adverse reactions to the anesthetic patch.[15] [16]
- Disinfect the site with an antiseptic solution and then access the port as usual.[15] [16]

For an intradermal anesthetic

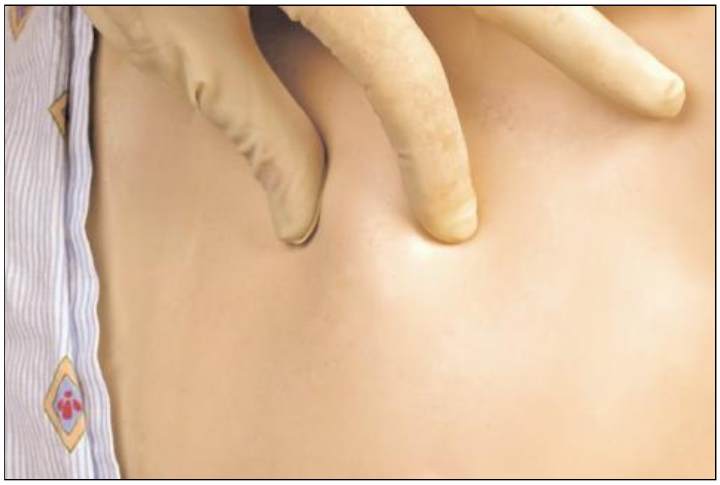
- Disinfect the skin of the intended access site with antiseptic solution, and allow it to dry.[15] [16]

- Withdraw 0.3 mL of injectable anesthetic into a 1-mL syringe.[15][16]
- Gently insert the needle intradermally above the intended access site with the needle bevel up.[15][16]
- Aspirate to make sure that the needle wasn't inadvertently inserted into a vessel.[15][16]
- Inject 0.1 to 0.3 mL of the anesthetic, forming a wheal at the intended access site.[15][16]
- Remove the needle and discard the syringe in a puncture-resistant sharps disposal container.[15][16]
- Evaluate the effectiveness of the anesthetic, and assess for any adverse reactions.[15][16]
- Disinfect the site with an antiseptic solution and then access the port as usual.[15][16]

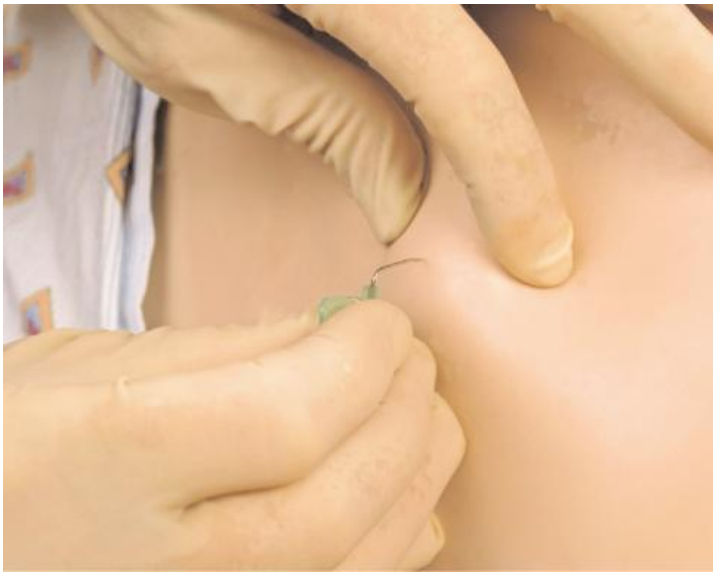
For topical vapocoolant (skin refrigerant) spray

- Disinfect the skin of the intended access site with antiseptic solution, and allow it to dry.
- Spray the vapocoolant from the recommended distance at the intended insertion site immediately before cannulation.[42]
- Apply the spray for the recommended number of seconds or until the skin turns white, whichever occurs sooner.[42]
- Allow the liquid to evaporate from the skin.
- Access the port as usual.

- If appropriate, raise the bed to waist level before providing care *to prevent caregiver back strain*.[43]
- Perform hand hygiene.[10][20][21][22][23][24][25][26]
- Put on gloves *to comply with standard precautions*.[39][40][41]
- Position the patient for comfort with the head turned away from the implanted port.[15][16] Alternatively, put a mask on the patient.
- Assess the patient's skin overlying the port and the tissue surrounding the port.[15][16] Observe and palpate for swelling, pain, erythema, and drainage; the presence of chest wall collateral circulation, which may signal occlusion; erosion of the port through the skin; and signs of thrombosis.[6] Don't insert the noncoring needle if such findings are present. Instead, notify the patient's practitioner.
- Palpate and locate the septum; assess for device rotation.[15][16]
- Remove and discard your gloves.[39][41][44]
- Perform hand hygiene.[10][20][21][22][23][24][25][26]
- Put on a mask.[15][16]
- Perform hand hygiene.[10][20][21][22][23][24][25][26]
- Open the supplies and prepare a sterile field using a sterile drape. Using sterile no-touch technique, place the supplies on the sterile field.[6]
- Perform hand hygiene.[10][20][21][22][23][24][25][26]
- Put on sterile gloves.[15][16][39][41]
- Prepare the implanted port access site with an antiseptic agent (alcohol-based chlorhexidine preferred; if contraindicated, use an iodophor, such as povidone-iodine or 70% alcohol) following the manufacturer's instructions. Apply using a single-use sterile applicator. Allow the solution to dry completely without fanning, wiping, or blowing on the site.[13]
    - For alcohol-based chlorhexidine (preferred), apply with an applicator using a vigorous side-to-side motion for 30 seconds. Allow the area to dry completely.[45]
    - For povidone-iodine solution, apply using a swab. Begin at the intended insertion site, and move outward in concentric circles. Allow the solution to dry completely (typically at least 2 minutes).[46]
- Attach a sterile needleless connector to the extension set, which is connected to the noncoring needle.[15][16]
- While maintaining sterility of the syringe tip, attach a syringe containing preservative-free normal saline solution to the needleless connector and prime the extension set and noncoring needle with preservative-free normal saline solution.[15][16] Clamp the extension tubing.
- With your nondominant hand, palpate and stabilize the implanted port (as shown below).[15][16]



- Grasp the noncoring needle with your dominant hand, and insert the noncoring needle perpendicular to the skin (as shown below) through the septum of the port until the needle tip comes in contact with the bottom of the port.[6] Consider orienting the bevel of the noncoring needle in the opposite direction from the outflow channel where the catheter is attached to the port body *to remove a greater amount of protein when flushing with this bevel orientation.*[6] [47] One study suggests that a needle assistive device may improve first-attempt success with insertion of the noncoring needle into the port.[6]



- Unclamp the extension tubing and slowly aspirate for a blood return that's the color and consistency of whole blood *to help confirm device patency.*[6] If you don't obtain a blood return, take steps to locate and correct an external cause of obstruction.[14] Have the patient change position, raise the arms overhead, breathe deeply, or cough *to alter catheter position.* If you still don't obtain a blood return to confirm noncoring needle placement, notify the practitioner.[48]
- If you obtain a blood return, inject preservative-free normal saline solution slowly into the port. Use a minimal volume of twice the internal volume of the implanted port system; a larger volume may be necessary if the implanted port is used for blood sampling, transfusions, parenteral nutrition, contrast media, or other viscous solutions. Don't forcibly flush the device; troubleshoot the device if you meet resistance. (See the "Implanted port flushing and locking" procedure.)[14] [15] [16]
- Close the clamp on the extension tubing.
- Remove the syringe and discard it in a puncture-resistant sharps disposal container.[41]
- Secure the noncoring needle *to reduce the risk of needle dislodgement, which reduces the risk of infiltration and extravasation.* Sterile tape strips were found to be effective in a quality improvement initiative.[6]

Support the wings of the noncoring needle (if necessary) with sterile gauze; make sure that the gauze doesn't prevent visualization of the needle insertion site.[6]

- If applicable, place a chlorhexidine-impregnated sponge dressing beneath the needle. The edges of the radial slit of the sponge dressing must touch *to maximize antimicrobial action.* Always follow the manufacturer's directions.[10] [49] [50] [51] Oncology guidelines suggest using a chlorhexidine-impregnated sponge dressing around the needle insertion site when the duration of infusions exceeds 4 to 6 hours.[6]
- If the patient is at high risk for skin injury, apply a sterile, alcohol-free skin barrier product, as necessary, according to the manufacturer's instructions *to reduce the risk of medical adhesive-related skin injury.*[52]
- Apply a sterile transparent semipermeable dressing over the insertion site, noncoring needle, and upper portion of the extension tubing *to maintain sterility and allow visualization of the needle and insertion site.*[6] [15] [16]
- Perform a vigorous mechanical scrub of the needleless connector device for at least 5 seconds using an antiseptic pad. Allow it to dry completely.[9] [53]
- If the practitioner prescribed an IV infusion, attach the primed IV administration set to the needleless connector and begin infusion therapy, as ordered. (See the "Implanted port continuous infusion" procedure.) Trace the IV tubing from the patient to the point of origin *to make sure that you're attaching the tubing to the correct port before beginning the infusion.*[19] [54] [55] Route the tubing in a standardized direction if the patient has other tubing and catheters having different purposes. Label the tubing at both the distal (near the patient connection) and proximal (near the source container) ends *to reduce the risk of misconnection* if multiple IV lines will be used.[19]
- If the practitioner didn't prescribe a continuous infusion, lock the device with prescribed locking solution[6] [14] and, if available at your facility, place a disinfectant-containing end cap on the needleless connector *to reduce the risk of vascular catheter–associated infection.*[53]
- Label the dressing with the current date or the date the dressing is due for changing as directed by your facility. Don't place the label over the access site.[15] [16] [52]
- Discard used supplies in appropriate receptacles.[39] [41] [44]
- Return the bed to the lowest position *to prevent falls and maintain the patient's safety.*[56]
- Remove and discard your gloves and mask.[39] [41] [44]
- Perform hand hygiene.[10] [20] [21] [22] [23] [24] [25] [26]
- Document the procedure.[57] [58] [59] [60] [61]

Special Considerations

- When planning to use an implanted port for power injections, identify the power injection capability at the time of access and immediately before power injection. Use an identification method, such as the unique device identifier noted in a retrievable manner in the patient's health record, an identification card, review of operative procedure report, radiographic scan, or palpation of the port. If using palpation, you must use another method as well, because not all power injection capable ports are identifiable by palpation. Before power injection, ensure that all power-injectable implanted ports are accessed with the designated noncoring needle and infusion set.[6]
- Anticipate the use of antimicrobial locking solutions for treatment of a port-related infection or if the patient is at high risk for infection.[6] If you use an antimicrobial locking solution, first withdraw the solution from the port lumen before flushing and discard. *Flushing the lock solution into the patient's bloodstream could increase development of antibiotic resistance and other adverse effects.*[16]
- The Joint Commission issued a sentinel event alert related to managing risk during transition to new International Organization for Standardization tubing standards that were designed to prevent dangerous tubing misconnections, which can lead to serious patient injury and death. During the transition, make 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 having different purposes in different standardized directions; when there are different access sites or several bags hanging, label the tubing at both the distal and proximal ends; use tubing and equipment only as intended; and store medications for different delivery routes in separate locations.[55]

Patient Teaching

Before discharge to home, provide thorough teaching about procedures as well as follow-up visits from a home health nurse to ensure safety and successful treatment.[6] Tell the patient the type of port that's in place, and explain the importance of carrying a port identification card.

If the patient will be self-accessing the port, explain that the most uncomfortable part of the procedure is the actual insertion of the needle into the skin. When the needle has penetrated the skin, the patient will feel mostly pressure. Eventually, the skin over the port will become desensitized from frequent needle punctures. Until then, the patient may want to use a topical anesthetic. Stress the importance of pushing the needle into the port until the patient feels the needle bevel touch the bottom of the port; many patients tend to stop short of the bottom of the port, leaving the needle bevel in the septum.

If the patient is receiving an infusion at home, teach the patient and family about checking the dressing daily. Also teach the patient how to dress and undress to avoid pulling at the needle site; how to protect the site during bathing and when wearing a seat belt; to report pain, burning, stinging, or soreness at the site immediately; and to stop the infusion and report wetness, leaking, or swelling at the site.[6]

Answer questions from the patient and family (if appropriate). Allow them to teach-back and demonstrate the procedure skills they have learned to evaluate their understanding.[33]

Complications

Complications associated with accessing an implanted port may include:

- localized infection
- systemic infection
- skin breakdown. (See *Troubleshooting an implanted port*.)

TROUBLESHOOTING

TROUBLESHOOTING AN IMPLANTED PORT

Follow these tips to troubleshoot an implanted port.

Inability to flush or draw blood

- Check for external mechanical causes by assessing the entire infusion system, from the administration set to the access site under the dressing; ensure that the extension tubing or IV administration set isn't clamped or kinked, the needleless connector isn't obstructed or malfunctioning, and the port isn't malpositioned.[48]
- If the port is located in the patient's upper anterior chest wall, move the patient's arm, shoulder, and head and attempt to aspirate for blood. Notify the practitioner if you're able to aspirate only when the patient is in a certain position. The patient may need to be evaluated for pinch-off syndrome of the catheter.[62] Collaborate with the practitioner to manage pinch-off syndrome if present.[48]
- Verify that the correct needle length was used and that the needle is properly placed. Replace the needle, as necessary.[62]
- Keep in mind that occlusion can occur as a result of external or internal mechanical obstruction; chemical occlusions can result from drug precipitates or lipid residue, and thrombotic occlusions can result from fibrin deposits or blood clots (thrombosis).[48]
- For suspected chemical occlusion, attempt to aspirate to clear the port or tubing of visible precipitate. Review the patient's medication record and collaborate with the pharmacist to determine the appropriate intervention or catheter clearance agent.[48] Administer a catheter clearance agent, as prescribed; the instilled volume should be based on the port system's priming volume. Allow the agent to dwell for 20 to 60 minutes. After the appropriate dwell time of the particular catheter clearance agent, aspirate and discard the degradation products before flushing the port to assess patency.[48]
- For suspected thrombotic occlusion, the practitioner should assess the risks and benefits of thrombolysis to determine whether port removal and replacement is indicated. If ordered, instill low-dose alteplase, as prescribed.[48] [63] After the appropriate dwell time, aspirate and discard the degradation products before flushing the port to assess patency.[48]
- For persistent or recurring unresolved occlusion, consult with the practitioner about performing a contrast study.[48]

Infiltration or extravasation

- Stop the infusion immediately.[64] [65]

- Assess for a dislodged catheter, a dislodged noncoring needle, or a rupture or leak from the external catheter.[16]
- Aspirate for blood. Don't attempt to flush; doing so could move additional medication into the surrounding tissue.[65]
- Disconnect the administration set, and then aspirate fluid from the port using a small syringe.[65] Don't aspirate with extravasation of contrast media.[65]
- Remove the noncoring needle.[64]
- Assess the insertion site and surrounding skin. Outline the area of suspected infiltration or extravasation with a skin marker to assess progression. If directed by your facility, photograph the area to identify progression or exacerbation of tissue injury.[65]
- Estimate the volume of fluid that has escaped into the tissue based on the rate of injection or infusion and the time of your last assessment.[65]
- Notify the practitioner about the event. Treat the site, as ordered or as directed by your facility.[65]
- Apply dry, cold compresses (as directed) for deoxyribonucleic acid (DNA)–binding agents and valproate to induce vasoconstriction, which will localize the medication in the tissue and reduce inflammation. Apply dry, warm compresses (as directed) for non-DNA-binding agents to induce vasodilation, which will increase local blood flow and disperse the medication through the tissue.[65]
- If necessary, administer the appropriate antidote, as prescribed.[65] Guidelines recommend nonpharmacologic interventions such as surgical washout for extravasation of acidic and alkaline medications.[65]
- Assess the infiltration or extravasation site initially and regularly using a standardized tool or definition chosen by your facility. Monitor the site, as necessary, based on the severity of the event and the care venue. Assess change using measurement, photography, or both. Monitor skin integrity, pain level, and sensation.[65]

Local infection

- Assess the skin surrounding the port and noncoring needle for erythema, edema, pain, tenderness, drainage, elevated body temperature, fluid in the subcutaneous pocket, induration over the pocket, and skin breakdown.[8]
- Monitor the patient's temperature and vital signs.
- Notify the practitioner of signs and symptoms of localized infection.[8]
- Obtain culture specimens, as ordered.[8]

Systemic infection

- Monitor the patient's temperature and vital signs.
- Notify the practitioner of signs and symptoms of systemic infection.
- Before starting antimicrobial therapy, draw paired blood samples for culture from the port and a peripheral vein.[8]
- Administer antibiotics, as prescribed (after obtaining culture specimens).[63]

Extrusion

- Notify the practitioner that the port reservoir is extruding and is visible through the patient's skin to determine whether port removal is required.

Documentation

Documentation associated with accessing an implanted port includes:

- assessment findings, including:
  - location
  - appearance of the site
- needle gauge and length
- appearance of a blood return

- number of attempts
- any unexpected outcomes
- interventions
- patient's response to interventions
- details of the infusion (if you initiated one), including:
  - type
  - amount
  - rate
  - method
- date and time
- amount and type of flush solution used
- patency of the catheter
- presence of blood return
- lack of resistance when flushing
- absence of signs and symptoms of complications
- any complications
- interventions
- patient's response to interventions
- patient's tolerance of the procedure
- patient's response to the procedure
- teaching provided to the patient and family (if applicable)
- patient and family's understanding of that teaching
- any need for follow-up teaching
- all needle and dressing changes for continuous infusions
- blood samples obtained, including the type and amount.[58]

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

AMSN Academy of Medical-Surgical Nurses

Related Procedures

- Implanted port accessing, home care
- Implanted port accessing, pediatric
- Implanted port blood sampling
- Implanted port blood sampling, pediatric
- Implanted port bolus injection, home care
- Implanted port continuous infusion
- Implanted port continuous infusion, pediatric

Related Lexicomp and UpToDate Patient Teaching Handouts

- Portacath
- Portacath Discharge Instructions

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

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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., Hefland, 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.