Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers
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Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers is intended to reflect current knowledge and practices of the clinical specialty of infusion therapy. Because clinical practice continuously evolves based on ongoing research, clinicians should make an independent assessment of the appropriateness and applicability of a policy or procedures in any specific instance. Applicable federal and state laws and regulations should also be considered, as well as the standard of care in a particular jurisdiction, as these may take precedence. INS is not responsible for injury to persons or property, or other harm, arising from exercising guidelines outlined in this publication.

Suggested citation for this publication:
Preface

While a patient’s plan of care for infusion therapy often begins in the hospital, that care may transition to other practice settings. Ambulatory infusion centers offer an environment where patients who don’t need to be hospitalized can safely, efficiently, and cost-effectively receive their therapies. In our effort to ensure safe, quality infusion patient care, the Infusion Nurses Society (INS) develops resources to guide clinicians in their practice. We recognize the invasive nature and risks associated with infusion care—not only to our patients, but to clinicians as well. Therefore, it’s imperative the resources are supported by the most current research and best available evidence. Better patient outcomes result when there is consistency in practice among health care professionals. Incorporating practices from the Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers provides the framework to do just that.

As the basis for professional practice, clinicians are accountable within the boundaries of their scope of practice. With variations among health care organizations, knowledge of the policies, procedures, and practice guidelines of one’s organization is essential, as well as any directives from federal, state, or regulatory bodies. While the policies and procedures are written in general terms, there may be device-specific features or specifications that need to be followed for proper function, so clinicians need to adhere to the manufacturers’ directions for use.

The format for the Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers includes the policy, which defines a course and purpose of an action, and the procedure, which lists the steps needed to comply with the policy. Sections on key points, assessment, and patient education have also been added. While there are areas of care, such as infusion-related complications and infusion therapies that don’t fit the typical policy and procedure format, inclusion was important as these areas directly impact the delivery of infusion care.

A bibliography accompanies each policy and procedure as a resource for those seeking more information. Since the 2016 Infusion Therapy Standards of Practice was the primary reference for development of the policies and procedures, the individual standards are not cited in the bibliography in order to minimize repetition.

As clinicians seek to provide safe infusion care and improved patient outcomes, the Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers is an indispensable resource in the quest to achieve consistency in practice—a principle INS fully endorses.

Mary Alexander, MA, RN, CRNI®, CAE, FAAN
INS Chief Executive Officer
Infusion Therapy in the Ambulatory Infusion Setting

The high cost of health care and decreasing reimbursement have made early discharge from an acute care facility to an ambulatory infusion setting for infusion administration a necessity. In some cases, hospitalization for uncomplicated conditions can be avoided by delivery of needed infusion therapy at an ambulatory practice site.

An infusion center may be located in a variety of health care environments, including a provider’s office, a hospital clinic, an urgent care center, emergency department, or a free-standing infusion clinic. Infusion centers have health care professionals on-site and ready availability of medications, supplies, and equipment needed to respond to vascular access complications or emergencies. The nurse, physician, pharmacist, social worker, dietitian, and administrative staff work together to provide an effective and efficient communication system for designing treatment programs and promoting positive patient outcomes.

Infusion centers allow for coordination of resources and efficient delivery of services. With staffing, equipment, and provider involvement similar to those in a hospital, the infusion center is a practical way to initiate extended outpatient care. Because of this similarity, some patients may perceive the transition from the hospital to the infusion center as less traumatic and perhaps better supervised than transitioning directly to home care and self-administration. Specialized infusion services in the infusion center include, but are not limited to, vascular access device (VAD) care; antimicrobial, antifungal, and antiviral infusions; continuous or intermittent chemotherapy administration; various intramuscular and subcutaneous injections, infusions of intravenous immunoglobulin and other biologics, hydration solutions, and analgesics; transfusion therapy; and parenteral nutrition administration.

Patient Care Considerations

The criteria for patient selection and monitoring of patients who receive infusion therapies in the ambulatory setting has been established by various professional groups. The patient is the central member of the care team and must participate in his or her own care. The patient’s mental and physical abilities, self-confidence, anxiety, and fears should be assessed during discharge planning from the hospital. Limitations on ambulation, prolonged sitting, and access to transportation may weigh heavily against an ambulatory setting for treatment. Yet, home care may not be appropriate either for patients who live alone and are not able to adequately self-monitor their infusion care. An important role for the patient is reporting significant changes in vital signs and symptoms of adverse effects, including rash, nausea, vomiting, diarrhea, phlebitis, erythema, or purulence at the insertion site of the access device. Educating patients to be reliable team members involves encouraging them to communicate often with the nurse, physician, and pharmacist.
Practice guidelines from the Infectious Diseases Society of America list factors to be considered when evaluating patients for outpatient parenteral antimicrobial therapy that include the following:

- There is a documented need for outpatient antimicrobial therapy.
- The patient’s health care resource needs are available at the proposed outpatient site.
- Patient and/or caregiver is willing to participate in care.
- Mechanisms are in place for rapid and reliable communications for patient monitoring.
- Patient and/or caregiver understand the risks, benefits, and economic considerations.

VAD selection should be appropriate for the prescribed therapy. Peripheral catheters may be appropriate for short-term infusion therapies. The peripherally inserted central catheter is frequently the VAD of choice; long-term catheters such as tunneled catheters or implanted ports present another option, especially when frequent blood draws are necessary in very active patients or in children. The patient should be included and educated in the decision process of VAD selection.

**Role of the Infusion Nurse**

As a method of public protection to ensure safety, the infusion nurse should be clinically competent in the safe delivery of infusion therapy and VAD insertion and/or management within his or her scope of practice in the ambulatory setting. Pharmacological and technical advances demand that the nurse working in an ambulatory infusion setting be specialized and knowledgeable in order to offset the risk involved and maximize value for the patient and the health care organization. The infusion nurse must demonstrate accountability, reliability, initiative, and effective communication and technical skills.

Clinical competencies describe practice and educational requirements and provide validation for professional infusion nursing practice. Clinical competencies include many tasks that infusion nurses perform daily, such as initiating, monitoring, and terminating infusion therapy; educating the patient or caregiver; and collecting and analyzing data. The ambulatory infusion organization must define in their policy and procedure, the competencies that are the responsibility of the infusion nurse and the organization. Competency assessment and validation should be performed and documented initially and on an ongoing basis. Achieving and maintaining board certification, noted by the certified registered nurse infusion (CRNI®) designation, is one method for documenting continuing competence and should be encouraged and supported.
Summary
Infusion therapy is administered across all health care settings. When patients are stable in the acute care setting yet still require ongoing infusion therapy, the most appropriate alternative setting should be selected. Increasingly, infusion therapies are safely initiated in a non-acute care setting without prior hospitalization. The patient’s specific infusion therapy needs along with functional and cognitive status, availability of caregiver or family support, home environment, and patient and provider preference are important factors influencing the optimal infusion setting. Regardless of the setting, the role of the infusion nurse is essential in ensuring the best possible outcome for the patient.

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Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers

Infusion Team

Policy
The team is structured through its scope of service to meet patient and organizational needs for safe, effective, and high-quality infusion therapy.

Vascular access device (VAD) insertion and/or VAD management and surveillance are performed by clinicians and/or teams with validated competency.

The infusion team is evaluated for effectiveness through collection, monitoring, and reporting of quality outcome and process data.

Key Points
The scope of services and hours of operation for the infusion team are clearly identified.

When the infusion team works with many patient populations, responsibilities for each aspect of infusion therapy are clearly delineated based on the required knowledge, skill(s), availability, and outcomes from clinicians and the team, as well as the complexity, risks, and volume of the patients’ infusion therapies.

Although there is overlap between groups of professionals within infusion therapy, no single profession may claim ownership of any skill, activity, or task.

Use the infusion team for infusion therapy product evaluation, education, and quality improvement initiatives, and to collaborate in the evaluation and implementation of standardized evidence-based infusion therapy practices.

Preferably the infusion team is led by a certified infusion nurse specialist (eg, CRNI®) with a staffing mix that may include registered nurses, licensed practical/vocational nurses, and/or unlicensed assistive personnel.

A designated infusion team increases first-attempt insertion success rates with short peripheral catheters and decreases facility-acquired bloodstream infections, other complications, and accidental removals.

When applicable, a designated infusion team provides standardized methods for midline catheter and central vascular access device insertion, including preinsertion assessment of vascular access needs, adherence to all aseptic techniques, completion of the insertion checklist, and decreased insertion-related complications.

A designated infusion team that is accountable for management of VADs through daily assessment of need, site care and dressing changes, implanted port access, when applicable, and other designated infusion-related procedures (eg, catheter clearance) decreases infusion-related complications and related costs and increases patient satisfaction.
Bibliography


Competence and Competency Validation

Policy
As a method of public protection to ensure patient safety, clinicians are competent in the safe delivery of infusion therapy and vascular access device (VAD) insertion and/or management within her or his scope of practice.

The clinician is responsible and accountable for attaining and maintaining competence with infusion therapy administration and VAD insertion and/or management within her or his scope of practice.

The organization is responsible for assessment and validation of clinician competency initially (before providing patient care) and on an ongoing basis, when the scope of practice changes, and with introduction of new procedures, equipment, or technology.

Documentation of competency validation is maintained in individual personnel records according to organizational policy.

Performance expectations for contracted clinicians are established and should include documentation of competency, compliance with organizational requirements (eg, policies and procedures), and outcome monitoring.

For contracted clinicians who are learning new procedures through clinical practice on the organization’s patients, ensure adequate supervision during the period required to assess and validate their initial competency.

Invasive procedures (eg, venipuncture) are not performed on clinician peers for educational purposes.

Key Points
Competence includes application of knowledge, critical thinking skills, decision-making abilities, and psychomotor skills.

Competence addresses specific patient populations, including age-specific needs and cultural needs of ethnically diverse populations.

Use organizational clinical outcome data, adverse and serious adverse events, changes in patient population, and patient satisfaction data to identify procedures/skills/tasks for ongoing competency validation.

Use multiple methods to deliver education, such as lectures, reading materials, simulation, self-study, and repeat education over time; combine education with outcome monitoring and feedback to increase its impact on professional behavior.

Use a combination of different competency measurement techniques such as:

- Self-assessment processes to promote self-efficacy and confidence levels
• Written tests to assess knowledge
• Clinical scenarios to assess critical thinking skills
• Psychomotor skills in a simulation laboratory
• Observation of performance of knowledge and skills in the work environment (preferred method for invasive infusion therapy procedures). Note that there is no set number of times for performing a procedure that will ensure competency.
• Inclusion of professional activities, such as presentations at seminars and conferences, maintaining national board certification, publishing in a scholarly journal, conducting clinical research, and portfolio development

Specialized skills (eg, central VAD placement, antineoplastic administration) require multiple components involving knowledge acquisition and supervised clinical performance for initial competency assessment and validation.

Validate performance using well-designed forms or checklists that include objective and measurable assessment points. Components of such forms include a competency statement, specific performance criteria or crucial behaviors, method of demonstrating competence, criteria for achieving success, and assessor signature.

Develop criteria for the role of the competency assessor to ensure an unbiased and objective process.

Achieving board certification is one method for documenting continued nursing competence. Clinical competencies for the infusion nurse specialist are based on the infusion nursing core curriculum:
• Technical and clinical applications
• Fluid and electrolyte balance
• Pharmacology
• Infection prevention
• Special patient populations
• Transfusion therapy
• Antineoplastic and biologic therapy
• Parenteral nutrition

Bibliography


Product Evaluation, Integrity, and Defect Reporting

Policy
Evaluation of infusion-related products and devices includes input from a multidisciplinary group of direct and indirect end users.

In the identification, evaluation, and selection of effective engineering and work practice controls, input is obtained from nonmanagement clinicians responsible for direct patient care who are potentially exposed to injuries from contaminated sharps. The solicitation of this input is documented as part of the Exposure Control Plan.

Infusion equipment and supplies are inspected for product integrity and functionality before, during, and after use as determined by verification of inspection or expiration date and visual inspection of the product.

Lot numbers, serial numbers, manufacturer, and other information used for tracking potential product defects are maintained by the organization.

When a defective product or device is identified, it is removed from patient use and reported to the appropriate department and/or agency or manufacturer.

Key Points
Infusion-related products and devices should be evaluated with consideration given to cost, safety, and effectiveness, and according to parameters designated by the organization’s product evaluation committee.

Product defect reporting includes suspected and known intrinsic and extrinsic contamination; product damage; product tampering; improper, unclear, or confusing patient or user instructions or labeling; similar or confusing product names; packaging problems; and reliance on color coding.

When a product defect is identified before use, retain the product, product overwrap or packaging, and other identifying information (such as model number, lot number, serial number, expiration date, and unique device identification when available) for further analysis and reporting.

Monitor and obtain reports of internally and externally reported adverse events for the committee/individual managing product evaluation and product procurement.

Bibliography


Polisena J, Gagliardi A, Clifford T. How can we improve the recognition, reporting and resolution of medical device-related incidents in hospitals? A qualitative study of physicians and registered nurses. BMC Health Serv Res. 2015;15:220-228.


Informed Consent

Policy
Informed consent is obtained for all invasive procedures and treatments in accordance with local or state laws and organizational policy, when applicable.

Informed consent is required for human subject participation in research according to federal rules and regulations.

The clinician who performs the invasive procedure (eg, central vascular access device insertion) facilitates the process and obtains informed consent.

The patient has the right to refuse treatment. In the event a patient is deemed incompetent or unable to give consent, the consent of a surrogate is obtained.

Key Points
Informed consent is an educational process involving the patient in shared decision making that includes dialogue between the patient/surrogate and the licensed independent practitioner or qualified clinician performing the procedure, and concludes with the patient/surrogate signing a consent document or providing verbal consent according to organizational policy (eg, via phone conversation).

Informed consent for pediatric and adolescent patients is obtained from the parent or legal guardian.

Verify assent (ie, agreement) from the pediatric or adolescent patient, using language and learning methods appropriate for the age and/or cognitive stage of the individual; while there is lack of consensus over the age of assent, this is generally considered 7 years old or school-age.

The clinician must be knowledgeable about advance directives and health care proxies that may be in existence.

Not all procedures require written informed consent forms.

Continued confirmation of informed consent may be necessary for ongoing treatments (eg, hemodialysis or antineoplastic administration).

There may be condition-based exceptions to requirements for informed consent (eg, emergency/life-threatening situations); adhere to the organizational policy for managing such situations.

Photographs of patients may or may not require informed consent.

• Unless the photograph is for treatment purposes, payment for services, or health care operations, written informed consent is required under Health Insurance Portability and Accountability Act (HIPAA) rules when the patient is identifiable by inclusion of the...
patient’s face or other identifiable features such as jewelry, tattoos, or other anatomically notable scars or lesions. This consent includes how the images will be obtained, managed, stored, and shared.

• A photograph that does not identify the patient would not require informed consent under HIPAA rules.

The process of informed consent includes the following elements:

• Consent is voluntarily given and is free from coercion or persuasion.

• The patient/surrogate is capable of understanding relevant information, appreciates the situation and its consequences, and is able to make choices.

• The patient/surrogate has received the necessary information to understand the procedure/treatment, its purpose, risks, potential benefits, alternative procedures/treatments, common complications, and potentially serious or irreversible risks.

• The patient/surrogate comprehends the information and can apply it to her or his specific situation.

• The decision is authorized by the patient/surrogate and documented on the signed form.

Assessment

Identify cultural differences that may affect the process of informed consent. For example, the foundation of informed consent is self-determination, which may not fit with cultures in which medical treatment choices are a family decision rather than an individual decision.

Assess patients with age-, trauma-, or disease-related alterations in cognitive capacity for their ability to consent by using tools to evaluate cognitive status or asking probing questions to evaluate language comprehension, memory, and ability to reason. When the patient does not have the necessary cognitive capacity, obtain informed consent from a surrogate.

Before informed consent can be obtained, it is necessary to assess the patient’s mental status. Mental status can be impaired for many reasons. If impaired memory or confusion is due to a reversible condition, it is important to address the underlying condition and implement management strategies prior to obtaining informed consent.

Sensory deficits should be assessed, such as vision or hearing problems. Provide written consent forms that are printed in an easy-to-read font, and adapt spoken information for any hearing deficits. The use of unfamiliar language should be avoided, and written material should be provided at the patient’s reading level. Pausing periodically allows the patient time to process the information given and can enhance comprehension. The clinician should assess any literacy issues, such as inability to read or low reading level, prior to obtaining consent. If necessary, a family member or power of attorney may need to be involved in the consent process.
Patient Education
Use learning methods appropriate for the patient’s age and level of health literacy.

- Provide educational materials and the consent document at a reading level between the fourth and sixth grades and in the patient’s primary language.
- Provide information at the most appropriate time, considering the effect of anxiety, pain, and other therapeutic interventions on the patient’s comprehension.
- Provide a qualified medical interpreter for non-English-speaking patients and for those who cannot read their primary language.
- Provide appropriate resources for patients/surrogates who have vision or hearing limitations.
- Allow sufficient opportunity for the patient/surrogate to ask questions and receive answers.
- Choose appropriate methods to deliver the information, including verbal and paper-based written information, videos, or computer-based materials.
- Validate the patient’s/surrogate’s comprehension of the information by asking the patient/surrogate to recount or “teach-back” the proposed treatment or procedure. Clarify and/or reinforce information as needed.
- When the patient/surrogate expresses confusion or has further questions, collaborate with the provider about the need for more dialogue.

Documentation
Document in the patient’s health record:

- Completion of the informed consent process, including organizational written consent form, if applicable
- Patient/surrogate education and response

Bibliography


First Dose Administration

Policy
Whenever possible, the patient should receive the first dose of an infusion medication in a controlled environment with access to emergency medical equipment and medications (eg, hospital, ambulatory infusion center).

The first dose of an infusion medication is considered for administration in an ambulatory infusion center under the following circumstances:

- Patient has no history of allergic, life-threatening reactions to previous drug therapies (see Allergic Reaction and Anaphylactic/Anaphylactoid Reactions).
- Patient is alert, cooperative, and able to respond appropriately.
- Collaboration with the licensed independent practitioner (LIP) regarding concerns and alternative solutions to first dose administration in an ambulatory infusion center.
- Collaboration with other health care providers (eg, pharmacist) to determine the safety of administering the prescribed medication.
- Informed consent by LIP: the patient is provided with sufficient information regarding the risks of a first dose in an ambulatory infusion center in a culturally and linguistically appropriate format, and at an education level understood by the patient (see Informed Consent).
- Drugs for treatment of adverse reactions, including those used to treat anaphylaxis, are ordered and available in the treatment setting.
- The clinician administers the medication and observes the patient for a minimum of one-half hour after completion of the infusion.
- Emergency medical services are available in the geographic area.
- Location has access to working telephone.

Clinicians who administer first doses are certified in basic life support.

Key Points
Patient safety is a priority when considering an ambulatory infusion center for initiation of infusion therapy.

Anaphylaxis is a rare event but is a medical emergency that may result in death due to respiratory failure and cardiovascular collapse.

Recommended components of an anaphylaxis kit include epinephrine and diphenhydramine; specific orders for dosage and use are to be obtained from the LIP.
**Assessment**

Obtain a thorough allergy and drug history; note any cross-sensitivity.

Identify risk factors for anaphylaxis, including history of severe drug reactions and family history of same, and when administering first dose of an infusion medication.

Ensure that the patient meets criteria for first dose administration as listed above; if not, notify the LIP and collaborate to develop an alternative plan of care.

Confirm that the informed consent process is completed; refer back to LIP if patient has concerns or condition declines.

Anaphylactoid reactions have been associated with midline catheter and peripherally inserted central catheter insertion and other medications such as vancomycin and morphine.

Vancomycin is associated with a reaction called “red man syndrome.” This anaphylactoid reaction results in the release of histamine and causes signs and symptoms such as an erythematous rash on the face, neck, and upper torso, and hypotension. Vancomycin infusion should be administered over at least 1 hour to reduce the risk of this syndrome. Slower infusions and treatment with diphenhydramine may be necessary in some patients.

**Patient Education**

Signs and symptoms of allergic, anaphylactic/anaphylactoid reactions as these events may occur after multiple doses of the medication (see *Allergic Reaction and Anaphylactic/Anaphylactoid Reactions*).

**Documentation**

Document in the patient’s health record:

- Assessment and risk factors related to first dose
- Any communication with LIP related to first dose
- Orders for drugs for treatment in the event of a potential adverse reaction
- Signs/symptoms of adverse reaction and interventions including administration of ordered drugs

**Bibliography**


Latex Sensitivity or Allergy

Policy
Perform a careful and thorough assessment of every patient, not just patients at risk for a latex allergy.

Latex-containing products are removed from the patient care setting to reduce the exposure to latex.

Latex-free personal protective equipment, patient care equipment, and supplies are provided to latex-sensitive or latex-allergic clinicians and patients and are used during patient care.

Key Points
Latex allergy may cause allergic reactions ranging from skin irritation to anaphylaxis, a potentially life-threatening condition. An allergic reaction usually happens within minutes of exposure, but symptoms can also show up a few hours later. Symptoms of a mild reaction are skin redness, hives, or itching. Symptoms of more serious reactions might include runny nose, sneezing, itchy eyes, scratchy throat, wheezing, coughing, or difficulty with breathing. Rarely, shock may occur, but a life-threatening reaction is seldom the first sign of sensitivity.

Besides gloves, be aware that certain latex-containing medical equipment may evoke an allergic reaction, such as blood pressure cuffs, stethoscopes, administration sets, and electrode pads.

Certain people are at greater risk of developing a latex allergy:
- People with spina bifida
- People who undergo multiple surgeries or medical procedures
- Health care workers
- Rubber industry workers
- People with a personal or family history of allergies

Powdered gloves made of natural rubber latex are not used as they are associated with the greatest risk of sensitization and subsequent allergic reactions in individuals.

Labels on medical devices, equipment, and supplies should be reviewed prior to use for the presence of latex, which is a component of product labeling required by the US Food and Drug Administration.

Patient Education
How to avoid latex exposure:
- Make patients aware of everyday exposure from common items such as dishwashing gloves, hot water bottles, balloons, rubber bands, erasers, and swim goggles.
• Advise patients with a latex allergy to wear a medical alert bracelet.

Assessment
Assess patient for a latex sensitivity or allergy, history of asthma, environmental allergens, medications, and food allergies.
• Fruit allergies can create cross-reactions with latex including, but not limited to, avocado, mangoes, pears, bananas, citrus fruits, chestnuts, and other tropical foods.
• Exposure to latex may cause a hypersensitivity response either locally at the site of contact or systemically, resulting in breathing difficulty, chest tightness and pain, anxiety, palpitations, cutaneous erythema and urticaria, angioedema, shock, and death.

Documentation
Document in the patient's health record:
• Existence of latex sensitivity or allergy
• Post LATEX ALLERGY sign on patient’s assigned ambulatory infusion chair or on identification band

Bibliography


Adverse and Serious Adverse Events

Policy
Adverse events or serious adverse events (also called sentinel events) associated with infusion therapy are reported and documented.

Serious adverse events are immediately investigated to ensure prompt action and improvement in safety.

Clinicians are active participants in the development, implementation, and evaluation of improvement plans.

Errors are disclosed responsibly to patients.

Key Points
It is critical that organizations establish a strong “just culture” that continuously strengthens safety and creates an environment that raises the level of transparency, encourages reporting, empowers the clinician to identify and implement appropriate actions to prevent adverse events and near misses, and promotes quality patient outcomes.

Clinicians should be educated to report all unusual occurrences or adverse events including near misses so that they may be reviewed by the organization and process improvement evaluated.

An adverse event is defined as any unintended or untoward event that occurs with a patient receiving medical treatment that is related to a medication, product, equipment, or procedure.

An adverse event is serious when the patient outcome is death, disability, life-threatening, requires initial or prolonged hospitalization, or requires intervention to prevent permanent damage.

Adverse and serious adverse events involving devices or drugs are reported to accrediting bodies as required and may be voluntarily reported to the US Food and Drug Administration (FDA). The FDA relies on voluntary reporting and uses such data to maintain the safety surveillance of products. A report may be the critical action that prompts a modification in use or design of the product, improves its safety profile, and leads to increased patient safety.

It is mandatory for user facilities (defined as hospitals, ambulatory surgical facilities, nursing homes, outpatient diagnostic facilities that are not providers’ offices, or outpatient treatment facilities) to report a suspected medical device-related death to both the FDA and the manufacturer. User facilities must report a medical device-related serious injury to the manufacturer or to the FDA, if the medical device manufacturer is unknown. The Medical Device Reporting regulation (21 CFR 803) contains mandatory requirements for
manufacturers, importers, and device user facilities to report certain device-related adverse events and product problems to the FDA. The regulation specifies that reports be filed on FDA MedWatch Form 3500A or an electronic equivalent.

A standard document should be used to guide the documentation of objective and specific facts about an adverse or serious adverse event.

When serious adverse events occur, use a process such as a root cause analysis (RCA) or other systematic investigation and analysis to improve quality and safety. The process includes:

- Description and analysis of the event, identification of the cause(s), and implementation of specific strategies and/or actions for improvement to protect patients
- An interprofessional approach focusing on systems issues, procedures, human resources, peer and/or clinical review, products/equipment, processes, and training gaps

Consider using an RCA or other systematic investigation or analysis not only for serious adverse events but also for complex, recurrent problems and for “near misses.”

Employ interprofessional collaboration in planning and discussing information with the team responsible for disclosing information about the adverse event to the patient, caregiver, or surrogate.

**Documentation**

Document in the patient’s health record:

- Complete description of only objective facts without speculation or comments about causes
- Complete organizational documentation as required for risk management department

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Hand Hygiene

Policy
Hand hygiene is performed routinely during patient care activities.

Artificial fingernails or extenders are not worn when having direct contact with patients at high risk (e.g., immunocompromised, comorbidities, or inserting a central vascular access device).

Keep the nail length short.

Key Points
Hand hygiene is a routine infection prevention practice that decreases the potential risk of microbial contamination and cross contamination.

Use an alcohol-based hand rub routinely when performing hand hygiene unless the hands are visibly soiled or there is an outbreak of a spore-forming pathogen or norovirus gastroenteritis.

Perform hand hygiene with either a nonantimicrobial soap or an antimicrobial soap and water:

- When the hands are visibly contaminated with blood or other body fluids
- After providing care or having contact with patients suspected or confirmed of being infected with norovirus gastroenteritis or a spore-forming pathogen during an outbreak (e.g., Clostridium difficile)
- Before eating and after using a restroom

Involve the employee with the evaluation of hand hygiene products to assess for product feel, fragrance, and skin irritation. Clinicians who have sensitivity to a particular product should be provided with an alternative. Other products for skin care such as gloves, lotions, and moisturizers should be assessed for compatibility with hand antisepsis products.

Do not add soap to a partially empty soap dispenser.

Store hand hygiene products in convenient locations at the point of use.

Provide hand hygiene products that have a low irritancy potential and are compatible with hand lotions or creams.

Provide employees with education on hand hygiene, monitor their hand hygiene performance, and provide feedback regarding their hand hygiene performance.

Patient Education
How to perform hand hygiene and to ask the employee to perform hand hygiene before having direct contact with the patient, if it was not observed
Procedure

Perform hand hygiene with an alcohol-based hand rub or antimicrobial soap and water during patient care:

- Before having direct contact with the patient
- Before donning sterile gloves when inserting a central vascular access device or midline catheter
- Before donning nonsterile gloves when inserting a short peripheral catheter
- After contact with the patient's intact or nonintact skin
- After contact with body fluids or excretions, mucous membranes, and wound dressings, if the hands are not visibly soiled
- After contact with inanimate objects, including medical equipment, in the immediate vicinity of the patient
- After removing gloves

Bibliography


World Health Organization. WHO guidelines on hand hygiene in health care. 
Sharps Management

Considerations for the Ambulatory Infusion Patient

Place sharps containers out of reach of patients.
Use sharps containers that restrict access of internal contents.

Policy

Regulated medical waste, which includes sharps, is discarded in the appropriate container and disposed of according to local, state, and federal laws and regulations.

Contaminated sharps are discarded in a nonpermeable, puncture-resistant, tamper-proof biohazard container.

Safety-engineered devices, such as self-sheathing needles that isolate or remove the bloodborne pathogens hazard, are available in the workplace and consistently activated or used.

The organization has an exposure control plan that is in accordance with the Occupational Safety and Health Administration’s bloodborne pathogens standard.

The organization educates employees how to safely handle and dispose of sharps and maintains documentation of employee education.

Key Points

The organization will have protocols for the safe handling of sharps that are based on local, state, and federal laws and regulations.

The organization will educate and train the employee in the use of the safety-engineered devices and maintain documentation of education.

Identify, report, and document exposures to potentially infectious materials or injury from sharps and follow organizational protocols for postexposure follow-up. Monitor and analyze data for trends and implement performance improvement as needed.

Consider the use of passive safety-engineered devices for needlestick injury prevention.

Patient Education

Teach the patient and caregiver when and how to dispose of sharps that may be used during the course of self-care.
Procedure

- Use a safety-engineered device for needlestick injury prevention.
- Do not break or bend the sharps. Use a 1-handed technique for recapping, if necessary.
- Activate the built-in safety controls during use and discard as a single unit after use.
- Dispose of sharps in a sharps container that is closable, puncture-resistant, leakproof, appropriately labeled or color-coded, and large enough to accommodate the disposal of the entire blood collection assembly (eg, holder and needle).
- Place the sharps containers in the immediate area where sharps are used and are easily accessible.
- Replace the sharps containers when about three-fourths full to avoid overfilling and disposal-related injuries.

Bibliography


Medical Waste Disposal

Policy
The organization has protocols for the safe handling of regulated medical waste that are based on local, state, and federal laws and regulations.

The organization has an exposure control plan that is in accordance with the Occupational Safety and Health Administration’s bloodborne pathogens standard.

Regulated medical waste is discarded in an appropriate container and disposed of according to local, state, and federal laws and regulations.

The organization that handles, generates, and disposes of medical waste educates its employees and maintains documentation of employee education.

Key Points
Medical waste may include liquid or semiliquid blood or other potentially infectious materials, contaminated items that would release blood or other potentially infectious materials in a liquid or semiliquid state, if compressed, or items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling.

Identify, report, and document exposure to potentially infectious materials and follow organizational protocol for postexposure follow-up. Monitor and analyze data for trends, and implement performance improvement as needed.

Procedure
• Don gloves and other personal protective equipment as appropriate before handling medical waste.
• Place medical waste in a red bag that has a biohazard label.
• Transport the medical waste to the designated area for temporary collection or storage.
• Restrict access of medical waste storage areas to authorized personnel.

Bibliography

Durable Medical Equipment Disinfection

Policy
Durable medical equipment (DME) is cleaned and disinfected using an Environmental Protection Agency (EPA)-registered disinfectant. Cleaning and disinfectant products are used in accordance with the equipment and manufacturers’ directions for use.

Key Point
DME includes, but is not limited to, intravenous (IV) poles, flow-control devices, ultrasound or infrared devices for vascular visualization and other nondisposable, hard, nonporous surface, infusion-related equipment.

Procedure
- Inspect the DME’s surfaces for breaks in integrity that would impair either cleaning or disinfection. Discard or repair equipment that no longer functions as intended or cannot be properly cleaned and disinfected.
- Clean and disinfect DME surfaces when visibly soiled, on a regular basis (eg, at a frequency defined by organizational policies and procedures), and at established intervals during long-term single-patient use.
- Clean and disinfect DME surfaces with an EPA-registered disinfectant, according to the label’s safety precautions and directions for use, as well as safety data sheets.
- Handle DME according to Standard Precautions. Wear personal protective equipment (eg, gloves, gown), according to the level of anticipated contamination, when handling patient-care equipment, and instruments/devices that are visibly soiled or may have been in contact with blood or body fluids.
- If common use of medical equipment for multiple patients is unavoidable (eg, ultrasound or infrared devices for vascular visualization), clean and disinfect the equipment before use on another patient, according to manufacturers’ directions for disinfection.
- Used DME (eg, IV poles, flow-control devices) is placed in a plastic bag before being placed in a soiled utility area for subsequent cleaning and disinfection.
Bibliography


Standard Precautions

Considerations for the Ambulatory Infusion Patient

The primary role of the immune system is to protect the organism against pathogens. But age-associated alterations to immunity increase the immunocompromised patient’s susceptibility to infectious disease. Using Standard Precautions with all patient care decreases risk.

Policy

Standard Precautions are used during all infusion procedures that potentially expose the employee to blood and body fluids, secretions, excretions (except sweat), nonintact skin, and mucous membranes, and may contain transmissible infectious agents.

The organization ensures that sufficient and appropriate personal protective equipment (PPE) is available and readily accessible at the point of care.

Key Points

Standard Precautions are based on the assumption that every person is potentially infected or colonized with an organism that could be transmitted and that all blood/body fluids, secretions, excretions (except sweat), nonintact skin, and mucous membranes may contain transmissible agents.

When wearing PPE, keep hands away from the face, and limit surfaces touched in the patient’s environment.

Patient Education

Implementation of respiratory hygiene/cough etiquette by placing a face mask on the coughing person, if tolerated and appropriate, or covering the mouth/nose with a tissue when coughing, promptly disposing of used tissues, placing mouth toward sleeve if no tissues are available, and performing hand hygiene

How to implement Standard Precautions, including the importance of carefully removing PPE to avoid self-contamination and contamination of the environment, and when and how to perform hand hygiene

Procedure

- Select PPE based on the nature of the patient/clinician interaction and potential for exposure to blood, body fluids, or infectious agents, and the Centers for Disease Control and Prevention’s Guideline for Isolation Precautions in effect at the time of the patient encounter for specific communicable diseases.
• Perform hand hygiene immediately in between each step of removing PPE if the hands become contaminated, immediately after removing all PPE, and before leaving the patient’s environment.
• Wear gloves that fit appropriately and extend to cover the wrist of an isolation gown (if worn), when there is potential contact with blood (eg, during phlebotomy), body fluids, mucous membranes, nonintact skin, or contaminated equipment.
• Change gloves during patient care when torn or heavily contaminated, or if moving from a contaminated body site to a clean body site.
• Wear a gown to protect skin and clothing during procedures or activities in which contact with blood or body fluids is anticipated.
• Do not wear the same gown or gloves when caring for more than 1 patient.
• Wear eye protection, which may include goggles with a face mask, or a face shield alone, to prevent the potential splash or spray of blood, respiratory secretions, or other body fluids from the mouth, nose, and eyes.
• Educate the employee to implement respiratory hygiene/cough etiquette by covering the mouth/nose with a tissue when coughing, promptly disposing of used tissues, placing mouth toward sleeve if no tissues are available, and performing hand hygiene.

Bibliography


Transmission-based Precautions

Considerations for the Ambulatory Infusion Patient

Ambulatory care settings have the same infection prevention and control requirements as inpatient hospital settings, but the method of application to comply with the standards will vary depending on the type of care provided by the facility to its patient population.

Transmission-based Precautions, including Airborne Precautions, Droplet Precautions, and/or Contact Precautions, should be adapted and applied as appropriate in the ambulatory infusion setting.

Patients may be exposed to infectious diseases in the ambulatory setting. Health care workers need to use Standard Precautions in the care of all patients, but patients exhibiting communicable disease symptoms should be managed according to the Centers for Disease Control and Prevention’s (CDC’s) Guideline for Isolation Precautions. Because most ambulatory settings do not have adequate private rooms, a triage policy should be followed. The goal is to identify and process patients with symptoms compatible with a communicable disease promptly to protect other patients and ambulatory care staff from exposure or infection.

Policy

Transmission-based Precautions, including Airborne Precautions, Droplet Precautions, and/or Contact Precautions, are implemented when infection control strategies, in addition to Standard Precautions, are required to reduce the risk for transmission of infectious agents.

Airborne Precautions are implemented to prevent the transmission of infectious agents that remain infectious when suspended in the air over long distances, or as recommended by the CDC’s Guideline for Isolation Precautions in effect at the time of the patient encounter.

Droplet Precautions are implemented to prevent transmission of pathogens spread through close respiratory or mucous membrane contact with respiratory secretions.

Contact Precautions are implemented to prevent the transmission of infectious agents, which are spread by direct or indirect contact with the patient or the environment, including when there are excessive bodily discharges, such as wound drainage.

Transmission-based Precautions are maintained until it is determined that the cause of the symptoms is not due to an infectious agent or the duration of the recommended isolation precautions guidelines have been met.
Key Points
Transmission-based Precautions will be used when patients are suspected or known to be infected or colonized with infectious agents that cannot be controlled with Standard Precautions alone.

Patient Education
How to implement Transmission-based Precautions, including the importance of carefully removing personal protective equipment (PPE) to avoid self-contamination and contamination of the environment, and when and how to perform hand hygiene and respiratory etiquette (eg, use of tissues or mask)

Procedure
- Select and use PPE for Transmission-based Precautions based on the nature of the patient interaction and potential for exposure to blood, body fluids, or infectious agents, and the CDC’s Guideline for Isolation Precautions in effect at the time of the patient encounter for specific communicable diseases.
- Wear a face mask and observe Droplet Precautions, in addition to Standard Precautions, when there is a potential for contact with respiratory secretions and sprays of blood or body fluids.
- Perform hand hygiene immediately between each step of removing PPE worn, if the hands become contaminated, immediately after removing all PPE, and before leaving the patient’s environment.
- Wear a fit-tested, NIOSH-certified N95-or-higher respirator and observe Airborne Precautions in addition to Standard Precautions, if the patient is suspected or confirmed of having an infection spread by the airborne route to prevent the potential exposure to infectious agents transmitted via the airborne route (eg, *M. tuberculosis*). Perform fit testing before its initial use and at least annually thereafter.
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Vascular Access Device (VAD) Planning

Considerations for the Ambulatory Infusion Patient

Patients may arrive at the facility with a vascular access device (VAD) already placed.

Policy

The type and location (peripheral or central) of a VAD is selected to best accommodate the patient’s needs based on factors such as the prescribed therapy or treatment regimen, anticipated duration of therapy, and patient characteristics such as age, history of vascular access and infusion therapy, comorbidities, venue of care, resources, and ability to care for the VAD.

Selection of the most appropriate VAD occurs as a collaborative process among the interprofessional team, the patient, and the patient’s caregivers.

The VAD selected is of the smallest outer diameter, with the fewest number of lumens needed, and is the least invasive device needed for the prescribed infusion therapy.

Key Points

Selection of the most appropriate VAD and site of placement are critical decisions that impact the clinical outcome, as well as the patient experience and satisfaction with care. Such decisions require critical thinking and analysis; the decision is generally not based on a single factor, such as the drug or solution category of vesicant or irritant. For example, while a continued need for a vesicant infusion requires a central vascular access device (CVAD), short-term emergent needs may demand peripheral administration or a relatively few intermittent doses administered peripherally. Vein choice (larger vein of the forearm and not close to any area of joint flexion), the need for frequent assessment, and the importance of patient education accompany such decisions. A CVAD is preferred for continuous infusion of hypertonic (osmolarity >900 mOsm/L) or vesicant infusates, when the patient factors and venue of care indicate a clear benefit greater than the risk.

Several factors must be considered when planning for discharge, including the environment to which the patient will be discharged, the ability of the patient to participate in infusion selfcare activities, home health resources and use of equipment, and the availability and capability of a caregiver or health care provider to manage infusion therapy.

If the patient is being transferred to another facility or home, it is especially important that the infusion needs are clearly conveyed, being sure to include such information as:
Vascular Access Device Placement

- Existing VAD and catheter tip termination, if applicable
- Expected care regimen(s) and device management
- Presence of securement device
- Dosage and time of the most recent parenteral administrations
- Complete list of infusion medications or solutions prescribed and administered
- Any unusual reactions and other complications related to prescribed infusion therapy
- If the VAD is to remain in place after discharge to home, identify who will be responsible for care and maintenance
- Who and when to call for signs of device malfunction or any infusion- or device-related complications

Choices for peripheral vascular access include short peripheral catheters (SPCs) and midline catheters. Characteristics of the prescribed infusion therapy are similar for both types of catheters. When the anticipated length of therapy will be 1 week or less, an SPC is preferred. When the prescribed solutions and medications are well tolerated by peripheral veins and the patient has difficult venous access, use ultrasound to place an SPC or a midline catheter in a larger vein.

CVAD placement should be avoided unless necessary. It is recommended that an evidence-based list of CVAD indications guide practice; examples of indications include:

- Clinical instability of the patient or complex infusion regimen
- Chemotherapy with duration of more than 3 months or episodic administration
- Continuous infusion therapy (vesicant, parenteral nutrition, fluid and electrolytes, medications, blood or blood products)
- Long-term intermittent infusion therapy
- History of difficult or failed peripheral access when vascular visualization technology has not enhanced placement

Peripherally inserted central catheters (PICCs) are associated with a higher rate of venous thrombosis, particularly in patients with cancer and those who are critically ill. The risk for catheter-related bloodstream infection in hospitalized patients is similar to other types of nontunneled CVADs, and the selection of a PICC should not be construed as an infection prevention strategy.

Implanted vascular access ports and tunneled, cuffed catheters are considered for patients who require long-term infusion needs (eg, parenteral nutrition, antineoplastic therapy).

Special VAD features:

- Consider anti-infective CVADs in the following circumstances: emergency insertions, a high central line-associated bloodstream infection rate in the presence of other infection prevention strategies, prolonged anticipated duration of therapy (eg, longer than 5 days),
and patients who have no history of allergy to the anti-infective agent on the CVAD.

- Consider the need for a VAD designed for power injection for patients who require ongoing diagnostic testing that requires rapid injection of contrast media (eg, computed tomography scans).

Vein preservation is an important consideration when planning for vascular access in all patients. For patients with end-stage renal disease, it is especially important to preserve veins for a future arteriovenous fistula or graft.

To avoid needlestick injuries during insertion and removal, VADs with a safety-engineered device are selected.

A child life specialist can help prepare children and caregivers for infusion therapy-related procedures and treatments.

**Assessment**

Consider the potential for changes in the infusion therapy (eg, culture results, increasing nutritional support requirements) and potential transfer to another venue of care during the anticipated length of dwell.

Use vascular visualization technology (eg, visible or near infrared light and ultrasound) to identify veins and enhance the success rate for peripheral access device placement, especially for patients who are known to have difficult access.

When using ultrasound guidance to place an SPC, choose a catheter with adequate length for the depth of the vein; longer catheter length is associated with longer duration of dwell; veins that are more than 0.5 cm deep are associated with an increased risk for infiltration due to catheter length that is too short for the vein’s depth.

Consideration for the VAD’s outer diameter is based on the risk of venous thrombosis; a catheter-to-vein ratio of 45% or less, as assessed by ultrasound, is recommended for PICCs due to risk of venous thrombosis.

When planning for specific infusates, recognize that the internal diameter of each lumen may vary on a multilumen VAD. Use the most appropriate VAD lumen size, based on type, volume, and rate of infusate.

**Patient Education**

**Rationale for VAD**

Types of VADs appropriate for needed infusion therapy

Advantages and disadvantages of VAD types

Care and management requirements

Potential risks/complications and how and to whom to report them
### Table 3.1. Vascular Access Device Planning by Catheter Type

<table>
<thead>
<tr>
<th>Catheter Type</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peripheral</strong></td>
<td>Consider infusate characteristics in relation to anticipated duration of therapy.</td>
</tr>
<tr>
<td></td>
<td>Duration of infusion therapy for less than 1 week</td>
</tr>
<tr>
<td></td>
<td>Use vascular visualization technology to identify veins and to increase insertion success, especially for those with difficult access.</td>
</tr>
<tr>
<td></td>
<td>A 20- to 24-gauge SPC is appropriate for most infusates and blood products for adults, and 22- to 24-gauge for pediatric patients and the elderly. Research has demonstrated that peripheral catheters larger than 20-gauge are more likely to cause phlebitis.</td>
</tr>
<tr>
<td></td>
<td>Consider larger-gauge catheters when rapid fluid replacement is a necessity.</td>
</tr>
<tr>
<td></td>
<td>Avoid the use of steel winged devices except for single-dose administration.</td>
</tr>
<tr>
<td><strong>Midline</strong></td>
<td>Consider infusate characteristics in relation to anticipated duration of therapy.</td>
</tr>
<tr>
<td></td>
<td>Duration of therapy (eg, 1-4 weeks)</td>
</tr>
<tr>
<td></td>
<td>Consider for infusates, including antimicrobials, fluid replacement, and analgesics that are well tolerated by peripheral vein.</td>
</tr>
<tr>
<td></td>
<td>Avoid in patients with a history of thrombosis, hypercoagulability, end-stage renal disease, and decreased vascular flow to the extremities.</td>
</tr>
<tr>
<td></td>
<td>Use caution with intermittent vesicant administration (eg, calcium solutions, contrast agents) because of the risk of extravasation, which may be more difficult to detect in deeper veins. Short-term administration (eg, less than 1 week) of vancomycin via a midline catheter was found to be safe in 1 study.</td>
</tr>
<tr>
<td></td>
<td>Increased risk of catheter-associated venous thrombosis with PICCs, particularly in patients with cancer and those who are critically ill</td>
</tr>
<tr>
<td></td>
<td>Consider an implanted port or a tunneled cuffed catheter for patients who have long-term infusion therapy needs.</td>
</tr>
</tbody>
</table>
Table 3.1. Vascular Access Device Planning by Catheter Type (continued)

<table>
<thead>
<tr>
<th>Catheter Type</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Can be used for any type of infusion therapy</td>
</tr>
<tr>
<td></td>
<td>Selected by reason of an evidence-based list of indications</td>
</tr>
<tr>
<td></td>
<td>Increased risk of catheter-associated venous thrombosis with PICCs, particularly in patients with cancer and those who are critically ill</td>
</tr>
<tr>
<td></td>
<td>Consider use of an anti-infective CVAD when specific criteria are met.</td>
</tr>
<tr>
<td></td>
<td>Consider an implanted port or a tunneled cuffed catheter for patients who have long-term infusion therapy needs.</td>
</tr>
<tr>
<td></td>
<td>Consider the need for a CVAD that is designed for power injection. Plan proactively for patients with chronic kidney disease because the arteriovenous fistula or graft is preferred for hemodialysis access. Vein preservation is critical. Avoid PICCs and subclavian placement due to risks of central venous stenosis and thrombosis.</td>
</tr>
</tbody>
</table>

Abbreviations: CVAD, central vascular access device; PICC, peripherally inserted central catheter; SPC, short peripheral catheter.

Bibliography


Local Anesthesia

Considerations for the Ambulatory Infusion Patient
Allow intradermal anesthetics time to produce desired results. The patient can be instructed to apply topical transdermal agents before arrival for treatment.

Policy
Local anesthesia is used to minimize pain associated with placement of a vascular access device (VAD) or with access of an implanted vascular access port based on an assessment of patient condition, needs, risks, and benefits.

Key Points
Use of local anesthesia should be provided as an option to all patients before all vascular access procedures.

Topical anesthetics and needle-free lidocaine are effective pain prevention strategies for peripheral vascular insertions.

Local anesthesia may be used to reduce pain and discomfort before each painful VAD puncture, implanted vascular port access, intraosseous access, and for patients who request it or have a history of vasovagal reactions.

The local anesthetic agent and method that is least invasive and carries the least risk for allergic reaction or infection is selected.

Types of local anesthesia:
- Transdermal anesthetic cream
- Anesthetic dermal patch
- Intradermal injection of lidocaine hydrochloride 1% solution; Buffered lidocaine may be used but is not commercially available and must be compounded by the pharmacy.
- Intradermal injection of bacteriostatic sodium chloride (the preservative benzyl alcohol acts as a local anesthetic)
- Iontophoresis technology: use of an electric current to deliver the anesthetic into the skin
- Pressure-accelerated lidocaine
- Ice may be placed over the implanted vascular port for a few minutes before accessing the VAD.
- Topical vapocoolant spray: an issue is short duration of action; however, recent research suggests that application after skin disinfection did not result in a significant increase in skin bacterial count.
Use the most effective and available local anesthetic method and/or agent, considering time-to-peak effectiveness, as well as adjunctive and less invasive anxiolytic, cognitive, behavioral, and complementary therapies (eg, distraction, positioning).

It is important to assess each patient individually. Additionally, the patient’s history of allergies must be taken into consideration, as well as previous experience with catheter insertions.

**Assessment**

Patient tolerance to pain and patient preferences related to pain management

Patient anxiety about the procedure

Allergic reactions, tissue damage

**Patient Education**

Information on the selected local anesthetic agent, including benefits, management, and potential complications and how and to whom to report it

**Supplies**

- Transdermal (topical) anesthetic cream
  - Transparent semipermeable membrane (TSM) dressing
  - Antiseptic solutions
  - Gauze pads
  - Gloves
- Lidocaine hydrochloride 1% solution
  - Antiseptic solution
  - Gauze pads
  - Gloves
  - 1-mL (tuberculin) syringe
- Iontophoresis equipment

**Procedure**

1. Obtain and review licensed independent practitioner’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Assess for any history of hypersensitivity or allergy to local anesthetics.
4. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.
5. Compare medication label against order, for accuracy.
6. Perform hand hygiene.
7. Don gloves.
Transdermal (Topical) Anesthetic Cream
a. Apply recommended amount of transdermal anesthetic cream to intended venipuncture site or implanted port needle insertion site.
b. Cover anesthetic cream with TSM dressing.
c. Remove dressing material after recommended application time, and cleanse skin of remaining transdermal cream.
d. Proceed with device insertion procedure.
e. Assess for response and any reactions to topical anesthetic cream.

Anesthetic Dermal Patch
a. Apply anesthetic dermal patch to intended venipuncture site or implanted port needle insertion site.
b. Leave on skin for the recommended application time.
c. Remove patch.
d. Proceed with device insertion procedure.
e. Assess for response and any reactions to anesthetic dermal patch.

Intradermal Anesthetic
May be used with peripheral venipuncture and percutaneous CVAD insertion
a. Cleanse skin of intended venipuncture site with antiseptic solution and allow to dry.
b. Draw 0.3 cc of injectable anesthetic into 1-mL (tuberculin) syringe.
c. With needle bevel up, gently insert needle intradermally lateral to intended venipuncture site.
d. Aspirate to confirm no blood return.
e. Inject 0.1 cc to 0.3 cc anesthetic to form wheal at intended access site.
f. Remove needle and discard syringe in appropriate sharps container.
g. Proceed with device insertion.
h. Assess for response and any reactions to intradermal anesthetic.

Iontophoresis
a. Refer to manufacturers’ directions for use.
b. Assess for response and any reactions to iontophoresis procedure.
   i. Skin irritation or burns associated with use
   ii. Erythema under electrodes, which is usually transient
**Documentation**

Document in the patient’s health record:
- Local anesthetic used
- Date, time of administration
- Patient education
- Patient response to effectiveness of local anesthetic and VAD procedure

**Bibliography**


Short Peripheral Catheter (SPC) Placement

**Policy**
The decision to place a short peripheral catheter (SPC) as the most appropriate vascular access device (VAD) for the patient occurs as an interprofessional collaboration with the patient and caregiver(s), based on the projected treatment plan.

The VAD selected is of the smallest outer diameter with the fewest number of lumens and is the least invasive device needed for the prescribed therapy.

Peripheral vein preservation is considered when planning for vascular access.

An SPC is chosen for nonirritant, nonvesicant, and nonhyperosmolar infusion therapy, with a relatively short anticipated duration of infusion therapy (eg, less than 1 week).

No more than 2 attempts at SPC placement will be made by any 1 clinician, and no more than 4 attempts per patient. Attempts at SPC insertion should be made only if venous access is believed to be adequate.

Competency is validated for clinicians who insert SPCs.

**Key Points**
The smallest-gauge SPC that will accommodate the prescribed therapy will be chosen.

Use steel winged devices for single-dose administration only, and do not leave this device in place.

The clinical need for each SPC is assessed with each infusion visit.

If 4 unsuccessful attempts have been made, another plan for vascular access is required.

Avoid areas of joint flexion, including the hand, all surfaces of the wrist, and the antecubital fossa. Choose insertion sites in the forearm to increase dwell time, decrease complications, promote self-care, and prevent accidental removal.

Sudden complaints of paresthesia-type pain, including electrical shock-like pain, tingling, severe burning, and/or numbness, indicate nerve damage and require immediate removal of the catheter.

Antiseptic preparations can cause stinging and irritation. Too much alcohol can dry compromised skin. Although antiseptic agents should be applied with friction, be aware that irritated skin may become more damaged, causing further distress and discomfort.
In immunocompromised patients, the length of time and amount of tension applied to the tourniquet should be limited to avoid inadvertent bruising and skin tears. Venous distention may take longer and tapping the area over the vein and intended venipuncture site may cause accidental bruising. If the tourniquet is too tight or in place for an extended period of time, the vein may become overdistended and become damaged during venipuncture. The tourniquet should be released as soon as possible after the insertion of the SPC and positive confirmation of blood return.

Tourniquets should not be applied for longer than 2 to 3 minutes. The tourniquet should lie flat against the skin or over clothing for additional comfort. The patient should never be left with the tourniquet in place, and it should be removed while preparing equipment for venipuncture.

Joint stabilization devices typically are used to support areas of flexion when an SPC is in place. Examples include splints, soft arm boards, or tongue depressors wrapped in gauze. While positioning the hand or wrist in a functional position is necessary, extra padding under taping surfaces may be required to prevent joint stiffness and resulting discomfort.

Consider methods to reduce pain and discomfort of catheter insertion, such as:

- Local anesthetic agents, including, but not limited to, topical vapocoolant sprays, topical transdermal agents, intradermal lidocaine, and pressure-accelerated lidocaine
- Adjunctive and less invasive anxiolytic, cognitive, behavioral, and complementary therapies

**Assessment**

Assess the characteristics of the prescribed infusion therapy and the anticipated length of therapy to determine if an SPC is the most appropriate VAD.

Assess the condition of the skin and previous sites of venipunctures and/or infusion complications (eg, phlebitis, infiltration) and avoid these areas for SPC insertion.

Discuss arm preference with the patient and the recommendation for use of the nondominant arm in order to decrease accidental removal.

Assess the number and location of peripheral veins that are easily seen and palpated. If venous sites are not found, avoid blind venipuncture and use a vascular visualization method, eg, visible or near infrared light and ultrasound.

- Avoid veins in the upper extremity of the side of breast surgery with axillary node dissection, with lymphedema, or with an arteriovenous fistula/graft; after radiation therapy to that side of the body; or the affected extremity from a cerebrovascular accident.
- For patients with chronic kidney disease, collaborate with the patient and licensed independent practitioner (LIP) to discuss the risks and benefits of using the upper extremity when a future dialysis graft or fistula is planned.
• Do not use veins of the lower extremities, unless necessary, due to risk of tissue damage, thrombophlebitis, and ulceration.
• For pediatric patients, consider veins in the hand, forearm, and upper arm below the axilla.
  ◦ Avoid the antecubital area, which has a higher failure rate.
  ◦ Avoid veins in the right arm of children after procedures treating congenital cardiac defects that may have decreased blood flow to the subclavian artery.

**Patient Education**

Purpose of the SPC insertion procedure, including risks, benefits, signs, and symptoms of common complications and how and to whom to report them

Patient and/or caregiver instruction includes:
• Infection prevention, including aseptic technique and hand hygiene before any catheter access
• Disinfection of needleless connector before every catheter access
• Flushing and locking frequency, technique, and solution
• Dressing change frequency
• Importance of keeping dressing and site clean and dry while catheter is in place
• Signs and symptoms of complications and whom to and how to report them, including complications after catheter removal
• Living with an SPC, including activity limitations and protecting the device while performing activities of daily living, such as protection from water during bathing, without disruption of the dressing or insertion site

Instruction of procedures is accomplished through demonstration, return demonstration, and use of the teach-back technique.

Comprehension and performance are evaluated throughout the period of catheter dwell time.

**Supplies**
• Gloves, nonsterile (sterile gloves are needed for site palpation after skin antisepsis.)
• SPC with safety mechanism
• Vein visualization device, if needed
• Single-use clippers or scissors for hair removal, if indicated
• Local anesthetic, as indicated
• Stabilization device
• Short extension set, if not permanently attached to the catheter
• Needleless connector
• Preservative-free 0.9% sodium chloride (USP) prefilled syringe(s) or primed administration set
Vascular Access Device Placement

- Intravenous start kit (preferred) or the following:
  - Single-use tourniquet
  - Antiseptic solution
  - Transparent semipermeable membrane (TSM) dressing (preferred)
  - Sterile gauze and sterile tape for dressing, if indicated
  - Label

Preprocedure

1. Obtain and review the LIP’s order for infusion therapy.
2. Assess for history of allergies to analgesia, adhesives, or antiseptic solutions.
3. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
4. Obtain informed consent according to organizational policy or patient assent.
5. Disinfect work area (ie, over-bed table) with antimicrobial solution; allow to dry completely

Procedure

1. Gather supplies.
2. Place patient in sitting or recumbent position, as appropriate.
3. Perform hand hygiene.
4. Place tourniquet to promote venous distention.
   
   Note: To reduce the discomfort, pressure, or “pinching” from a tourniquet, wrap the area where the tourniquet will be placed with a washcloth, or apply the tourniquet over a piece of clothing. Tourniquets are single-use and latex-free. A tourniquet is not to be applied on an extremity with an arteriovenous fistula. If a blood pressure cuff is used to promote venous distension, inflate to just below diastolic pressure. An arterial pulse should be easily palpable distal to the tourniquet location.
5. Assess vasculature of the upper extremity and identify potential sites that are easily seen and/or palpated.
6. If no venous sites are visible or easily palpated, use technology to improve insertion success:
   a. For visible light devices, use only cold light sources designed for vascular visualization to reduce risk for thermal burns. Darken the room to remove ambient light levels when using these devices; ensure adequate light to observe blood return from the catheter.
   b. For near-infrared light devices, follow the manufacturers’ directions for use to identify bifurcating veins, tortuosity of veins, and palpable but nonvisible veins.
c. For ultrasound-guided insertion, assessment of vessel depth is critical since selection of the appropriate length catheter will prevent inadvertent infiltration. Follow the manufacturers’ directions for use of ultrasound equipment. (See Ultrasound-Guided Short Peripheral Catheter Placement).

7. Remove tourniquet.
8. Prepare insertion site:
   a. If visibly soiled, cleanse with antiseptic soap and water.
   b. Remove excess hair, if necessary, by clipping.
9. Administer local anesthesia if needed (see Local Anesthesia).
11. Don gloves.
12. Cleanse insertion site with antiseptic solution; allow to dry completely.
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of concentric circles or a back-and-forth motion for this skin preparation has not been studied.
13. Prepare equipment.
   a. Flush add-on devices with preservative-free 0.9% sodium chloride (USP) to remove air from devices.
14. Reapply a tourniquet above the intended venipuncture site, or use alternative methods to promote venous distention.
15. Use vein visualization technology if needed.
16. If vein palpation is necessary after application of skin antiseptic, apply sterile gloves.
17. Stabilize the selected vein below the intended venipuncture site by stretching the skin taut with the nondominant hand.
18. Perform venipuncture and advance catheter according to device-specific manufacturers’ directions for use. Observe blood in the catheter and/or flash chamber of the SPC.
19. Release the tourniquet.
20. Activate the safety mechanisms according to manufacturers’ directions for use.
21. If extension set is to be attached, compress the skin well above the catheter tip to stop the flow of blood, and attach the primed extension set to the catheter hub and tighten the luer lock. Do not allow the male luer of the extension set to touch the skin.
22. If using an SPC with a preattached extension set, attach a prefilled flush syringe, aspirate to remove air, and assess for blood return the color and consistency of whole blood.

23. For intermittent use, attach needleless connector and disinfect the connection surface.

24. Aspirate to remove air and to assess for blood return the color and consistency of whole blood, flush with preservative-free 0.9% sodium chloride (USP).

25. For continuous infusion, attach primed administration set.

26. Observe the site for signs of swelling, or if patient complains of discomfort or pain. Remove the catheter if signs are present.

27. Stabilize the catheter, preferably with an engineered stabilization device. If not available, use only sterile tape.

28. Apply a TSM dressing over the insertion site.

29. For added securement, curl the extension set to the side and tape to the arm. Do not “wrap” the tape around the extremity.

30. Discard used supplies in the appropriate receptacles.

31. Remove gloves and perform hand hygiene.

32. Label dressing with:
   a. Insertion date and time
   b. Gauge and length of device
   c. Initials of inserter

**Documentation**

Document in the patient’s health record:

- Use of visualization technology, as appropriate
- Date and time of insertion, number of attempts, functionality of device, local anesthetic, if used
- Identification of the insertion site by anatomical descriptors, laterality, landmarks, or appropriately marked drawings
- Patient’s response to the procedure
- Patient education
Bibliography


Ultrasound-Guided Short Peripheral Catheter (SPC) Placement

Considerations for the Ambulatory Infusion Patient

It may be less common for a patient to be discharged with an ultrasound-guided short peripheral catheter (SPC) in place. If this occurs, however, patients and/or caregivers may be involved in various aspects of care.

Policy

The decision to place an ultrasound-guided SPC as the most appropriate vascular access device (VAD) for the patient occurs as an interprofessional collaboration with the patient and caregiver(s) based on the projected treatment plan.

The VAD selected is of the smallest outer diameter with the fewest number of lumens and is the least invasive device needed for the prescribed therapy.

Peripheral vein preservation is considered when planning for vascular access.

Competency is validated for clinicians who use ultrasound technology for SPC insertion.

Key Points

Ultrasound-guided SPC insertion is an important clinical adjunct for patients with difficult vascular access.

Visualization of vessels can lead to less insertion trauma.

Infusion therapies expected to last more than 1 week may be better suited to peripherally inserted central catheter or midline catheter placement.

Assessment

Longitudinal or transverse views can be used when placing vascular catheters with ultrasound. Surrounding structures will not be visible in the longitudinal view. The needle tip should remain in view at all times. If the inserter is unable to visualize the tip of the needle, the probe, not the needle, should be moved to reestablish visibility. Otherwise, inadvertent nerve or arterial puncture could occur.

Assessment of vessel depth is critical, because selection of the appropriate length catheter will prevent inadvertent infiltration.

Vessels more than 0.5 cm deep have an increased risk for inadvertent infiltration as the result of the use of short catheters; choose catheters long enough to ensure at least two-thirds of the catheter length will reside in the vein after insertion.
Power injection of ultrasound-guided VADs can result in extravasation if sufficient catheter length does not dwell in the vessel.

Vessels deeper than 1.5 cm should be avoided, and an alternative vascular access plan should be developed.

**Patient Education**
Purpose of SPC insertion procedure, including risks, benefits, and signs and symptoms of common complications and how and to whom to report them

Rationale for use of ultrasound

**Supplies**
- Gloves, nonsterile (sterile gloves are needed for site palpation after skin antisepsis.)
- SPC with safety mechanism (1.75 – 1.88-inch catheters provide better stabilization and prevent infiltration in deeper vessels.)
- Vein visualization device
- Single-use clippers or scissors for hair removal, if indicated
- Local anesthetic, as indicated
- Stabilization device
- Short extension set, if not permanently attached to the catheter
- Needleless connector
- Preservative-free 0.9% sodium chloride (USP) prefilled syringe(s) or primed administration set
- Intravenous start kit (preferred) or the following:
  - Single-use tourniquet
  - Antiseptic solution
  - Transparent semipermeable membrane (TSM) dressing (preferred)
  - Sterile gauze and sterile tape for dressing, if indicated
  - Label
- For ultrasound:
  - Disinfectant wipe
  - Sterile ultrasound gel
  - Sterile ultrasound probe cover
  - Portable ultrasound machine

**Preprocedure**
1. Obtain and review licensed independent practitioner’s order for infusion therapy.
2. Assess for history of allergies to analgesics, adhesives, or antimicrobial solutions.
3. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth)
4. Obtain informed consent according to organizational policy or patient assent.
5. Disinfect work area (ie, over-bed table) with antimicrobial solution; allow it to dry completely.

**Procedure**

1. Assess vasculature using ultrasound.
   a. Sanitize the ultrasound probe with a disinfectant wipe.
   b. Perform hand hygiene.
   c. Don clean gloves.
   d. Apply liberal amount of ultrasound gel to the patient’s arm.
2. Apply probe to the skin: visualize and note the location of the veins, arteries, and nerves surrounding the proposed insertion site.
   a. When compressed, arteries are pulsatile. Healthy veins should compress easily when light downward pressure is applied to the ultrasound probe. Nerves can appear as echogenic bundles adjacent to veins and arteries, and caution should be used to avoid nerve stimulation.
   b. Without a tourniquet, assess veins for vessel size, path, round shape, and compressibility.
   c. Assess depth of intended vessel for venipuncture.
   d. Assess for adequacy of vessel size compared to proposed outer catheter diameter to promote hemodilution and preserve vessel health.
   e. Smaller vessels should be avoided to prevent phlebitis and thrombosis.
   f. Remove gloves and discard.
3. Perform hand hygiene.
4. Prepare for insertion, collecting necessary insertion supplies, and setting up a sterile field.
   a. Position patient for comfort and equipment for visualization of the vasculature.
5. Apply a bead of ultrasound gel to the probe and cover with sterile TSM dressing or probe cover; avoid contamination of the probe cover or TSM dressing that will be in contact with the patient’s skin.
6. Create a sterile field by opening a paper sterile barrier on a clean surface.
7. Don clean gloves.
8. Prepare the insertion site:
   a. If visibly soiled, cleanse with antiseptic soap and water.
   b. Remove excess hair, if necessary, by clipping.
9. Administer local anesthesia, if needed (see *Local Anesthesia*).
10. Cleanse insertion site with antiseptic solution; allow it to dry completely.
b. Povidone-iodine: apply using applicator and allow to it to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of concentric circles or a back-and-forth motion for this skin preparation has not been studied.

11. Apply tourniquet.
12. Apply a small amount of sterile ultrasound gel to the prepped area.
13. Relocate the intended vein with the ultrasound probe, verifying it is nonpulsatile.
14. Place the tip of the catheter on the skin at a distance from the probe that will intersect the vein within the plane of the scan field as the catheter is advanced to the intended vein's depth. Pierce the skin using a shallow enough angle to allow for successful threading of the catheter into the vessel. Move the ultrasound probe toward the catheter to identify the catheter tip. Move the ultrasound probe and the needle in the same direction, keeping the needle tip in view on the screen as the catheter approaches the vein. Observe for dimpling of the tissue and vessel wall as the needle tip approaches and enters the lumen of the intended vessel. Make sure to keep the gel and probe away from the sterile catheter.
   a. The tip of the catheter stylet will appear as an echogenic white dot on the screen.
15. Align the path of the needle to enter the centermost superficial area of the vein wall and observe the needle tip entering the lumen of the vein.
16. Confirm slow venous blood return the color and consistency of whole blood.
   a. If blood return is pulsatile, immediately abort the procedure by removing the needle and tourniquet and applying pressure to the area for 10 minutes or until hemostasis is achieved.
17. Place the ultrasound probe on the sterile field.
18. Decrease the angle of the catheter and advance the catheter into the vein.
20. Retract the catheter stylet while applying pressure to the vein proximal to the tip of the catheter, using caution not to contaminate the insertion site.
21. Connect the primed extension set, if not using a catheter with a preattached extension set.
22. Retrieve probe from the sterile field and position over the catheter tip in the longitudinal view.
23. Flush the catheter while viewing the catheter in the longitudinal view on ultrasound to ensure the catheter is properly seated in the vein and that inadvertent infiltration has not occurred during insertion.
24. Stabilize and secure the catheter hub and attached extension set using aseptic technique, preferably with an engineered stabilization device.
25. Confirm blood return, lack of resistance to flush, and absence of swelling or tenderness at site.
26. Catheters placed in the antecubital space or within another area of flexion require joint stabilization to prevent infiltration/extravasation.
27. Apply a TSM dressing over the insertion site.
28. Discard used supplies in the appropriate receptacles.
29. Remove gloves and perform hand hygiene.
30. Label dressing with the date performed or date to be changed.

**Documentation**

Document in the patient’s health record:
- Use of ultrasound for catheter placement, catheter size, vessel depth, catheter length, and insertion location
- Date and time of insertion, number of attempts, functionality of device, local anesthetic, if used
- Identification of the insertion site by anatomical descriptors, laterality, landmarks, or appropriately marked drawings
- Patient’s response to the procedure
- Patient education

**Bibliography**


Ultrasound-Guided Midline Catheter Insertion

Considerations for the Ambulatory Infusion Patient
Midline catheters may be an option for patients receiving infusion therapy in an ambulatory setting. Several factors must be considered when planning for return to home or another environment, including the ability of the patient to participate in infusion selfcare activities, home health resources and use of equipment, and the availability and capability of a caregiver or health care provider to manage infusion therapy.

Policy
The decision to place a midline catheter as the most appropriate vascular access device (VAD) for the patient occurs as an interprofessional collaboration with the patient and caregiver(s), based on the projected treatment plan.

The VAD selected is of the smallest outer diameter with the fewest number of lumens and is the least invasive device needed for the prescribed therapy.

Peripheral vein preservation is considered when planning for vascular access.

Competency is validated for clinicians who place midline catheters.

Key Points
A midline catheter is defined as a catheter inserted into the upper arm through the basilic, cephalic, or brachial vein, with the internal tip located level at or near the level of the axilla and distal to the shoulder.

Consider a midline catheter for medications and solutions, such as antimicrobials, fluid replacement, and analgesics, with characteristics that are well tolerated by peripheral veins for an anticipated treatment duration of 1 to 4 weeks.

Use caution for noncontinuous (or intermittent) vesicant administration because of the risk of undetected extravasation.

Therapies intended for longer than 2 weeks may be better suited to peripherally inserted central catheter placement.

Relative contraindications to midline catheter placement include upper extremity edema, limited mobility, vascular implants (eg, arteriovenous fistula), prolonged bleeding time, history of unresolved deep vein thrombosis, or end-stage renal disease requiring vein preservation, and the right arm of children after procedures treating specific congenital cardiac defects that may have decreased blood flow to the subclavian artery.
Modified Seldinger technique is a multistep process that employs the use of a micropuncture needle and a dilator/introducer combination to insert a catheter for vascular access.

Seldinger technique is a multistep process that employs the use of a dilator to facilitate catheter advancement into a central location over a guidewire.

Midline catheters may also incorporate new techniques designed to reduce the number of individual pieces required, potentially decreasing the risk of insertion-related complications. This technique integrates the guidewire within a sterile housing followed by catheter advancement from that same housing.

Consider the use of maximal barrier precautions for insertion.

**Assessment**

Select sites in the upper arm (preferred) or the region of the antecubital fossa (secondarily), using the basilic, cephalic, median cubital, and brachial veins, with the basilic vein preferred. For pediatric patients, additional site selections include veins in the leg with the tip below the groin.

Avoid insertion in areas with pain on palpation; areas of open wounds; areas on an extremity with an infection; veins that are compromised (eg, bruised, infiltrated, phlebitic, sclerosed, corded, or engorged); and areas of planned procedures.

Discuss arm preference with the patient and the recommendation for use of the nondominant arm to decrease chances of accidental removal.

Longitudinal or transverse views can be used when placing vascular catheters with ultrasound. Surrounding structures will not be visible in the longitudinal view. The needle tip should remain in view at all times. If the inserter is unable to visualize the tip of the needle, the probe, not the needle, should be moved to reestablish visibility. Otherwise, inadvertent nerve or arterial puncture could occur.

Visualize and note the location of the veins, arteries, and nerves surrounding the proposed insertion site. When compressed, arteries are pulsatile. Healthy veins should compress easily when light downward pressure is applied to the ultrasound probe. Nerves can appear as echogenic bundles adjacent to veins and arteries, and caution should be used to avoid nerve stimulation.

Without a tourniquet, assess veins for vessel size, path, round shape, and compressibility.

Assess depth of the intended vessel for venipuncture.

Assess for adequacy of vessel size compared to proposed outer catheter diameter (catheter-to-vein ratio greater than or equal to 45%) to promote hemodilution and preserve vessel health.
Smaller vessels (catheter-to-vein ratios of less than 45%) should be avoided to reduce the risk of phlebitis and thrombosis.

**Patient Education**

Purpose of midline catheter, risks, benefits, and signs and symptoms of common complications

Rationale for the use of ultrasound

Patients and/or caregiver instruction includes:

- Infection prevention measures, including aseptic no-touch technique and hand hygiene before any catheter access
- Disinfection of needleless connector before every catheter access
- Flushing and locking frequency, technique, and solution
- Importance of keeping dressing and site clean and dry while catheter is in place
- Dressing change frequency
- Signs and symptoms of complications and whom to and how to report these, including complications after catheter removal
- Living with a midline catheter, including activity limitations and protecting the device while performing activities of daily living, including protection from water during bathing

Instruction of procedures is accomplished through demonstration, return demonstration, and use of teach-back technique.

Comprehension and performance are evaluated throughout the period of catheter dwell time, as well as on removal.

**Supplies**

- Insertion kit for Modified Seldinger procedure:
  - Midline catheter
  - Safety microintroducer needle
  - Introducer/dilator appropriate to the catheter size
  - Guidewire
  - Safety scalpel
  - Tourniquet: single use
- Insertion tray:
  - Maximal barrier supplies
    - Head covering
    - Mask
    - Sterile gloves (2 pair)
    - Sterile gown
    - Underarm sterile drape
    - Large sheet sterile drape with fenestration
- Antiseptic solution (Alcoholic chlorhexidine preferred, may substitute 70% isopropyl alcohol and povidone-iodine for chlorhexidine gluconate [CHG] sensitivities.)
- Sterile gauze
- Disposable tape measure
- Disposable skin marker

- Engineered stabilization device (ESD)
- Extension set (needed for some catheters)
- Needleless connector(s) for each lumen
- Prefilled syringe preservative-free 0.9% sodium chloride (USP) flushes for each lumen
- Prefilled syringe of heparin lock solution 10 units per mL or as indicated by organizational policy or licensed independent practitioner (LIP) order
- Transparent semipermeable membrane (TSM) dressing: antimicrobial sponge or antimicrobial gel dressing, if used
- Skin protectant solution
- Sterile ultrasound gel
- Sterile ultrasound probe cover
- Disinfectant wipe
- Ultrasound machine
- Clean gloves
- Local anesthetic, as needed, according to protocol or as ordered
  - 3-mL syringe and small-gauge needle for subcutaneous anesthetic administration

For the Seldinger technique, add components for the procedure not included in the insertion kit.

### Preprocedure

1. Obtain and review LIP’s order for insertion of midline catheter.
2. Collaborate with the prescribing LIP for any relative contraindication to placement before placing a midline catheter.
3. Assess for history of allergies to analgesics, adhesives, or antimicrobial solutions.
4. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
5. Obtain informed consent according to organizational policy.
6. Position patient supine, as appropriate, related to insertion site.
7. Disinfect work area (ie, over-bed table) with antimicrobial solution; allow to dry completely.
8. Gather supplies.
Procedure

1. Assess vasculature using ultrasound.
   a. Sanitize the ultrasound probe with a disinfectant wipe.
   b. Perform hand hygiene.
   c. Don clean gloves.
   d. Apply liberal amount of ultrasound gel to the patient’s arm.

2. Apply probe to the skin: visualize and note the location of the veins, arteries, and nerves surrounding the proposed insertion site.
   a. When compressed, arteries are pulsatile. Healthy veins should compress easily when light downward pressure is applied to the ultrasound probe. Nerves can appear as echogenic bundles adjacent to veins and arteries, and caution should be used to avoid nerve stimulation.
   b. Without a tourniquet, assess veins for vessel size, path, round shape, and compressibility.
   c. Assess depth of intended vessel for venipuncture.
   d. Assess for adequacy of vessel size compared to the proposed outer catheter diameter to promote hemodilution and preserve vessel health.
   e. Smaller vessels should be avoided to prevent phlebitis and thrombosis.
   f. Mark the level of the proposed insertion site with single-use disposable skin marker on the outer aspect of the arm to avoid leaving ink under the dressing and to allow for appropriate skin cleansing.
   g. Remove the ultrasound gel from the patient’s skin.

3. Obtain baseline measurements as appropriate to insertion site.

4. If using topical anesthetic cream, apply to proposed insertion site, cover with TSM dressing, and allow 15 to 60 minutes before continuing with procedure, according to the manufacturers’ directions for use.

5. Remove gloves and discard.

6. Prepare for insertion, collecting necessary insertion supplies and setting up a sterile field.

7. Perform hand hygiene.

8. Position patient for comfort and equipment for visualization of the vasculature.

9. Don head covering and mask.


11. Open the insertion tray and midline catheter kit to create a sterile field and add additional items to the field, using sterile technique as needed.

12. Don sterile gown and 2 pairs of sterile gloves.
13. Prime any needed extension set(s) and catheter with 0.9% sodium chloride.

14. If the catheter has a stylet wire, withdraw just past the desired length, bending the stylet wire over the catheter hub before trimming the catheter to the premeasured length. Use caution never to cut the stylet wire.

15. If the catheter is to be trimmed, the use of a guillotine or scalpel is preferred instead of scissors for trimming in a blunt cut.

16. Place sterile drape under the extremity of the intended insertion site.

17. Prep the skin in the entire area where the dressing will cover.
   a. Chlorhexidine solution (preferred): apply using a back-and-forth motion for at least 30 seconds
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of concentric circles or a back-and-forth motion for this skin preparation has not been studied.

18. Apply a tourniquet proximal to the insertion site.

19. Remove outer set of gloves after prepping the skin and applying the tourniquet.

20. Use maximal sterile barrier precautions when placing a midline catheter.

21. Cover the ultrasound with sterile probe cover and secure.

22. Apply sterile ultrasound gel to skin over the proposed insertion site.

23. Relocate the intended vein with the ultrasound probe, verifying that it is nonpulsatile and compressible.

24. Inject local anesthetic subcutaneously at the insertion site, if needed. Before injection, aspirate for absence of blood return.

25. While visualizing the vessel, insert the microintroducer needle through the skin and into the vein using a 45-degree angle. Place the tip of the microintroducer needle on the skin at a distance from the probe that will intersect the vein within the plane of the scan field as the catheter is advanced to the intended vein’s depth. Move the ultrasound probe toward the needle to identify the needle tip. Move the ultrasound probe and the needle in the same direction, keeping the needle tip in view on the screen as the catheter approaches the vein. Observe for dimpling of the tissue and vessel wall as the needle tip approaches and enters the lumen of the intended vessel. Make sure to keep the gel and probe away from the sterile catheter.
   a. The tip of the microintroducer needle will appear as an echogenic white dot on the screen.
26. Align the path of the needle to enter the centermost superficial area of the vein wall and observe the needle tip entering the lumen of the vein.

27. Confirm slow venous blood return the color and consistency of whole blood.
   a. If blood return is pulsatile, immediately abort the procedure by removing the needle and tourniquet and applying pressure to the area for 10 minutes or until hemostasis is achieved.

28. Observe for blood return in microintroducer needle hub and visualize the needle tip in the center of the vein on ultrasound before proceeding.

29. Put the ultrasound probe down on sterile field.

30. Reduce the angle of the microintroducer needle and stabilize the microintroducer needle.

31. Insert the floppy-tipped guidewire into the microintroducer needle, threading into the vein. The guidewire should never be inserted into a position beyond the level of the axilla.

32. Carefully remove the microintroducer needle from the vein and skin, pulling it back over the guidewire.
   a. Do not allow the guidewire to move outward through the microintroducer needle because of the risk of severing the guidewire.

33. Secure the guidewire with your nondominant hand to prevent migration in or out of the vein.

34. Make a skin nick, if needed.
   a. Using a scalpel, hold the blade with the blunt side against the wire.
   b. Make a small nick at the insertion site on the side of the guidewire to facilitate insertion of the peel-away dilator/introducer into the skin.

35. Advance the peel-away dilator/introducer over the guidewire through the skin completely into the vein using a twisting motion.

36. Remove the guidewire.

37. Release the tourniquet, using caution not to break sterile technique.

38. Slowly remove the dilator leaving the peel-away introducer sheath in the vein.

39. Slowly advance the catheter through the introducer sheath.

40. Continue to advance the catheter slowly to the measured length.

41. Attach sterile saline-filled syringe, and aspirate for blood return the color and consistency of whole blood from catheter and flush to determine patency.
42. Break the wings and slowly peel away the introducer sheath as it is withdrawn, taking care to allow the catheter to remain in its terminal tip location.

43. Connect the primed extension set(s) to the catheter hub, if needed.

44. Apply a needleless connector to each lumen.

45. Clean excess blood from the insertion site using CHG solution or dry gauze.

46. Stabilize the catheter:
   a. If using a subcutaneous ESD, use according to manufacturers’ directions
   b. If using an adhesive-based ESD, apply a skin protectant solution to the area to be covered by the ESD and dressing and allow to dry

47. For oozing sites, apply sterile gauze and a TSM dressing to the insertion site and change in 24 hours; hemostatic agents may be required for sites that continue to ooze for longer than 24 hours; use in accordance with manufacturers’ directions.

48. If using a CHG-impregnated dressing, do not apply skin protectant solution directly under the sponge or gel patch, as the solution will block its action at the puncture site. Apply the TSM dressing to dry sites.

49. Flush and lock the midline catheter according to organizational policy.

**Documentation**

Document in the patient’s health record:
- Date/time of insertion, number of attempts, functionality of catheter, and local anesthetic, if used
- Insertion site: vessel and size
- Catheter length, size, and number of lumens
- Length of any external catheter
- Dressing and securement method used (date and initial on dressing)
- Baseline measurements relevant to insertion site
- Patient’s response to the procedure and pain management
- Patient education
Bibliography


Ultrasound-Guided Peripherally Inserted Central Catheter (PICC) Insertion Using Modified Seldinger Technique (MST)

**Considerations for the Ambulatory Infusion Patient**

When it is anticipated that the patient may receive a longer course of infusion therapy, a peripherally inserted central catheter (PICC) may be an option. Several factors must be considered when planning for return to home or another environment, including the ability of the patient to participate in infusion selfcare activities, home health resources and use of equipment, and the availability and capability of a caregiver or health care provider to manage infusion therapy.

**Policy**

The decision to place a PICC as the most appropriate vascular access device (VAD) for the patient occurs as an interprofessional collaboration with the patient and caregiver(s) based on the projected treatment plan.

The VAD selected is of the smallest outer diameter with the fewest number of lumens and is the least invasive device needed for the prescribed therapy.

Peripheral vein preservation is considered when planning for vascular access.

Competency is validated for clinicians who place PICCs.

A checklist is completed by a trained observer to ensure that all steps have been completed without contamination. The observer is trained in how to observe and assist with the procedure and may be an unlicensed person without insertion skills.

Tip location is the cavoatrial junction (superior or inferior) and is confirmed and documented before infusion therapy is initiated through the PICC.

**Key Points**

A PICC insertion is a sterile procedure requiring implementation of the central line bundle components of maximal sterile barrier (MSB) precautions. The Centers for Disease Control and Prevention recommends MSB precautions for central vascular device placement, because it substantially reduces catheter-related bloodstream infection.

Since the advent of ultrasound, the placement of PICCs using palpation only is becoming rare. The clinician competent in using ultrasound for PICC placement is at a greater advantage compared to those inserting PICCs using palpation only. In addition to increasing accuracy rates and decreasing complications, ultrasound can detect venous thrombosis and prevent inappropriate placements.
To minimize unnecessary central vascular access device (CVAD) placement, including PICCs, ensure that placement of the PICC is based on evidence-based indications for CVAD placement such as:

- Clinical instability of the patient and/or complexity of infusion regimen (multiple infusates)
- Episodic chemotherapy treatment anticipated for more than 3 months
- Prescribed continuous infusion therapy (eg, parenteral nutrition, fluid and electrolytes, medications, blood or blood products)
- Long-term intermittent infusion therapy (eg, any medication, including antifungals in patients with a known or suspected infection)
- History of failed or difficult peripheral venous access, if use of ultrasound guidance has failed

Recognize risks associated with PICCs, including increased incidence of venous thrombosis and rates of central line-associated bloodstream infection similar to other nontunneled CVADs.

Power injection of PICCs can result in catheter malposition. Verification of proper tip placement should be reestablished after power injection.

Relative contraindications to PICC placement include upper extremity edema; limited mobility; vascular implants (eg, arteriovenous fistula); prolonged bleeding time; history of unresolved deep vein thrombosis or superior vena cava (SVC) filter; end-stage renal disease requiring vein preservation; and the right arm of children after procedures treating specific congenital cardiac defects that may have decreased blood flow to the subclavian artery.

PICC placement with an SVC filter should only be attempted using fluoroscopy.

Modified Seldinger technique is a multistep process that employs the use of a micropuncture needle and a dilator/introducer combination to insert a catheter for vascular access.

For any catheter placed above the level of the heart where the gradient of intrathoracic pressure can lead to an influx of air, use air emboli precautions by taking steps to cover the open access to the vasculature when inserting needles, introducers, dilators, or catheters.

**Assessment**

Select sites in the upper arm, using the basilic, cephalic, and brachial veins, with the basilic vein preferred.

Avoid insertion in areas with pain on palpation, areas of open wounds, areas on an extremity with an infection, veins that are compromised (eg, bruised, infiltrated, phlebitic, sclerosed, corded, or engorged), and areas of planned procedures.
PICCs may be the preferred CVAD in patients with coagulopathy disorders or those receiving anticoagulants, as direct pressure can be applied to control bleeding, and in patients with respiratory diagnoses or intracranial bleeding when the Trendelenburg position is difficult or contraindicated.

Discuss arm preference with the patient and the recommendation for use of the nondominant arm to decrease chances of accidental removal.

Longitudinal or transverse views can be used when placing vascular catheters with ultrasound. Surrounding structures will not be visible in the longitudinal view. The needle tip should remain in view at all times. If the inserter is unable to visualize the tip of the needle, the probe, not the needle, should be moved to reestablish visibility. Otherwise, inadvertent nerve or arterial puncture could occur.

Visualize and note the location of the veins, arteries, and nerves surrounding the proposed insertion site. When compressed, arteries are pulsatile. Healthy veins should compress easily when light, downward pressure is applied to the ultrasound probe. Nerves can appear as echogenic bundles adjacent to veins and arteries, and caution should be used to avoid nerve stimulation.

Without a tourniquet, assess veins for vessel size, path, round shape, and compressibility.

Assess depth of the intended vessel for venipuncture.

Assess for adequacy of vessel size compared to proposed outer catheter diameter (catheter-to-vein ratio greater than or equal to 45%) to promote hemodilution and preserve vessel health.

Smaller vessels (catheter-to-vein ratios of less than 45%) should be avoided to reduce the risk of phlebitis and thrombosis.

**Patient Education**

Purpose of PICC, risks, benefits, and signs and symptoms of common complications

What to expect with the procedure, including the purpose for the use of ultrasound

Patient and/or caregiver instructions include:
- Infection prevention measures, including aseptic technique and hand hygiene before any catheter access
- Disinfection of needleless connector before every catheter access
- Flushing and locking frequency, technique, and solution
- Dressing change frequency
- Importance of keeping dressing and site clean and dry while catheter is in place
- Signs and symptoms of complications and to whom and how to report them, including complications after catheter removal
• Living with a PICC, including activity limitations and protecting the device while performing activities of daily living, including protection from water during bathing

Instruction of procedures is accomplished through demonstration, return demonstration, and use of the teach-back technique.

Comprehension and performance are evaluated throughout the period of catheter dwell time.

**Supplies**

• Insertion kit for Modified Seldinger procedure:
  ◦ PICC
  ◦ Safety microintroducer needle
  ◦ Introducer/dilator appropriate to the catheter size
  ◦ Guidewire for accessing the vein
  ◦ Stylet for stiffening the catheter
  ◦ Safety scalpel
  ◦ Tourniquet: single use

• Insertion tray:
  ◦ Maximal barrier supplies
    ■ Head covering
    ■ Mask
    ■ Sterile gloves (2 pair)
    ■ Sterile gown
    ■ Underarm sterile drape
    ■ Large, full-body sheet sterile drape with fenestration
  ◦ Antiseptic solution (alcoholic chlorhexidine preferred; may substitute 70% isopropyl alcohol and povidone-iodine for chlorhexidine gluconate [CHG]) sensitivities)
  ◦ Sterile gauze
  ◦ Disposable tape measure
  ◦ Disposable skin marker

• Engineered stabilization device (ESD)

• Needleless connector(s) for each lumen

• Prefilled syringe preservative-free 0.9% sodium chloride (USP) flushes for each lumen

• Prefilled syringe of heparin lock solution 10 units per mL or as indicated by organizational policy or licensed independent practitioner (LIP) order.

• Transparent semipermeable membrane (TSM) dressing; antimicrobial sponge or antimicrobial gel dressing if used

• Skin protectant solution

• Sterile ultrasound gel

• Sterile ultrasound probe cover

• Ultrasound machine
Vascular Access Device Placement

- Disinfectant wipes
- Clean gloves
- Local anesthetic, as needed per protocol, or as ordered
  - 3-mL syringe and small-gauge needle for subcutaneous anesthetic administration
- Tip-locating device

Preprocedure
1. Obtain and review LIP’s order for insertion of PICC.
2. Collaborate with the prescribing LIP for any relative contraindication to placement before placing a PICC.
3. Assess for history of allergies to analgesics, adhesives, or antimicrobial solutions.
4. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
5. Obtain informed consent per organizational policy or patient assent.
6. Position patient as appropriate, related to insertion site.
7. Disinfect work area (ie, over-bed table) with antimicrobial solution; allow to dry completely.
8. Gather supplies.

Procedure
1. Assess vasculature using ultrasound.
   a. Sanitize the ultrasound probe with a disinfectant wipe.
   b. Perform hand hygiene.
   c. Don clean gloves.
   d. Apply liberal amount of ultrasound gel to the patient’s arm.
2. Apply probe to the skin: visualize and note the location of the veins, arteries, and nerves surrounding the proposed insertion site.
   a. When compressed, arteries are pulsatile. Healthy veins should compress easily when light downward pressure is applied to the ultrasound probe. Nerves can appear as echogenic bundles adjacent to veins and arteries, and caution should be used to avoid nerve stimulation.
   b. Without a tourniquet, assess veins for vessel size, path, round shape, and compressibility.
   c. Assess depth of intended vessel for venipuncture.
   d. Assess for adequacy of vessel size compared to the proposed outer catheter diameter to promote hemodilution and preserve vessel health.
   e. Smaller vessels should be avoided to prevent phlebitis and thrombosis.
   f. Mark the level of the proposed insertion site with a single-use disposable skin marker on the outer aspect of the arm to avoid
leaving ink under the dressing and to allow for appropriate skin cleansing.

g. Remove the ultrasound gel from the patient’s skin.

3. Obtain baseline measurements as appropriate to insertion site.

4. To approximate the desired terminal tip location at the lower one-third of the SVC at the level of the cavoatrial junction, measure from the proposed insertion site to the clavicular head on the right side and then down to the bottom of the third intercostal space on the right. Viewing previous chest radiographs can help determine the distance from the clavicle to the level of the cavoatrial junction. Add length as needed to facilitate use of chosen adhesive-based ESD.

5. If using topical anesthetic cream, apply to proposed insertion site, cover with TSM dressing, and allow 15 to 60 minutes before continuing with procedure according to the manufacturers’ directions for use.

6. Remove gloves and discard.

7. Prepare for insertion, collecting necessary insertion supplies and setting up a sterile field.

8. Perform hand hygiene.


10. Don head covering and mask.

11. Perform hand hygiene.

12. Open the insertion tray and PICC kit to create a sterile field and include items in the field using sterile technique as needed.

13. Don sterile gown and 2 pairs of sterile gloves.

14. Prime any needed extension set(s) and catheter with 0.9% sodium chloride.

15. Use stylet wires according to manufacturers’ directions for use.
   a. *Never* cut a wire of any kind.
   b. If the catheter has a manufacturer-installed stylet wire, withdraw just past the desired length, bending the stylet wire over the catheter hub or locking in place before trimming the catheter to the premeasured length.
   c. If the stylet wire is provided in the kit but not already installed inside the PICC, follow directions for loading the stylet wire into the catheter lumen.
   d. Stylet wires provide stiffness for ease of catheter insertion. The stylet wire should not extend beyond the catheter tip.

16. If the catheter is to be trimmed, use of a guillotine or scalpel is preferred instead of scissors for trimming in a blunt cut.

17. Place sterile drape under the extremity of the intended insertion site.
18. Prep the skin in the entire area where the dressing will cover.
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of concentric circles or a back-and-forth motion for this skin preparation has not been studied.

19. Apply a tourniquet proximal to the insertion site.

20. Remove outer set of gloves after prepping the skin and applying the tourniquet.

21. Place large sterile sheet drape with insertion site fenestration over the entire patient; best practice is to cover the patient’s face with the large, sterile drape. If the patient cannot tolerate having his or her face covered, the drape can be tented, and the patient can wear a mask or turn the head away from the insertion site.

22. Cover the ultrasound with sterile probe cover and secure.

23. Apply sterile ultrasound gel to skin over the proposed insertion site.

24. Relocate the intended vein with the ultrasound probe, verifying it is nonpulsatile and compressible.

25. Inject local anesthetic subcutaneously at the insertion site, if needed. Before injection, aspirate for absence of blood return.

26. While visualizing the vessel, insert the microintroducer needle through the skin and into the vein using a 45-degree angle. Place the tip of the access needle on the skin at a distance from the probe that will intersect the vein within the plane of the scan field as the catheter is advanced to the intended vein’s depth. Move the ultrasound probe toward the catheter to identify the catheter tip. Move the ultrasound probe and the needle in the same direction, keeping the needle tip in view on the screen as the catheter approaches the vein. Observe for dimpling of the tissue and vessel wall as the needle tip approaches and enters the lumen of the intended vessel. Make sure to keep the gel and probe away from the sterile catheter.
   a. The tip of the microintroducer needle will appear as an echogenic white dot on the screen.

27. Align the path of the needle to enter the centermost superficial area of the vein wall and observe the needle tip entering the lumen of the vein.

28. Confirm slow venous blood return the color and consistency of whole blood.
a. If blood return is pulsatile, immediately abort the procedure by removing the needle and tourniquet and applying pressure to the area for 10 minutes or until hemostasis is achieved.

29. Observe for blood return in microintroducer needle hub and visualize the needle tip in the center of the vein on ultrasound before proceeding.

30. Put the ultrasound probe down on sterile field.

31. Reduce the angle of the microintroducer needle and stabilize the microintroducer needle.

32. Insert the floppy-tipped guidewire into the microintroducer needle, threading into the vein. The guidewire should never be inserted into a position beyond the level of the axilla without fluoroscopy guidance.

33. Carefully remove the microintroducer needle by removing it from the vein and skin and pulling it back over the guidewire.
   a. Do not allow the guidewire to move outward through the microintroducer needle due to risk of severing the guidewire.

34. Secure the guidewire with your nondominant hand to prevent migration in or out of the vein.

35. Make a skin nick, if needed.
   a. Using a scalpel, hold the blade with the blunt side against the wire.
   b. Make a small nick at the insertion site on the side of the guidewire to facilitate insertion of the peel-away dilator/introducer into the skin.

36. Advance the peel-away dilator/introducer over the guidewire through the skin completely into the vein using a twisting motion.

37. Remove the guidewire.

38. Release the tourniquet, using caution not to break sterile technique.

39. Slowly remove the dilator, leaving the peel-away introducer sheath in the vein.

40. Slowly advance the catheter through the introducer sheath.

41. Continue to advance the catheter slowly to the predetermined measurement.
   a. If using a tip-locating device, follow the manufacturers’ directions for use to determine proper tip placement, using air emboli precautions.
   b. If tip-location technology is not being used, withdraw the stylet wire from the catheter lumen, using air emboli precautions.

42. Attach sterile 0.9% sodium chloride-filled syringe, and aspirate for blood return the color and consistency of whole blood from catheter and flush to determine patency.
43. Break the wings and slowly peel away the introducer sheath as it is withdrawn, taking care to allow the catheter to remain in its terminal tip location.

44. Connect the primed extension sets.

45. Apply a needleless connector to each lumen.

46. Clean excess blood from the insertion site using CHG-solution or dry gauze.

47. Stabilize the catheter.
   a. If using a subcutaneous ESD, use according to manufacturers’ directions.
   b. If using an adhesive-based ESD, apply skin protectant solution to the area to be covered by the ESD and dressing and allow to dry.

48. For oozing sites, apply sterile gauze and TSM dressing to the insertion site and change in 24 hours; hemostatic agents may be required for sites that continue to ooze for longer than 24 hours. Use in accordance with manufacturers’ directions.

49. If using a CHG-impregnated dressing, do not apply skin protectant solution directly under the sponge or gel patch, as the solution will block its action at the puncture site. Apply the TSM dressing to dry sites.

50. Flush and lock the PICC according to organizational policy.

51. If using a tip-locating device, document the terminal tip location in the patient’s health record.

52. If not using a tip-locating device, obtain a chest radiograph to determine tip placement, and follow organizational policy for activating the catheter for use.

53. Catheters may be withdrawn after insertion to ensure proper tip location, using a sterile dressing change procedure, but should never be advanced after the initial insertion procedure.

**Documentation**

Document in the patient’s health record:

- Date/time of insertion, number of attempts, functionality of catheter, local anesthetic, if used
- Insertion site: vessel and size
- Catheter length, size, and number of lumens
- Length of any external catheter
- Terminal tip location, if using a tip-locating device
- Dressing and stabilization method used (date and initial on dressing)
- Baseline measurements relative to insertion site
- Patient response to the procedure and pain management
- Patient education
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Administration Set Change

Policy
Administration sets, including add-on devices, are changed at established intervals, depending on the type of administration and the infusate, and immediately when contamination is suspected or when product integrity is compromised.

Administration set changes, including add-on devices, will coincide with peripheral device replacement and central vascular access device insertion.

Administration sets used with lipid-based infusates, such as intravenous fat emulsions, will be free of di(2-ethylhexyl)phthalate.

All administration sets, any add-on devices, and needleless connectors are of a luer-lock design to ensure a secure junction.

Administration sets are attached and primed just before administration.

Minimize the number of manipulations and entries into the system.

All catheters/administration sets/add-on devices between the patient and the solution container are traced before connecting or reconnecting any infusion device, at each care transition to a new setting or service, and as part of the hand-off process.

Key Points
Administration set changes can pose a problem for patients who have impaired vision or who are cognitively impaired.

Administration sets for infusion therapy in pediatric patients may differ from those used for adults. Use of an incorrect administration set could result in serious administration errors.

Use a vented administration set for solutions supplied in glass or semirigid containers and a nonvented administration set for plastic fluid containers.

Minimize the use of add-on devices for administration sets, because each device is a potential source of contamination, misuse, and disconnection. Whenever possible, use an administration set with devices as an integral part of the set (eg, filter).

For intermittent administration sets that are used more than once in 24 hours, aseptically attach a new, sterile, compatible covering device to the male luer end of the administration set after each intermittent use. Do not attach the exposed male luer end of the administration set to a port on the same set.

Label administration sets for infusion via vascular access devices with the date of initiation or the date of change based on organizational procedure. If
sending the patient home with an infusion set attached, label administration sets used for medications that are administered by means of specialized access devices (eg, intraspinal, subcutaneous) to indicate the correct administration route and device. Place the label near the connection to the device.

Use a new administration set and any add-on devices for each infusion visit.

Table 4.1. Administration Set Change Frequency by Administration Type

<table>
<thead>
<tr>
<th>Administration Type</th>
<th>Administration Set</th>
<th>Set Change Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>Primary and secondary sets</td>
<td>No more frequently than every 96 hours</td>
</tr>
<tr>
<td>Intermittent</td>
<td>Primary and secondary sets</td>
<td>Every 24 hours</td>
</tr>
</tbody>
</table>

Table 4.2. Administration Set Change Frequency by Infusate

<table>
<thead>
<tr>
<th>Infusate</th>
<th>Administration Set</th>
<th>Set Change Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood and blood components</td>
<td>Continuous or single unit</td>
<td>At end of 4 hours</td>
</tr>
<tr>
<td>Intravenous fat emulsion (IVFE)</td>
<td>Continuous or single dose</td>
<td>Every 12 hours or with each new container</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>Continuous with IVFE</td>
<td>Every 24 hours</td>
</tr>
<tr>
<td></td>
<td>Continuous without IVFE</td>
<td>Every 24 hours</td>
</tr>
<tr>
<td></td>
<td>Cyclic or intermittent delivery</td>
<td>Every 24 hours</td>
</tr>
</tbody>
</table>

Note: Change administration set immediately, if contamination is suspected or product integrity is compromised.
Bibliography


Maintaining Vascular Access Device (VAD) Patency: Flushing and Locking

Considerations for the Ambulatory Infusion Patient

Flushing and locking protocols should be consistent across the continuum. Questions about noted differences in flushing and locking procedures between the acute care and ambulatory infusion settings should be addressed.

Policy

Vascular access devices (VADs) are flushed and aspirated for a blood return before each infusion to assess catheter function and prevent complications.

VADs are flushed after each infusion to clear the infused medication from the catheter lumen to reduce the risk of contact between incompatible medications.

The VAD is locked after completion of the final flush to decrease the risk of intraluminal occlusion and catheter-related bloodstream infection (CR-BSI), depending on the solution used.

Single-use flushing and locking systems are used.

A VAD is never forcibly flushed.

The patency of the VAD is assessed using a 10-mL syringe to reduce the risk of catheter damage.

Key Points

Do not use intravenous solution containers (eg, bags or bottles) as a source for obtaining flush solutions.

For VAD flushing, use a minimum volume equal to twice the internal volume of the VAD system.

For VAD locking, use a volume that is equal to the internal volume of the VAD system plus 20%.

After confirmation of patency using a 10-mL syringe, use syringes appropriately sized for the medication and locking solution being injected.

Needleless connectors are available with 3 different internal mechanisms to displace blood reflux. These mechanisms have an impact on the sequence of clamping and disconnecting. There is no way to determine the type of internal mechanism by simply looking at the device. Therefore, knowledge of the type being used is required for correct technique.
The volume and frequency of flush solution will vary in the pediatric population. Certain types of catheters and smaller-diameter lumens may require more frequent flushing.

Recommendations for locking solutions include:

- Short peripheral catheters (SPCs) (adults): preservative-free 0.9% sodium chloride (USP)
- SPCs (pediatrics): heparin 0.5 to 10 units/mL or preservative-free 0.9% sodium chloride (USP)
- Midline catheters: no evidence-based recommendations; consider either heparin 10 units/mL or preservative-free 0.9% sodium chloride (USP), according to the directions for use for the midline catheter and needleless connector
- Central vascular access devices (CVADs): either heparin 10 units/mL or preservative-free 0.9% sodium chloride (USP), according to the directions for use for the VAD and needleless connector; concentrations of heparin locking solutions may vary from 1 to 10 units/mL in children; consider using heparin 10 units/mL for locking peripherally inserted central catheters in patients receiving care at home

Antimicrobial locking solutions may be used for therapeutic and prophylactic purposes in patients with long-term CVADs, patients with a history of multiple CR-BSIs, or in high-risk patient populations, despite application of other methods of central line-associated bloodstream infection reduction.

- Antibiotic lock solutions contain supratherapeutic concentrations of antibiotics and may be combined with heparin.
- Antiseptic locking solutions include ethanol, taurolidine, citrate, 26% sodium chloride, methylene blue, fusidic acid, and ethylenediaminetetraacetic acid, used alone or in various combinations.
- Follow VAD manufacturers’ instructions for intraluminal locking with ethanol. CVADs made of polyurethane material, not silicone, has led to catheter rupture and splitting.
- There is no clear evidence guiding the length of time antimicrobial lock solutions should reside inside CVAD lumen; up to 12 hours a day may be required. This limits use in patients receiving continuous or frequent intermittent infusions.

**Assessment**

Verify if the current locking solution dwelling in the VAD needs to be aspirated and discarded or if it may be infused as part of the flushing procedure (eg, some hemodialysis VADs and all antimicrobial lock solutions).

**Patient Education**

What to expect with the procedure

Patient may experience disturbances in taste and odor
Supplies

- Gloves
- Antiseptic wipes (eg, alcohol)
- Preservative-free 0.9% sodium chloride (USP) prefilled syringe(s)
- Lock solution as indicated (eg, preservative-free 0.9% sodium chloride [USP], heparin solution [10 units/mL], or other solution in prefilled syringe)
- 10-mL syringe(s) for aspiration of locking solution, if needed

Procedure

Flushing

1. Obtain and review licensed independent practitioner’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Gather supplies.
5. Don gloves.
6. Disinfect needleless connector.
   a. If using a disinfection cap, remove and discard. Do not reuse this cap.
   b. If using manual disinfection, vigorously scrub with antiseptic wipe using friction and allow to dry completely. Discard antiseptic wipe.
7. Attach syringe of preservative-free 0.9% sodium chloride (USP) to needleless connector, while maintaining the sterility of the syringe tip.
8. Open VAD clamp, if present.
9. Slowly inject preservative-free 0.9% sodium chloride (USP) into VAD, noting any resistance or sluggishness of flow, and slowly aspirate until brisk blood return is obtained.
   a. ALERT: If an antimicrobial locking solution was used, withdraw solution from the CVAD lumen before flushing, and discard. Flushing the lock solution into the patient’s bloodstream could increase development of antibiotic resistance and other adverse effects.
   b. Inability to flush or absence of a blood return from a CVAD requires further investigation about the cause (eg, mechanical problem, fibrin/thrombosis over VAD tip, extravascular tip location); (see Central Vascular Access Device [CVAD] Malposition, Central Vascular Access Device [CVAD] Occlusion).
   c. Inability to flush or absence of a blood return from an SPC or midline catheter requires further evaluation for catheter patency; catheter replacement may be indicated.
d. A pulsatile flushing technique of 10 short boluses of 1 mL interrupted by brief pauses may be effective at removing solid deposits.

e. Never inject against resistance.

10. Remove syringe and discard.

11. Initiate infusion therapy as prescribed (see IV [Intravenous] Administration: Continuous Infusion, IV Push, Intermittent Infusion).

12. Detach syringe and discard or detach administration set and cover male luer tip with a sterile cap if the set is to be used for up to 24 hours.

13. Scrub the needleless connector with a new disinfectant wipe.

14. Attach syringe of preservative-free 0.9% sodium chloride (USP) to needleless connector, while maintaining the sterility of the syringe tip.

15. Slowly inject preservative-free 0.9% sodium chloride (USP) into VAD and administer the flush at the same rate as the administration rate of the medication left in the VAD lumen.
   a. Note any resistance or sluggishness of flow.
   b. A pulsatile flushing technique of 10 short boluses of 1 mL interrupted by brief pauses may be effective at removing solid deposits.

16. Ensure the correct flow rate if continuous fluids are infusing or proceed with locking the VAD.

**Procedure**

**Locking**

1. Perform hand hygiene.

2. Gather supplies.

3. Don gloves.

4. Disinfect needleless connector with antiseptic using friction and a scrubbing motion and allow to dry.

5. Attach syringe with locking solution to needleless connector while maintaining the sterility of the syringe tip.

6. Slowly inject solution into VAD.

7. Follow appropriate clamping sequence to reduce blood reflux based on type of needleless connector used:
   b. Negative-displacement needleless connector: maintain pressure on the syringe plunger while closing the clamp on the VAD or extension set, then disconnect the syringe.
   c. Neutral-displacement needleless connector is not dependent on flushing technique and can be clamped either before or after syringe disconnection.
8. Discard syringe and used supplies in appropriate receptacles.
9. Remove gloves and perform hand hygiene.

**Documentation**

Document in the patient’s health record:
- Flush/lock solution and volume
- Date, time of administration
- Route, specific VAD or lumen used for administration
- Patient’s response to the procedure

**Bibliography**


Vascular Access Devices (VADs): Ongoing Assessment, Site Care, and Dressing Change

Considerations for the Ambulatory Infusion Patient

Dressing changes and procedures may differ from those experienced in an acute-care hospital setting.

For patients receiving home care, instruct the patient or caregiver to check the VAD site at least once a day for signs of complications and to report signs/symptoms or dressing dislodgment immediately to their health care provider; for continuous infusions via a short peripheral catheter (SPC), instruct the patient or caregiver to check the site every 4 hours during waking hours.

Policy

A sterile dressing is applied and maintained on all peripheral, nontunneled, and peripherally inserted central catheters, and accessed implanted VADs. For tunneled, cuffed catheters, a sterile dressing is applied and maintained until the insertion site is well healed.

For a healed exit site with a tunneled, cuffed VAD, no dressing may be needed.

Short peripheral access site care and dressing changes are performed when the integrity of the dressing is compromised; if moisture, drainage, or blood is present; or for further assessment, if site infection or inflammation is suspected.

Central vascular access device (CVAD) and midline catheter site care and dressing changes are performed at established intervals and immediately when the integrity of the dressing is compromised; if moisture, drainage, or blood is present; or for further assessment if site infection or inflammation is suspected.

Gauze dressings are changed every 2 days.

Transparent semipermeable membrane (TSM) dressings are changed every 5 to 7 days.

Compromised dressing materials must be changed as soon as possible.

Antimicrobial cleansing agents are often extremely drying or irritating to the skin. The skin must be inspected with each dressing change for any adverse reaction to antiseptic solutions and adhesives.

Use caution regarding scissors, razors, and other sharps near VADs.

Key Points

The preferred skin antiseptic agent is > 0.5% chlorhexidine in alcohol solution; for any contraindications to alcoholic chlorhexidine solution, alternative antiseptic solutions include tincture of iodine, an iodophor (povidone-iodine), or 70% alcohol.
Use chlorhexidine dressings over CVADs to reduce infection risk when the extraluminal route is the primary source of infection. Even when organizations show a low baseline central line-associated bloodstream infection (CLABSI) rate, further reduction in CLABSI rates has been demonstrated with use of chlorhexidine dressings.

Patients with infections and who are immunocompromised may be predisposed to catheter-related bloodstream infections.

Extra securement measures, such as additional taping and wraps, can obscure the insertion site, hindering the ability to observe for signs and symptoms of complications. Vascular access stabilization devices can be used to maintain the catheter in place while allowing ongoing visibility of the venipuncture site.

Pressure areas from catheter hubs or administration sets and add-on devices should be observed for maceration caused by leakage of bodily fluids or infusates from the catheter-skin junction. These are a medium for bacterial growth, and their presence may necessitate more frequent dressing changes or VAD replacement.

A skin barrier solution is used to reduce the risk of medical adhesive-related skin injury (MARSII). Avoid use of compound tincture of benzoin due to increased risk of MARSII because it may increase the bonding of adhesives to skin, causing skin injury when the adhesive-based engineered stabilization device (ESD) is removed.

Do not use rolled bandages, with or without elastic properties, to secure any type of VAD.

**Assessment**

Assessment of VADs includes checking the entire infusion system, from the solution container to the VAD, for integrity, and infusion accuracy, as well as expiration dates of the infusate, administration set, and dressing.

Assess the VAD catheter-skin junction site and surrounding area for redness, tenderness, swelling, and drainage by visual inspection and palpation through the intact dressing and through patient reports about any discomfort, including pain, paresthesias, numbness, or tingling.

*Touch, look, compare* is used in the assessment of vascular access device (VAD) insertion sites. Site assessment includes visualization and palpation of the entire extremity, noting symmetry between extremities including size, color, and temperature.

Assess SPCs:
- Minimally, at least every 4 hours
- Every 1 to 2 hours for patients who are sedated or have cognitive deficits
• Hourly for pediatric patients
• Minimally, every hour or more often for patients receiving infusions of vesicant medications

Assess CVADs and midline catheters at every ambulatory infusion visit.

Assess for MARSI associated with the use of adhesive-based ESDs. MARSI is exhibited when there is redness, tears, erosion of the skin, or development of vesicles or bullae in an area exposed to medical adhesive that last for 30 minutes or more following adhesive removal.

Measure upper arm circumference, when clinically indicated, to assess the presence of edema and possible deep vein thrombosis. Take this measurement 10 cm above the antecubital fossa; identify the location and other characteristics, such as pitting or nonpitting edema. Compare to baseline measurement to detect possible catheter-associated venous thrombosis.

At every ambulatory infusion visit and when catheter dislodgment is suspected, measure external length of the CVAD or midline catheter and compare it to the external length documented at insertion.

**Patient Education**

What to expect with the procedure

Signs or symptoms, such as redness, pain, or swelling, and where and how and whom to report them

**Supplies**

**SPC**

- Gloves, nonsterile
- Antiseptic solution
- Securement
  - Stabilization device, if used
- Skin barrier solution
- Site dressing
  - Gauze pad and tape
  - TSM dressing
- Label

**Procedure**

**SPC**

1. Obtain and review licensed independent practitioner’s (LIP’s) order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Gather supplies.
5. Explain procedure to patient.
6. Don gloves.
7. Assess insertion site for absence of redness, tenderness, swelling, or drainage. If present, the catheter should be removed.
8. Remove existing dressing beginning at device hub and gently pull the dressing perpendicular to the skin toward the insertion site. Avoid inadvertently dislodging the catheter, as it may be adhered to the dressing. Use an alcohol pad or other adhesive removal solution, if required.
9. Remove stabilization device, if used.
10. Cleanse skin with antiseptic solution; allow to dry completely.
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. The use of concentric circles or a back-and-forth motion has not been studied.
11. Apply skin barrier solution. Do not apply this solution directly under the antimicrobial pad or gel component of the dressing.
12. Apply stabilization device.
13. Apply TSM (or gauze and tape) dressing to insertion site.
14. Discard used supplies in appropriate receptacles.
15. Remove gloves and discard.
16. Perform hand hygiene.
17. Label dressing with date performed.

**Supplies**

**CVAD or Midline Catheter**
- Mask
- Gloves, nonsterile
- Gloves, sterile
- Antiseptic solution
- Tape measure, sterile if indicated
  - Stabilization device
- Skin barrier solution
- Site dressing
  - Antimicrobial dressing
  - Gauze pad and tape
  - TSM dressing
- Label

*Note: A CVAD dressing kit is recommended.*
Procedure

CVAD or Midline Catheter

1. Obtain and review LIP’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Gather supplies.
5. Explain procedure to patient.
6. Don mask.
7. Assemble supplies on sterile field.
8. Don nonsterile gloves.
9. Assess insertion site for absence of redness, tenderness, swelling, or drainage; palpate site for any local tenderness. If present, contact the LIP for a collaborative decision regarding interventions, including potential device removal.
10. Remove existing dressing, beginning at device hub, and gently pull the dressing perpendicular to the skin toward the insertion site. Avoid inadvertently dislodging the catheter, as it may be adhered to the dressing.
11. Remove stabilization device. A subcutaneous ESD is not removed with each dressing change. If sutures or staples have been used, carefully assess their integrity. If loosened, other methods of stabilization may be necessary.
12. Remove gloves.
13. Perform hand hygiene.
15. Identify catheter tip dislodgment by routinely assessing for changes in external catheter length.
16. Cleanse skin with antiseptic solution; allow to dry completely.
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. The use of concentric circles or a back-and-forth motion has not been studied.
17. Apply antimicrobial dressing, if used.
18. Apply skin barrier solution. Do not apply this solution directly under the antimicrobial pad or gel component of the dressing.
19. Apply stabilization device.
20. Apply TSM (or gauze and tape) dressing to insertion site.
21. Discard used supplies in appropriate receptacles.
22. Remove gloves and discard.
23. Perform hand hygiene.
24. Label dressing with date performed.

**Documentation**

Document in the patient’s health record:
- Performance of procedure, including type of antiseptic solution/type of dressing
- Measurement of external length of the catheter
- Patient’s response to the procedure
- Instructions given to the patient

**Bibliography**


Vascular Access Device (VAD) Removal

**Considerations for the Ambulatory Infusion Patient**

Nontunneled central vascular access devices (CVADs), peripherally inserted central catheters (PICCs), midline catheters, and short peripheral catheters (SPCs) may be removed in the ambulatory infusion care setting. Tunneled, cuffed CVADs and implanted ports should not be removed in this setting.

**Policy**

A vascular access device (VAD) is removed on the order of a licensed independent practitioner (LIP) when therapy is completed, when clinically indicated, or when deemed no longer necessary for the plan of care.

Replace a VAD within 24 to 48 hours, if the VAD was inserted under suboptimal aseptic conditions in any health care setting.

The clinical need for each SPC and nontunneled CVAD is assessed on a regular basis.

Removal of tunneled, cuffed, and implanted ports should be arranged with the LIP when infusion therapy is completed, and when it is no longer needed for the plan of care. Before removal, consider the possibility for infusion therapy to resume in the future.

**Key Points**

Tape and other adhesive materials must be removed carefully to avoid skin injury, including tearing and bruising. An adhesive remover may be helpful for the process. A pressure dressing may be necessary with patients who have bleeding dyscrasias or are on anticoagulants.

Resistance during removal, particularly associated with PICCs, is possible.

- Never pull against resistance as the risk of catheter breakage, catheter embolism, or vein wall damage can occur.
- Venospasm or vein thrombosis could be the cause of resistance.
- When simple interventions do not result in the ability to remove the VAD, referral to interventional radiology is warranted.

SPCs should be removed, if they are no longer included in the plan of care or have not been used for 24 hours or more.

**Assessment**

Use a standardized tool and/or designated staff for the assessment of VAD needs.

For surgically placed CVADs (ie, tunneled, cuffed catheters, and implanted
ports), assess the clinical need on a regular basis, considering the possible need for therapy to resume in the future.

Assess for exposed subcutaneous cuff or port body and notify LIP immediately, if detected.

Know the reason for removal and any method to manage identified complications. Aspiration from the VAD is required before removal in the presence of extravasation.

For unplanned or early removal of a CVAD due to a complication, assess and report all signs and symptoms to the LIP. Assess the fluids and medications being given and their impact on patient stability. Begin the infusion therapy through an SPC when possible or contact the LIP for altering the orders for peripheral infusion until a new CVAD is inserted.

A skin barrier solution may be used to reduce the risk of medical adhesive-related skin injury (MARSI). Assess for MARSI, which is exhibited when there is a redness, tears, erosion of the skin, or the development of vesicles or bullae in an area exposed to medical adhesive and lasting for 30 minutes or more following adhesive removal.

Identify if the patient is on anticoagulants or has any risk for prolonged bleeding, as increased time may be needed for hemostasis to occur.

Do not remove a CVAD in the presence of CVAD-associated vein thrombosis when the catheter is correctly positioned at the cavoatrial junction, the catheter is functioning correctly with a blood return, there is no evidence of any infection, and there is absence of severe deep vein thrombosis-related symptoms causing pain.

In the presence of an elevated body temperature, assess all obvious sources or causes for this elevation. Do not remove a functioning peripheral catheter or CVAD based solely on temperature elevation in the absence of confirmatory evidence of catheter-associated infection. Use clinical judgment regarding the appropriateness of removing the catheter if an infection is evidenced elsewhere or if a noninfectious cause of fever is suspected.

**Patient Education**

What to expect with VAD removal procedure

Signs or symptoms of increasing redness, pain, or swelling within the 48 hours after the catheter has been removed, and where and how and to whom to report

When to remove and/or change dressing and keeping exit site clean and dry until healed.
Supplies

SPC

- Gloves, nonsterile
- Gauze, sterile
- Tape
- Adhesive dressing, if indicated for SPC

Procedure

SPC

1. Obtain and review LIP’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers per organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Don gloves.
5. Explain procedure to patient.
6. Discontinue all infusates and/or clamp extension set.
7. Place patient in sitting or recumbent position.
8. Remove dressing from insertion site.
9. Remove stabilization device if present; use appropriate solution as indicated to loosen dressing and securement device adhesive.
10. Inspect catheter-skin junction.
11. Hold gauze gently to insertion site with nondominant hand. With dominant hand, slowly remove catheter using gentle, even pressure and keeping catheter parallel to skin.
12. Apply pressure to site with gauze until hemostasis is achieved for a minimum of 30 seconds.
13. Apply gauze and tape dressing or an adhesive dressing (eg, a Band-Aid) to SPC site.
14. Inspect catheter: it is intact, the tip is not jagged, and the length is appropriate for product, to ensure entire catheter is removed.
15. Discard used supplies in appropriate receptacles.
16. Remove gloves and discard.
17. Perform hand hygiene.

Supplies

Midline Catheter and Nontunneled CVAD

- Personal protective equipment, as indicated
- Gloves, nonsterile
- Suture removal set, as needed
- Gauze, sterile
- Petroleum-based ointment, sterile
- Transparent semipermeable membrane (TSM) dressing
Procedure

Midline Catheter and Nontunneled CVAD

1. Obtain and review LIP’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Don gloves.
5. Explain procedure to patient.
   a. Educate patient in Valsalva’s maneuver for all CVAD removal procedures.
   b. If a Valsalva’s maneuver is contraindicated, have the patient exhale during the procedure (see Air Embolism).
6. Discontinue all infusates and/or clamp extension set.
7. Position patient:
   a. Sitting or recumbent: midline catheter
   b. Supine flat or Trendelenburg, unless contraindicated: any type of CVAD
8. Remove dressing from insertion site.
9. Remove stabilization device or sutures, if present. Use appropriate solution as indicated to loosen dressing and securement device adhesive. If a subcutaneous engineered stabilization device is in place, follow manufacturers’ directions for removal.
10. Inspect catheter-skin junction.
11. Hold gauze gently to insertion site with nondominant hand. With dominant hand, slowly remove catheter; use gentle, even pressure.
   a. Use extreme caution when removing CVAD to prevent air embolism.
   b. Stop removal procedure if resistance is met.
      i. Redress catheter site with sterile dressing and attempt interventions, such as a warm compress above the exit site, relaxation techniques, and limb elevation.
      ii. Reattempt removal after 15 to 30 minutes.
      iii. Consult with LIP if resistance continues.
12. Apply pressure to site with gauze for a minimum of 30 seconds or until hemostasis is achieved.
13. Apply petroleum-based ointment to exit site, and cover with occlusive gauze dressing or TSM dressing.
14. Patient should remain in supine position for 30 minutes after CVAD removal.
15. Inspect catheter: it is intact, the tip is not jagged, and the length is appropriate for product, to ensure entire catheter is removed.
16. Leave dressing in place for at least 24 hours. Change dressing every 24 hours until exit site has healed.
Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers

**Documentation**

Document procedure in the patient’s health record:

- Date and time of procedure
- Length of catheter and integrity of catheter tip at time of removal
- Patient’s response to the procedure
- Instructions given to patient

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Air Embolism

Considerations for the Ambulatory Infusion Patient
Daily activities and behaviors can result in damage to a vascular access device (VAD) or infusion system, leading to air embolism.

Policy
All add-on devices, needleless connectors, and administration sets are of a luer-lock design and correctly tightened to ensure a secure junction.

Air is always purged from syringes, administration sets, needleless connectors, and any other add-on devices.

Key Points
VADs and administration sets should be well secured.

If a central vascular access device (CVAD) becomes dislodged or disconnected, the patient must be assessed for signs of air embolism. Attention should be paid to the patient at risk for inadvertent separation of the administration set from the VAD or when removing the device entirely. If possible, administration sets should be out of the reach and/or sight of children.

Air embolism is a preventable complication when risk factors are mitigated, including the following additional actions:

- Ensure the VAD is securely clamped when disconnecting/reconnecting a new administration set, needleless connector, or any other add-on device.
- When possible, the patient is positioned in a flat, supine manner any time the CVAD lumen is opened, (eg, during changes of administration sets, needleless connectors, or any other add-on device). If this position is not possible, a securely closed clamp is the only way to prevent air from entering the lumen.
- All lines are traced between the catheter and the solution container.
- Never use scissors, razors, or other sharp objects near the VAD.
- Use an air-eliminating filter appropriately on administration sets, including when the patient has a right-to-left heart shunting defect.
- Safely remove CVADs (see Vascular Access Device [VAD] Removal).

Patient Education
Instruct patients and/or caregivers with any type of VAD how to prevent an air embolism and critical actions to take if an air embolism is suspected. Ensure availability of a clamp or hemostat to use in the event of a ruptured or damaged VAD and provide instruction on how/when to use it.
Instruct patients/caregivers to never disconnect or reconnect any intravenous administration sets or connectors from the catheter hub, unless specifically instructed to do so and evaluated as competent in the procedure.

Assessment
Identify signs and symptoms of potential air embolism:

- Sudden onset of dyspnea
- Coughing
- Chest pain
- Hypotension
- Tachyarrhythmias
- Wheezing
- Tachypnea
- Altered mental status
- Altered speech
- Changes in facial appearance
- Numbness
- Paralysis
- A loud continuous churning sound may be heard over precordium during auscultation

Interventions
1. Take immediate action:
   a. Locate source of air entry and resolve: close, fold, clamp, or cover the existing catheter, use manual pressure if needed and cover the puncture site with an air-occlusive dressing or pad if the catheter has been removed.
   b. Place the patient on his or her left side in the Trendelenburg position or in the left lateral decubitus position if not contraindicated by other conditions, such as increased intracranial pressure, eye surgery, or severe cardiac or respiratory diseases, to minimize migration of embolus.
2. Initiate basic life support as needed:
   a. Initiate rapid response team, “code”
3. Notify licensed independent practitioner (LIP).
4. Continue to monitor vital signs and observe patient.
5. Perform interventions (eg, oxygen administration) and treatments as ordered.
Documentation
Document in the patient’s health record:

- Patient assessment data
- Interventions taken and outcome
- LIP notification
- Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.

Bibliography


Allergic Reaction and Anaphylactic/Anaphylactoid Reactions

Considerations for the Ambulatory Infusion Patient

For first dose administration, ensure that emergency medications (eg, epinephrine, diphenhydramine) are readily available with orders for their use and that the clinicians are certified in basic life support.

The clinician must remain with the patient the entire duration of the infusion of the first-dose medication and for at least 30 minutes after completion (see First Dose Administration).

Many specialty medications infused in the ambulatory infusion setting have specific guidelines in the package insert for observation periods specific to the drug infused/injected.

Policy

Patients are assessed for known allergies/anaphylactic reactions.

Patients are monitored for allergic reactions throughout the course of care.

Patient safety is considered when selecting an ambulatory infusion setting for infusion therapy.

Antineoplastic agents, blood products, and biologic infusion therapies (eg, colony-stimulating factors, gene therapy, monoclonal antibodies, fusion proteins, interleukin inhibitors, and immunoglobulins) are administered in a setting in which the clinician is prepared to recognize and manage severe adverse reactions.

Drugs for treatment of adverse reactions, including those used to treat anaphylaxis, are available in the treatment setting.

Whenever possible, the patient should receive the first dose of an infusion medication in a controlled environment (eg, hospital, ambulatory infusion center) with access to emergency medical equipment and medications (see First Dose Administration).

Key Points

Anaphylaxis is a medical emergency that may result in death due to respiratory failure and cardiovascular collapse.

Allergic and anaphylaxis reactions are mediated by the immune system, often immunoglobulin E (IgE).

Anaphylactoid reactions are mediated by physical or chemical stimulation of mast cells (eg, “red man syndrome”) and are not associated with the presence of IgE.
Anaphylactoid reactions have been associated with midline catheter and peripherally inserted central catheter insertion, and medications such as vancomycin and morphine.

Vancomycin is associated with a reaction called red man syndrome. This anaphylactoid reaction results in the release of histamine and causes signs and symptoms such as an erythematous rash on the face, neck, and upper torso, and hypotension. Vancomycin infusion should be administered over at least 1 hour to reduce the risk of this syndrome. Slower infusions and treatment with diphenhydramine may be necessary in some patients.

Common causes of anaphylaxis include:
- Foods such as nuts, fish, shellfish, milk, eggs, and sesame
- Latex
- Medications (eg, penicillin, biologic agents, antineoplastic agents)
- Blood and blood components

A premedication may be ordered in some cases (eg, acetaminophen, diphenhydramine, and methylprednisolone for known mild allergic reactions with blood transfusions or biologics).

It is recognized that reactions can happen at any point after exposure; it requires antigen exposure and antibody development.

**Patient Education**

Importance of reporting any history of severe reactions to medications or other substances

Signs and symptoms and actions to take in the event of a reaction

Importance of wearing/carrying identification bracelet/card to identify allergies

**Assessment**

Obtain a thorough allergy and drug history; note any cross sensitivity.

Identify risk factors for anaphylaxis, including history of severe drug reactions and family history of same, and when administering blood/blood components and the first dose of an infusion medication.

Identify and respond to signs/symptoms of anaphylaxis, which is the likely type of reaction when all of the following criteria are met:
- Sudden onset and rapid progression of symptoms
- Life-threatening airway/breathing/circulatory symptoms, such as laryngeal edema, stridor, severe dyspnea/wheezing, confusion, signs of shock, tachycardia, hypotension, cardiac arrest
- Skin or changes in mucosa, such as flushing, urticaria, angioedema

Symptoms associated with less severe systemic reactions may include:
- Neurological: dizziness, headache, weakness, syncope, seizures
- Psychiatric: anxiety
Infusion-Related Complications: Identification & Intervention

- Respiratory: dyspnea, wheezing, bronchospasm, tachypnea
- Cardiovascular: tachycardia, hypotension, arrhythmias
- Cutaneous: flushing, erythema, pruritis, urticaria, angioedema

Interventions

1. Stop infusion immediately.
2. Discontinue any medication suspected of causing reaction.
3. Initiate basic life support as needed.
   a. Initiate rapid response team, “code”
4. Maintain vascular access for emergency supportive therapies with 0.9% sodium chloride using a new administration set.
5. Perform interventions and treatments as ordered or according to organizational protocol. Anticipate treatment with epinephrine, oxygen, intravenous fluids.
6. Administer emergency medications, such as epinephrine or steroids, as ordered.
7. Monitor patient’s vital signs. Monitor and observe patient for at least 6 hours.
8. Patient may require transfer to emergency department for observation period.

Documentation

Document in the patient’s health record:
- Presence of allergies/reactions
- Observations and patient assessment
- Licensed independent practitioner notification
- Interventions taken and outcome
- Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.

Bibliography


Catheter Damage

**Considerations for the Ambulatory Infusion Patient**

The patient may not be able to adequately describe associated symptoms of catheter fracture or embolization, so careful monitoring by the clinician is necessary. The clinician should pay particular attention to patient education, encouraging patient compliance, and therapy restrictions on daily activities to maintain safety.

**Policy**

Assessment of the patient’s risk-to-benefit ratio is performed prior to repair or exchange of the vascular access catheter.

Catheter repair is initiated on the order of a licensed independent practitioner (LIP).

Central vascular access device (CVAD) exchange is initiated on the order of a LIP.

**Key Points**

While there are several ways for catheter fracture to occur, it is particularly important to assess the patient for prevention of this untoward event. Cognitively impaired older adults or pediatric patients may manipulate unfamiliar objects in their immediate environment, including infusion catheters, devices, and other related equipment. If the catheter becomes inadvertently dislodged, careful inspection must be made to ascertain that the device is intact, according to the manufacturers’ configuration and length.

Catheter damage includes catheter fracture and embolism and loss of integrity to the external catheter (eg, crack or hole in catheter).

Causes of catheter embolism include pinch-off syndrome, separation of the catheter from an implanted port, and catheter damage during catheter exchange.

Pinch-off syndrome is a relatively rare but significant and often unrecognized complication. It occurs when the CVAD enters the costoclavicular space medial to the subclavian vein and is positioned outside the lumen of the subclavian vein in the narrow area bounded by the clavicle, first rib, and costoclavicular ligament. Catheter compression causes intermittent or permanent catheter occlusion and, because of the “scissoring” effect of catheter compression between the bones, can result in catheter tearing, transection, and catheter embolism.

Catheter damage is a preventable complication through the following actions:

- Use a 10-mL syringe to assess vascular access device (VAD) patency.
• Do not forcibly flush a VAD against resistance with any syringe size.
• Do not forcibly remove a VAD against resistance.
• Do not withdraw the catheter or wire from the needle during insertion.
• Employ well qualified and competent clinicians for VAD insertion.
• Use ultrasound-guided CVAD placement.
• Do not use power injection with VADs that are not labeled for this purpose.

Options to consider for management of a damaged or ruptured catheter include use of a repair procedure (external damage), a catheter exchange procedure, or insertion of a new catheter at a new site. Factors to consider in making this decision include, but are not limited to, the patient’s age, immune status, length of time remaining on infusion therapy, characteristics of infusion therapy (e.g., osmolarity), external catheter length, and resulting changes in proper tip location with repair.

**Patient Education**

Never flush or forcibly administer an infusion through any VAD.

Do not use razors, scissors, or any other type of cutting tool near the VAD.

**Assessment**

External catheter damage:
- Inability to aspirate blood
- Localized pain and/or subcutaneous swelling
- Pinholes, cuts, and tears to the external portion of the catheter extending from catheter-skin junction to hub of catheter
- Leaking or wet dressing during infusion or flushing

Internal catheter damage:
- Examine VAD catheter tip and length after removal, comparing the removed length to the inserted length for damage and possible fragmentation.

Catheter embolism signs/symptoms:
- Inability to aspirate blood return
- Palpitations, arrhythmias, dyspnea, cough, or thoracic pain that are not associated with the patient’s primary disease or comorbidities
- May be no symptoms

Pinch-off syndrome (subclavian vein insertion sites):
- Difficulty aspirating, resistance to flushing, patient report of pain, possible swelling at the insertion site, and a change in the clinical picture with arm or shoulder movement
Interventions

1. If external catheter damage is seen or suspected, immediately seal catheter proximal to damaged portion of the catheter.
   a. Seal catheter by closing an existing clamp, adding a clamp, covering the damaged area with an adhesive dressing material or folding the external segment and securing.
   b. Label the catheter “Do not use” while awaiting decision for repair.
   c. If no device-specific repair kit is available, contact LIP to collaborate regarding other alternatives, such as catheter exchange or insertion of a new catheter.

2. If internal catheter damage is seen or suspected, contact LIP; a chest radiograph or further evaluation is warranted.

Catheter Repair

Supplies

• Personal protective equipment
• Clamp
• Repair kit supplied by manufacturer, specific to CVAD

Procedure

1. Obtain LIP’s order to repair damaged catheter, if appropriate.
   a. An assessment of risks versus benefits of catheter repair should be discussed.
   b. Factors in decision making include, but are not limited to, patient’s immune status, duration for remaining infusion therapy, or external catheter length.
   c. When catheter damage under the skin is suspected or external catheter repair is not appropriate, catheter removal and replacement using an exchange procedure or insertion at a new site are appropriate options.

2. Obtain sterile repair kit from the manufacturer specific to individual type and size of CVAD.

3. Use aseptic technique during the repair and observe Standard Precautions throughout the procedure.

4. Perform hand hygiene.

5. Don mask and sterile gloves.

6. Disinfect external portion of catheter with antiseptic solution, allow to air-dry, and position external catheter on a sterile towel.

7. Reduce risk of venous air embolism during procedure:
   a. Place the patient in a supine position with the head flat if patient can tolerate this position.
   b. Clamp external catheter proximal to the patient.
8. Complete repair according to manufacturers’ directions for use.
9. Apply sterile dressing, if applicable.
10. Reassess catheter tip location after repair.

**Documentation**

Document in the patient’s health record:
- Observations and patient assessment
- LIP notification
- Interventions taken and outcome
- Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.

**Bibliography**


Central Vascular Access Device (CVAD) Malposition

Considerations for the Ambulatory Infusion Patient

Often a central vascular access device (CVAD) is placed at another patient care facility. Transfer-of-care process should support documentation of CVAD placement, specific to the device (eg, number of lumens, length of catheter, date of placement, single/double port, etc.).

Policy

The clinician verifies the documented anatomic location of the CVAD tip on insertion before initial infusion through the catheter.

The clinician employs preventive interventions, identifies signs/symptoms, and promptly intervenes when catheter malposition is suspected.

Key Points

There may be no obvious signs and symptoms of catheter migration. However, the inability to flush, infuse, or aspirate may mean the CVAD tip is no longer at the desired position.

The catheter tip can migrate spontaneously into the right atrium or into the internal jugular vein after placement.

CVAD tips move as a result of patient position, respiration, and arm movement. Descent of diaphragm and abdominal contents with position change from lying to standing, obesity, and breast tissue are associated with a change in CVAD tip position.

Primary malposition may occur during the insertion procedure, resulting in intravascular or extravascular tip location.

- Intravascular malposition includes the aorta, contralateral innominate and subclavian veins, ipsilateral or contralateral internal jugular veins and tributaries, azygos vein, right or left internal thoracic vein, pericardiophrenic vein, internal mammary vein, deep in the right atrium (more than 2 cm below cavoatrial junction), the right ventricle, and a number of small tributary veins of the innominate and superior vena cava (SVC). Femoral insertion sites may produce malposition of the catheter tip in the lumbar, iliolumbar, and common iliac veins.

- Extravascular malposition includes tip location in the mediastinum, producing infiltration/extravasation; in the pleura, producing hemothorax or pleural effusion; in the pericardium, producing pericardial effusion and cardiac tamponade; and in the peritoneum, producing intra-abdominal bleeding.
Infusion-Related Complications: Identification & Intervention

• Primary malposition with peripherally inserted central catheters (PICCs) is more common than with other CVADs.
• Risk factors for primary malposition include acquired and congenital anatomical variations (eg, stenosis, thrombosis, and malignant or benign lesions compressing the vein, persistent left SVC and variations of the inferior vena cava, azygous vein, and pulmonary veins).

Secondary malposition, also called tip migration, may occur at any time during the catheter dwell time. It is related to sporadic changes in intrathoracic pressure (eg, coughing, vomiting), original tip located high in the SVC, deep vein thrombosis, congestive heart failure, neck or arm movement, and positive-pressure ventilation.
• The most common locations for secondary intravascular malposition include internal jugular; innominate (brachiocephalic); subclavian, axillary, and azygos veins; and deep in the right atrium.
• Secondary extravascular malposition is associated with erosion of catheter tip through the vessel wall and fistula formation between veins and arteries or veins and other structures.

Growth of children can result in suboptimal catheter tip location, when a CVAD is indwelling for extended periods of time.

Never advance any external portion of a CVAD that has been in contact with skin into the insertion site. No antiseptic agent or technique applied to skin or the external catheter will render skin or the catheter sterile, and no studies have established an acceptable length of time after insertion for such catheter manipulation.

Power injection through PICCs labeled for this purpose is known to cause tip migration, indicating the need for a scout scan before and after power injection.

Patient Education

Signs/symptoms to report and how/where to report them

Assessment

Assess the patient and the CVAD for signs and symptoms of catheter dysfunction and associated complications before each CVAD infusion:
• Absence of blood return from all catheter lumens
• Changes in blood color and pulsatility of the blood return from all catheter lumens
• Difficulty or inability to flush the CVAD
• Atrial and ventricular dysrhythmias
• Changes in blood pressure and/or heart rate
• Shoulder, chest, or back pain
• Edema in the neck or shoulder
• Changes in respiration
• Complaints of hearing gurgling or flow stream sounds on the ipsilateral side
• Paresthesia and neurological effects due to retrograde infusion into the intracranial venous sinuses

Measure the external CVAD length and compare it to the external CVAD length documented at insertion. Dislodgment could indicate the tip location is suboptimal, increasing the risk for catheter-related thrombosis (see Central Vascular Access Device [CVAD]-Associated Venous Thrombosis).

**Interventions**

1. **During insertion:**
   a. Use dynamic ultrasound during the insertion procedure to reduce the risk of inadvertent arterial insertion.
   b. Use tip location technology to enhance awareness of primary CVAD malposition during the insertion procedure.
   c. If arterial placement of a CVAD is suspected, assess waveforms using a pressure transducer, blood gas values for a sample taken from the CVAD, or computed tomography (CT) angiogram with contrast. Pulsatile flow and color of the blood are not always reliable indicators for arterial location. Withdrawal of large catheters from an accessed artery (eg, carotid) with site compression increases risk of brain ischemia from lack of blood flow, hematoma, or emboli. Consult with the licensed independent practitioner (LIP) before removal from arteries to determine if surgical removal or the use of a percutaneous closure device is most appropriate.
2. **For PICCs with primary malposition:**
   a. Intracardiac location more than 2 cm below the cavoatrial junction: retract catheter based on electrocardiogram results or based on measurement of the specific distance on the chest radiograph.
   b. Jugular vein location: use noninvasive techniques singly or in combination, including elevating the patient’s head, flushing the catheter, and walking. If noninvasive techniques fail, possible invasive techniques include catheter retraction and flush while advancing or retraction and advancement under fluoroscopy.
3. **During CVAD dwell time:**
   a. Report signs/symptoms to LIP; anticipate diagnostic tests, including chest radiograph with or without contrast injection, fluoroscopy, echocardiogram, CT scan, and/or magnetic resonance imaging.
b. Provide the radiology department with clinical information to enhance its ability to identify the problem.

c. Withhold infusion through a malpositioned catheter until proper tip position has been established. Assess the infusion therapy being administered and, if possible, insert a short peripheral catheter to continue therapy. If the infusion therapy is not possible through a peripheral vein, assess the potential risk for discontinuing therapy and consult with the LIP regarding changing the infusion therapy until the proper CVAD tip location can be reestablished.

d. Fluid aspiration through the CVAD before removal may be indicated, if cardiac tamponade is suspected. Consult with the LIP.

e. When infiltration or extravasation from a CVAD has occurred, develop a treatment plan for the specific medication involved.

**Documentation**

Document in the patient’s health record:

- Patient/CVAD assessment data
- LIP notification
- Interventions taken and outcome
- Patient’s condition and response to interventions

**Bibliography**


Central Vascular Access Device (CVAD) Occlusion

Policy
The central vascular access device (CVAD) is assessed for patency and proper function, as defined by the ability to flush the catheter without resistance and the ability to yield a blood return.

A thorough assessment of the patient and the CVAD for the potential cause of an occlusion is performed, and the appropriate catheter-clearance agent is administered to preserve catheter patency as ordered by the licensed independent practitioner (LIP); an occluded CVAD lumen is not left untreated because another lumen is patent.

Catheter-clearance agents such as precipitate-clearing or thrombolytic agents are used only with CVADs.

The LIP is notified if catheter patency is not restored and appropriate alternative actions are implemented (eg, radiographic studies to identify catheter tip location, dye studies to evaluate catheter flow).

Competency is validated for clinicians who administer precipitate-clearing or thrombolytic agents.

Key Points
CVAD occlusion is a potentially preventable complication through the following interventions:

- Use proper flushing and locking procedures (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).
- Do not allow solution containers to “run dry.”
- Respond promptly to electronic infusion device (EID) alarms.
- Use appropriate sequence of catheter clamping and final syringe disconnection, based on the type of needleless connector, to reduce reflux of blood into the catheter tip.
- Ensure all clamps are open before initiating infusion.

Medications/solutions at high risk for precipitation if they come into contact with each other include acyclovir, ampicillin, all calcium preparations, ceftriaxone, diazepam, ganciclovir, heparin, imipenem, parenteral nutrition solutions, phenytoin, and vancomycin.

Assessment
Identify signs of partial or complete catheter occlusion, including:

- Inability to withdraw blood or sluggish blood return
- Sluggish infusion flow
- Inability to flush or infuse
• Frequent occlusion alarms on an EID
• Infiltiration/extravasation or swelling/leaking at infusion site

To discern the most likely cause of the occlusion, assess history of CVAD use and performance, including the time of the signs and symptoms development (eg, sudden versus slowly decreasing flow rate over days), flushing techniques, and recent medications infused.

Evaluate/identify potential causes of occlusion
• Mechanical:
  ◦ External: tight suture, catheter clamped, clamp not attached correctly, kinked tubing, filter obstruction
  ◦ Internal: catheter malposition, kinked catheter, pinch-off syndrome
• Nonthrombotic: lipid buildup from patients receiving 3-in-1 parenteral nutrition admixtures, drug precipitate
• Thrombotic: most common, due to fibrin buildup, thrombosis within catheter lumen or surrounding catheter tip (eg, intraluminal occlusion or fibrin sheath/tail)

Identify appropriate use of a catheter-clearance agent for precipitate/thrombotic occlusions based on the history of catheter performance and problems.

Assess patient for any contraindications for use of a catheter-clearance agent.

Interventions
1. Rule out mechanical causes of CVAD occlusion before considering use of a precipitate-clearing or thrombolytic agent.
2. Follow single-syringe method or stopcock method for complete occlusions as these are instillation methods that use a negative-pressure approach.
3. Follow direct instillation method for partial occlusion when CVAD can still be flushed, but blood aspiration is not possible, or flow is sluggish.
4. Use a volume of the precipitate-clearing agent in an amount approximating the internal lumen volume of the CVAD.
5. Use a volume of a thrombolytic agent based on the manufacturers’ directions for use.
6. Check the CVAD manufacturers’ directions for use when considering instillation of alcohol solutions such as ethanol, as they may damage catheters made of some types of polyurethane.
Single-Syringe Method for Complete Occlusions

Supplies

- Gloves
- Antiseptic solution
- 10-mL syringe with precipitate-clearing or thrombolytic agent
- 10-mL syringe preservative-free 0.9% sodium chloride (USP)
- Needleless connector

Procedure

1. Obtain and review LIP’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Explain procedure to patient.
5. Don gloves.
6. Disinfect needleless connector with antiseptic solution and allow to air-dry.
7. Clamp CVAD, if appropriate.
8. Attach syringe with precipitate-clearing or thrombolytic agent to the needleless connector. Alternatively, remove the needleless connector as it could be a source of infecting organisms and/or thrombus and prepare to attach the syringe directly to the CVAD hub.
9. Unclamp CVAD and, while holding syringe vertically, gently aspirate until plunger reaches approximately 8-mL mark.
10. While maintaining syringe in vertical position, slowly release the plunger and repeat step until solution is pulled into the CVAD. Never apply pressure to plunger. Clamp CVAD.
11. Leave syringe in place and secure. Label syringe “Do not use” with date, time, and initials.
12. Allow solution to dwell in CVAD lumen according to thrombolytic manufacturers’ directions for use; in the case of a precipitate-clearance agent, allow solution to dwell for 20 to 60 minutes.
13. After appropriate dwell time, unclamp CVAD and attempt to aspirate blood.
   a. A free-flowing blood return the color and consistency of whole blood indicates patency.
   b. If patency is reestablished, withdraw a total of 4 to 5 mL of blood, clamp CVAD, and remove and discard syringe into biohazard container.
   c. Repeat procedure once if patency not achieved.
14. Attach 10-mL syringe of preservative-free 0.9% sodium chloride (USP), unclamp CVAD, and flush using positive-pressure method (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).

15. Resume infusion therapy as ordered or lock catheter as appropriate.

16. Dispose of used supplies in appropriate receptacles.

17. Remove gloves.

18. Perform hand hygiene.

19. Notify LIP if unable to achieve patency.

Stopcock Method for Complete Occlusions

Supplies
- Gloves
- Antiseptic solution
- 3-way stopcock
- 10-mL syringe
- 10-mL syringe with precipitate-clearing or thrombolytic agent
- 10-mL syringe preservative-free 0.9% sodium chloride (USP)
- Needleless connector

Procedure
1. Obtain and review LIP’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Explain procedure to patient.
5. Don gloves.
6. Disinfect junction of the CVAD and needleless connector with antiseptic solution and allow to air-dry.
7. Clamp catheter.
8. Remove needleless connector and aseptically attach stopcock to the CVAD hub; turn off from the patient to the CVAD hub.
9. Attach empty sterile 10-mL syringe to 1 port of stopcock.
10. Attach 10-mL syringe of precipitate-clearing or thrombolytic solution to stopcock port.
11. Open stopcock port connected to empty syringe.
12. Aspirate empty syringe to 8 to 9 mL while maintaining plunger position, then close port, creating negative pressure within catheter lumen.
13. Open stopcock connected to syringe with precipitate-clearing or thrombolytic agent, allowing solution to enter the CVAD lumen.
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a. Procedure steps 12 and 13 may need to be repeated until solution is pulled into the CVAD.

14. Secure device “unit” (stopcock/syringes) to patient and label “Do not use” with date, time, and initials.
   a. May opt to remove stopcock and syringes and replace with sterile needleless connector during dwell time; however, increased manipulation at hub increases risk of contamination should the procedure need to be repeated.

15. Allow solution to dwell according to thrombolytic manufacturers’ directions for use; in the case of a precipitate-clearing agent, allow to dwell for 20 to 60 minutes.

16. Disinfect needleless connector (if used to replace stopcock unit) with antiseptic solution and allow to dry.

17. Aseptically attach 10-mL syringe and attempt to aspirate blood (if previous syringe is left attached to stopcock, another one is not needed).
   a. A free-flowing blood return that is the color and consistency of whole blood indicates patency.
   b. If patency is reestablished, withdraw a total of 4 to 5 mL of blood, clamp CVAD, and remove and discard syringe into biohazard container.
   c. Repeat procedure once if patency not achieved.

18. Attach 10-mL syringe of preservative-free 0.9% sodium chloride (USP), unclamp CVAD, and flush using positive-pressure method (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).

19. Resume ordered therapy or lock catheter as appropriate.

20. Dispose of used supplies in appropriate receptacles.

21. Remove gloves.

22. Perform hand hygiene.

23. Notify LIP if unable to achieve patency.

**Direct Instillation Method for Partial Thrombotic or Nonthrombotic Occlusions**

**Supplies**

- Gloves
- Antiseptic solution
- Needleless connector
- 10-mL syringe
- 10-mL syringe with precipitate-clearing or thrombolytic agent
- 10-mL syringe of preservative-free 0.9% sodium chloride (USP)
Procedure

1. Obtain and review LIP’s order or standard protocol.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Explain procedure to patient.
5. Don gloves.
6. Disinfect needleless connector with antiseptic solution and allow to air-dry.
7. Clamp CVAD, if appropriate.
8. Attach syringe with precipitate-clearing or thrombolytic agent to the needleless connector.
   a. Alternatively, remove the needleless connector, because it could be a source of infecting organisms and/or thrombus, and prepare to attach the syringe directly to the CVAD hub.
9. Unclamp CVAD, if appropriate, and slowly inject precipitate-clearing or thrombolytic agent. Do not force solution into CVAD.
10. Clamp CVAD and leave syringe attached. Label CVAD “Do not use” with date, time, and initials.
11. Allow solution to dwell according to thrombolytic manufacturers’ directions for use; in the case of a precipitate-clearing agent, allow to dwell for 20 to 60 minutes.
12. After appropriate dwell time, unclamp CVAD and attempt to aspirate blood.
   a. A free-flowing blood return that is the color and consistency of whole blood indicates patency.
   b. If patency is reestablished, withdraw a total of 4 to 5 mL of blood, clamp CVAD, and remove and discard syringe into biohazard container.
   c. Repeat procedure once if patency not achieved.
13. Attach 10-mL syringe of preservative-free 0.9% sodium chloride (USP), unclamp CVAD, and flush using positive-pressure method (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).
14. Resume infusion therapy as ordered or lock catheter as appropriate.
15. Dispose of used supplies in appropriate receptacles.
16. Remove gloves.
17. Perform hand hygiene.
18. Notify LIP if unable to achieve patency.
Documentation

Document in the patient’s health record:
- Patient and CVAD assessment data
- Interventions performed and outcome
- LIP notification
- Response to interventions

### Table 5.1. Agents for CVAD Clearance of a Drug Precipitate

<table>
<thead>
<tr>
<th>Drug Precipitate</th>
<th>Clearing Agent</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidic drug (pH &lt; 6)</td>
<td>Hydrochloric acid (0.1 N)</td>
<td>NA</td>
</tr>
<tr>
<td>Alkaline drug (pH &gt; 7)</td>
<td>Sodium bicarbonate 8.4%</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Sodium hydroxide 0.1 mmol/L</td>
<td></td>
</tr>
<tr>
<td>Intravenous fat emulsion</td>
<td>70% ethanol</td>
<td>Use with caution with polyurethane CVADs, as ethanol may cause catheter damage; check manufacturers’ directions for use.</td>
</tr>
</tbody>
</table>

**Abbreviations:** CVAD, central vascular access device; L, liter; mmol, millimole; NA, not applicable.

### Bibliography


Central Vascular Access Device (CVAD)-Associated Venous Thrombosis

Policy
The clinician employs preventive interventions, identifies signs/symptoms, and promptly intervenes on recognition of central vascular access device (CVAD)-associated venous thrombosis.

Key Points
Some patients may be more prone to clot formation in a vein of the upper extremities or chest with the presence of a CVAD or a diagnosis of cancer. A patient may present with venous thrombosis due to vessel wall damage; alterations in the flow of blood due to immobility, chronic heart disease, or varicosities; and hypercoagulability of the blood due to malignancy or diabetes.

Risk factors associated with venous thrombosis include the following:
- History of deep vein thrombosis (DVT)
- Presence of chronic diseases associated with a hypercoagulable state, such as cancer, diabetes, irritable bowel syndrome, congenital heart disease, and end-stage renal failure
- Surgical and trauma patients
- Critical care patients, hyperglycemia in critically ill, nondiabetic children
- Known presence of genetic coagulation abnormalities (eg, factor V Leiden, prothrombin mutation)
- Pregnancy or the use of oral contraceptives
- Fluid volume deficit
- History of multiple CVADs, especially with difficult or traumatic insertion and the presence of other intravascular devices (eg, pacemakers)

The risk of CVAD-associated venous thrombosis is reduced with appropriate vascular access device selection and placement as follows:
- Peripherally inserted central catheters (PICCs) are associated with higher risk in patients who are critically ill and/or have a cancer diagnosis when compared to other types of CVADs.
- PICC insertion through the internal jugular vein rather than veins of the upper extremity is associated with lower rates of DVT than insertion in arm veins.
- Use catheters with smaller diameter; choose a PICC with a catheter-to-vein ratio of 45% or less, because it will take up less space within the vein.
• Ensure optimal catheter tip location in lower one-third of the superior vena cava (SVC) or cavoatrial junction; catheter tips located in the mid-to-upper portion of the SVC are associated with increased DVT risk.

Flushing and locking procedures have no effect on CVAD-associated venous thrombosis, because such interventions are aimed at the internal CVAD lumen, not the vein lumen.

The CVAD is generally not removed in the presence of venous thrombosis if the catheter is in the correct position, is functioning correctly with a blood return on aspiration, and when there is no evidence of infection. Patients will be treated with systemic anticoagulant therapy.

**Patient Education**

**Signs/symptoms of CVAD-associated venous thrombosis and how/where to report them**

Nonpharmacologic strategies for thrombosis prevention, including early mobilization of the catheterized extremity, performance of normal activities of daily living, gentle limb exercise, and adequate hydration

**Assessment**

Measure upper-arm circumference before PICC insertion and when clinically indicated to assess the presence of edema and possible DVT.

• Take the measurement 10 cm above the antecubital fossa.

Assess all patients with CVADs for signs and symptoms. The majority of the time, overt signs and symptoms are not apparent.

• Pain in the extremity, shoulder, neck, or chest
• Edema in the extremity, shoulder, neck, or chest
• Erythema in the extremity
• Engorged peripheral veins on the extremity, shoulder, neck, or chest wall
• Difficulty with neck or extremity motion
• Signs and symptoms of pulmonary emboli, including dyspnea, apprehension, pleuritic discomfort or pain, diaphoresis, tachycardia, cyanosis

**Interventions**

1. Take immediate action in the event of signs and symptoms of pulmonary embolus.
   a. Initiate basic life support as needed (eg, severe dyspnea, suspected embolus).
   b. Initiate rapid response team, “code.”
   c. Continue to monitor vital signs and observe patient.
   d. Perform interventions and treatments as ordered.
2. For nonemergent signs/symptoms, anticipate the following:
   a. Diagnostic testing: Doppler ultrasound in veins of upper extremity (noninvasive, no radiation exposure) or venography with contrast injection, computed tomography scan, or magnetic resonance imaging may be used to assess veins obscured by clavicle or ribs.
   b. Therapeutic doses of anticoagulant medication, which is usually continued for at least 3 months after removal

**Documentation**

Document in the patient's health record:
- Patient assessment data
- Licensed independent practitioner notification
- Interventions taken and outcome
- Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.

**Bibliography**


Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers


Circulatory Overload

Considerations for the Ambulatory Infusion Patient
Mild to moderate dehydration may be treated with infusion of hydration fluids in the ambulatory infusion setting. Often hydration may be given in correlation with specialty infusions. Safe practice includes attention to the risk factors for circulatory overload, slow infusion rates, electronic rate control, and frequent monitoring for signs and symptoms of circulatory overload. Instruct patient/caregiver in risks/signs and symptoms to report or to seek immediate emergency attention.

Policy
The clinician employs preventive interventions, identifies signs/symptoms, and promptly intervenes when circulatory overload is suspected.

Key Points
Circulatory overload may be caused by rapid infusion of large amounts of isotonic or hypertonic crystalloid solutions. The risk is greater in patients who have cardiopulmonary or renal disease.

Rapid administration of blood products can also result in fluid overload. Red blood cell and plasma products and 25% albumin are the components most associated with circulatory overload. At greatest risk are adults older than 70 years, as well as those with existing cardiopulmonary disease.

Circulatory overload may be prevented or detected early through:
• Identifying conditions that may increase risk (eg, heart failure or renal disease)
• Administering infusions at a slower rate
• Administering a diuretic when beginning infusions in at-risk patients
• Monitoring intake and output and daily weights
• Monitoring vital signs and for signs and symptoms
• Using electronic flow control and ensuring accuracy of prescribed flow rate

Patient Education
Instruct patients to report any type of pain or change in how they feel

Assessment
Identify signs and symptoms of circulatory overload, including:
• Increased blood pressure, heart rate, bounding pulse
• Greater intake than output
• Weight gain
• Increased central venous pressure
• Jugular venous distention
• Cough
• Edema
• Pulmonary edema: moist crackles, severe shortness of breath, anxiety/restlessness, blood-tinged sputum, pallor, cyanosis, hypoxia
• Decreased urinary output

Interventions
1. Report signs and symptoms to licensed independent practitioner (LIP) immediately, along with details of type of fluid infusing, rate, and total volume infused in a specific period:
   a. Slow infusion rate while waiting for specific orders.
   b. Position patient in semi-Fowler’s position.
2. Anticipate and perform interventions as ordered:
   a. Administer loop diuretics.
   b. Administer oxygen.
3. Monitor vital signs, cardiovascular, and pulmonary status, and report changes to LIP.
4. Patient may require transfer to emergency department for further treatment.

Documentation
Document in the patient’s health record:
• Patient assessment data
• Interventions taken and outcome
• LIP notification
• Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.

Bibliography


Infusion-Related Complications: Identification & Intervention

Infiltration/Extravasation

Policy
An approved list of vesicant and irritant medications/solutions based on the organization's internal formularies is available to clinicians.

The clinician assesses the peripheral and central vascular access device (CVAD) site for signs and/or symptoms of infiltration and extravasation before each infusion and on a regular basis.

Appropriate interventions are initiated promptly, as time is a critical element to reduce tissue damage.

Key Points
Infiltration is defined as inadvertent administration of a nonvesicant solution or medication into surrounding tissue, while extravasation is defined as inadvertent infiltration of vesicant solution or medication into surrounding tissue. A vesicant is an agent capable of causing tissue damage when it escapes from the intended vascular pathway into surrounding tissue.

Prevention of infiltration/extravasation with any type of vascular access device (VAD) should be the standard of care.

Prevention of infiltration/extravasation is critical, because many medications do not have successful treatment methods.

Vein fragility and the high acuity levels of young patients, as well as the older adult, can increase the likelihood of infiltration and extravasation, resulting in significant morbidity.

Infiltration of solutions or medications could lead to impairment of functional capabilities, which could result in diminished capacities for self-care. Infiltration can also contribute to medication error by delay of therapy administration and fluctuations in therapeutic medication levels secondary to delivery disruption.

Extravasation of vesicant parenteral solution or medication can be devastating. When a vesicant solution or medication extravasates, it can cause formation of blisters, with subsequent sloughing of tissues occurring from tissue necrosis. Extravasation can also contribute to medication error by delay of therapy administration and fluctuations in therapeutic medication levels secondary to delivery disruption.

Vesicant medications include antineoplastic medications, as well as many noncytotoxic medications, and are associated with many forms of tissue damage.

Early recognition through frequent and comprehensive assessment is necessary to limit the amount of fluid that escapes into an extravascular space.
Alarms from electronic infusion pumps are not designed to detect the presence or absence of infiltration/extravasation.

Causes of infiltration/extravasation include mechanical issues, pharmacologic properties of the infusion solution(s), and venous obstructions proximal to the VAD.

A large volume of irritant medication could produce local tissue damage.

A large volume of any solution (eg, vesicant, nonvesicant, and/or irritant) may cause compartment syndrome, which could lead to amputation and nerve damage that could produce complex regional pain syndrome.

Pressure at the insertion site should not be used, as this will force the solution into contact with more tissue.

Risk factors by category include:

- **Mechanical factors**
  - Insertion sites in the hand, antecubital fossa, upper arm
  - Ultrasound-guided catheter insertion in deep veins (eg, bariatric patients, veins of the upper arm) with insufficient catheter length
  - Subsequent peripheral catheters after the first insertion
  - Peripheral catheters indwelling longer than 24 hours
  - Difficult venous access, multiple previous venipunctures, or lengthy history of infusion therapy
  - CVAD tip location leading to vessel erosion and extravasation due to lack of adequate stabilization and body movements, such as respiratory and cardiac function

- **Pharmacologic factors**
  - Medication concentration
  - Volume escaping into the tissue
  - Hyperosmolarity
  - Nonphysiological pH
  - Medication’s ability to bind DNA, kill replicating cells, and/or cause vascular dilatation
  - Excipients, such as alcohol or polyethylene glycol, used in the formulation of some medications
  - Length of the injection or infusion time for vesicant medications

- **Obstructive factors that limit blood flow and cause overflow of infusing fluids from the puncture site**
  - Vein thrombosis or stenosis proximal to (located above) the insertion site and tip location
  - Lymphedema

- **Patient-related factors**
  - Inability or difficulty with communicating pain, tightness, or other discomfort
• Altered mental status or cognition (e.g., agitation, confusion, sedation)
• Age-related changes to vasculature, skin, and subcutaneous tissue
• Diseases that produce changes in vasculature or impaired circulation (e.g., diabetes, lymphedema, systemic lupus, Raynaud’s disease, peripheral neuropathy, peripheral vascular disease)
• Medications that alter pain sensation (e.g., narcotics) or suppress the inflammatory response (e.g., steroids)
• Current infection

Reduce risk by:
• Using appropriate methods for VAD planning, site selection, insertion, stabilization, and dressing the VAD
• Avoiding use of winged steel needles for infusion
• Having only clinicians with the highest skill level perform venipuncture in patients with difficult venous access
• Assessing all VADs for patency and the absence of signs and symptoms of infiltration and extravasation before each intermittent infusion and on a regular basis for continuous infusions
• Assessing short peripheral catheters (SPCs) frequently as follows: minimally at least every 4 hours; every 1 to 2 hours for patients who are sedated or have cognitive deficits; hourly for pediatric patients; and more often for patients receiving infusions of vesicant medications
• Careful observation of the insertion site and catheter pathway for changes in color and/or temperature, presence of edema, and leakage from the insertion site
• Comparison of extremity circumference when localized edema is not obvious
• Gentle palpation of site through intact dressing
• Flushing to identify resistance
• Aspiration of blood return
• Listening to patient’s report of any type of pain or discomfort
• Collaboration with pharmacists for appropriate diluent type and volume for each medication
• Collaboration with licensed independent practitioner (LIP) for appropriate type of VAD

**Patient Education**

Information about the risk of vesicant medications and the possible progression of signs and symptoms after the event

Care of VAD based on venue of care

Signs and symptoms to report and how/where to report them

Treatment interventions, their purpose, and length of treatment
Site protection (eg, from sunlight)

Appropriate actions, if the site worsens after discharge

Required follow-up with LIP

**Assessment**

Identify the nature (ie, vesicant, nonvesicant, or irritant) of antineoplastic and noncytotoxic medications before administration and be prepared to use the correct thermal application and antidote treatment for each medication.

Identify signs and symptoms of infiltration/extravasation

- Pain may be the initial symptom and may be sudden and severe when associated with a rapid injection of solutions or medications; may be out of proportion to the injury; may appear with passive stretching of the muscles in the extremity; pain intensity may increase over time.
- Edema may appear as a raised area under the skin near the peripheral VAD site or as an enlarged and tense extremity due to fluid accumulating in compartments of the extremity.
- Compare circumference of both extremities.
- Edema from a CVAD may appear as a raised area on the neck or chest.
- Changes in color may include blanching from nonvesicant fluids; vesicants can produce redness; however, extravasation into deep tissue may not produce visible color changes.
- Fluid leakage may occur from the puncture site, subcutaneous tunnel, or port pocket.
- Blister formation may appear within hours (eg, contrast media) or may be delayed for days with antineoplastic agents. Progression to ulceration may vary from a few days to 1 to 2 weeks, depending on the medication that extravasated.

**Interventions**

1. Stop infusion immediately when the patient reports pain, burning, stinging and/or tightness, at or around the insertion site, catheter tip, or entire venous pathway; this should not be considered “normal” with any infusion. Further assessment is required to determine appropriate intervention(s).
2. Assess the area distal to the VAD site for capillary refill, sensation, and motor function.
3. Confirm the presence or absence of blood return by aspiration. To enhance blood return, use a slow, gentle technique to pull back syringe plunger rod and/or a small syringe (eg, 3 or 5 mL). The peripheral catheter tip could be inside the vein lumen, yet an additional puncture of the vein wall is allowing fluid leakage. Absence
of blood return from a CVAD could be caused for many reasons, and diagnostic studies may be needed.

**Infiltration from an SPC or Midline Catheter:**
1. Remove the catheter and apply a dressing.
2. Elevate the extremity.
3. Apply cold for infiltration of hyperosmolar fluids (greater than 350 mOsm per liter).
4. Apply warm compresses for isotonic or hypotonic fluids.
5. Perform a neurovascular assessment, including capillary refill, sensation, and movement of distal joints.
6. Outline the area of visible signs with a skin marker to assess changes.
7. Estimate the amount of fluid that escaped from the vein.
8. Notify the LIP about alterations in the neurovascular assessment.

**Infiltration from a CVAD, including Peripherally Inserted Central Catheters (PICCs):**
1. Evaluate the type of fluid(s) and medication(s) infusing through the CVAD.
2. Stop the infusion.
3. If the fluid and medication can be infused through a peripheral vein, insert a peripheral catheter and initiate infusion(s).
4. Immediately collaborate with the LIP for patient management, especially if a peripheral vein cannot tolerate the infusing solution.
5. Diagnostic testing may be needed to identify the extravascular tip location and to plan appropriate removal.
6. Estimate the amount of fluid that escaped from the vein.

**Extravasation from an SPC or Midline Catheter:**
1. Stop the infusion immediately.
2. Do not flush the VAD, as this would inject additional medication into the tissue.
3. Disconnect the administration set from the catheter hub, and aspirate from the catheter with a small syringe, although a very small amount of fluid may be retrieved.
4. Remove the peripheral catheter and apply a dressing to achieve hemostasis.
5. Never apply pressure to the area.
6. Using a skin marker, outline the area with visible signs of extravasation to allow for assessing changes.
7. Estimate the volume of solution that escaped into the tissue.
8. Elevate the extremity.
9. Photograph the affected area to identify progression or exacerbation of the tissue injury.

10. Notify the LIP about the event and activate the established treatment protocol or the prescribed treatment.

11. Use the appropriate thermal application.
   a. Apply dry, cold compresses when the goal is to localize the medication in the tissue and reduce inflammation.
      i. Apply for 20 minutes 4 times a day for 24 to 48 hours unless otherwise prescribed.
      ii. Do not use cold compresses with extravasation of vinca alkaloids and vasopressors and in the presence of vaso-occlusive events (eg, sickle cell anemia). Neutralize the medication with the appropriate antidote.
   b. Apply dry, warm compresses when the goal is to increase local blood flow and disperse the medication through the tissue. Dilute the medication further with the appropriate antidote.

12. Administer the appropriate antidote for the extravasated drug (see Table 5.2).

13. Apply a sterile transparent occlusive dressing to the entire area.

**Extravasation from a CVAD, including a PICC:**

1. Stop the infusion immediately.

2. Check for dislodged catheter, dislodged port access needle, and ruptures or leaks from the external catheter.

3. Aspirate the residual drug, if possible, from the CVAD. For an implanted port needle dislodged from the port reservoir, attempt aspiration from the port pocket.

4. For extravasation into the subcutaneous area surrounding the port pocket or nontunneled CVAD insertion site, the appropriate thermal application and antidote injection should be considered.

5. For extravasation into other intrathoracic extravascular areas, collaborate with the LIP about radiographic diagnostic tests and a plan of care, which could involve surgical intervention.

**All Infiltration/Extravasation Events:**

1. Monitor progression of signs and symptoms and/or response to treatment at periodic intervals, usually determined by venue of care.

2. Photograph the site at periodic intervals, including the date and time, according to organizational policy.

3. Facilitate consultation with other specialists as needed (eg, hand surgeon, rehabilitation with physical or occupational therapy, pain management).
Documentation

Document in the patient's health record:

- Details of the type, size, and location of the VAD involved
- Patency assessment of the VAD before, during, and after the event, including blood return
- Patient assessment data
- All solution and medications involved, method of administration (e.g., injection, rate of infusion), and estimate of amount of solution in the tissue
- Immediate nursing interventions used and patient’s response
- Medical interventions and outcome
- LIP notification and referrals to other specialists
- Follow-up evaluations
- Patient education

Use a standardized tool that is valid and reliable for assessing and documenting the event. Continue use of the same tool through resolution.

Use a standardized format to document the initial event and each ongoing assessment to ensure that all factors are considered.

Complete an Adverse Event Report, according to organizational policy.
### Table 5.2. Antidotes Used in Infiltration Procedures

<table>
<thead>
<tr>
<th>Extravasated Drug</th>
<th>Antidote</th>
<th>Dosage of Antidote</th>
<th>Route of Administration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasopressors such as dopamine, dobutamine, norepinephrine, epinephrine, methylene blue, vasopressin, phenylephrine</td>
<td>Phentolamine</td>
<td>5 to 10 mg in 10 mL of normal saline</td>
<td>Subcutaneous injection of 0.5 to 1 mL around area of extravasation</td>
<td>Administer immediately or within 12 hours of the event</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clean entire site with alcoholic chlorhexidine gluconate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use 25-gauge or smaller needles, and change for each injection</td>
<td></td>
</tr>
<tr>
<td>Vasopressors (same drugs as above)</td>
<td>Terbutaline</td>
<td>1 mg in 10 mL of normal saline</td>
<td>Subcutaneous injection of 1 mL around area of extravasation</td>
<td>Used when phentolamine is not available</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clean entire site with alcoholic chlorhexidine gluconate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use 25-gauge or smaller needles, and change for each injection</td>
<td></td>
</tr>
<tr>
<td>Cytotoxic agents: • Vinca alkaloids • Suggested for use with others such as epipodophyllotoxins</td>
<td>Hyaluronidase</td>
<td>15 units in pediatric patients</td>
<td>Subcutaneous injection</td>
<td>Administer immediately</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 1500 units in adults</td>
<td>Clean entire site with alcoholic chlorhexidine gluconate</td>
<td>Delay of more than 1 hour decreases effectiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For cytotoxic agents, 1 to 6 mL or 1 mL for each mL of extravasated drug</td>
<td>Use 25-gauge or smaller needles, and change for each injection</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 brands are available. Follow manufacturers’ directions for use.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Vasopressors** such as dopamine, dobutamine, norepinephrine, epinephrine, methylene blue, vasopressin, phenylephrine
- **Vasopressors (same drugs as above)**
- **Cytotoxic agents**: • Vinca alkaloids • Suggested for use with others such as epipodophyllotoxins
- **Noncytotoxic agents**: • Antibiotics such as vancomycin, nafcillin • Electrolytes such as calcium solutions, sodium bicarbonate, potassium solution, hypertonic sodium chloride • Dextrose 10% or greater • Contrast agents
<table>
<thead>
<tr>
<th>Extravasated Drug</th>
<th>Antidote</th>
<th>Dosage of Antidote</th>
<th>Route of Administration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechlorethamine hydrochloride</td>
<td>Sodium thiosulfate</td>
<td>10% or 20% solution. Prepare according to manufacturers' directions for use</td>
<td>Subcutaneous injection of 2 mL for each 1 mg of extravasated drug</td>
<td>Administer immediately&lt;br&gt;Delay of more than 1 hour decreases effectiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clean entire site with alcoholic chlorhexidine gluconate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use 25-gauge or smaller needles, and change for each injection</td>
<td></td>
</tr>
<tr>
<td>Vasopressors</td>
<td>Nitroglycerin ointment</td>
<td>2% ointment 1 to 2-inch length for adults</td>
<td>Topical application</td>
<td></td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td></td>
<td></td>
<td>Reapplied every 8 hours if needed</td>
<td></td>
</tr>
<tr>
<td>Hypo- and hyperosmolar agents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drugs containing propylene glycol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(etomindate, lorazepam, phenytoin)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anthracyclines</td>
<td>Dexrazoxane</td>
<td>Days 1 and 2 = 1000 mg per m², not to exceed 2000 mg Day 3 = 500 mg per m², not to exceed 1000 mg</td>
<td>IV infusion</td>
<td>First dose within 6 hours of extravasation event; subsequent doses given at the same time each day&lt;br&gt;Use a large vein on the opposite extremity if possible or select a vein distal to the extravasated site if the same extremity must be used. Remove cold compresses 15 minutes before infusion begins</td>
</tr>
</tbody>
</table>

*Abbreviations: IV, intravenous; mg, milligram; mL, milliliter; m², meter squared.*
Bibliography


Nerve Injuries

Policy
Signs and/or symptoms of nerve injury are promptly reported to the licensed independent practitioner (LIP).

Key Points
Anatomical variations in veins, arteries, and nerves used for peripheral or central vascular access device insertion are common and can be complex. Nerve injuries are not always preventable. However, it is important to recognize that certain sites may have a greater risk for nerve injury.

The following venipuncture sites may be associated with greater risk for nerve injury due to the specific nerves as indicated:
- Dorsal hand: sensory branches of the radial and ulnar nerves
- Radial wrist area: superficial radial nerve at the cephalic vein
- Volar aspects of wrist: median nerve
- At or above the antecubital fossa: median antecubital interosseous nerve
- Antecubital fossa: lateral and medial antebrachial nerves
- Subclavian and jugular sites: brachial plexus nerve

Arterial sites with the greatest risk for nerve injury include:
- Brachial (median nerve)
- Radial (median and radial nerve)
- Axillary (brachial plexus)

Reduce the risk of nerve damage by:
- Avoiding venipuncture in areas with greater risk whenever possible
- Avoiding subcutaneous “probing” for a vein
- Avoiding multiple passes of a needle or catheter
- Reviewing patient medication profile for systemic anticoagulant use and controlling bleeding appropriately; a hematoma could lead to nerve injury due to compression
- Immediately removing a peripheral catheter during venipuncture when the patient complains of paresthesias, including shock-like pain in either direction from the puncture site, tingling or feelings of “pins and needles,” burning, and/or numbness
- Immediately removing a peripheral catheter when there is evidence of infiltration or edema associated with hematoma or phlebitis, as fluid accumulation in the tissue can result in nerve compression injury

Some patient populations, (eg, pediatrics, older adult) may be unable to articulate the feeling of numbness, tingling, or weakness. Careful assessment of the patient’s range of motion of the extremity is important, especially if the patient reports his or her extremities feel funny, hurt, or feel different.
Patient Education
Explain the type of pain associated with nerve injury (paresthesias).
Instruct the patient to immediately report any paresthesia-type of pain.

Assessment
Identify the presence of primary or secondary medical diagnoses of complex regional pain syndrome, also known as reflex sympathetic dystrophy, as the risk of venipuncture-associated nerve injury may be increased.

Identify signs and symptoms of nerve injury during vascular access device (VAD) placement or during VAD dwell including:
- “Electrical pain”
- Tingling
- Burning
- Prickly feeling
- Numbness
- Subclavian/jugular insertion: respiratory difficulty/dyspnea, eye changes (eg, pupil constriction, upper eyelid drooping), right shoulder/neck pain, and/or hiccups due to phrenic nerve damage

Interventions
1. Take immediate action:
   a. Stop the VAD insertion procedure and carefully remove the VAD.
2. Notify LIP; recognize that consultation with a medical specialist (eg, hand specialist) may be required.
3. Monitor neurovascular status, and report changes to LIP.
   a. Intensification of paresthesia (eg, pain, burning, localized tingling, numbness) may be indicative of advancing nerve damage from development of a neuroma (surgical removal required) or compartment syndrome (nerve compression) (see Infiltration/Extravasation).

Documentation
Document in the patient’s health record:
- Patient assessment data
- Interventions taken and outcome
- LIP notification
- Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.
Bibliography


Policies and Procedures for Infusion Therapy: Ambulatory Infusion Centers

Phlebitis

Policy
The clinician employs preventive interventions, identifies signs/symptoms, and promptly intervenes on recognition of phlebitis.

Key Points
The patient can be at particular risk for phlebitis due to alteration in the integumentary system, fluid and electrolyte imbalances, malnutrition, and other preexisting disease processes. They are often exposed to multiple parenteral medications and solutions with chemical properties that are inherently irritating. Phlebitis can also contribute to medication error by delay of therapy administration and fluctuations in therapeutic medication levels secondary to delivery disruption.

Phlebitis may result from chemical, mechanical, or bacterial causes.

Chemical causes of phlebitis include:
- Hyperosmolar solutions
- Known irritating solutions (eg, potassium chloride, promethazine, amiodarone, some antibiotics)
- Particulate matter
- Failure to allow antiseptic solution to dry before catheter insertion

Mechanical causes of phlebitis result from vein wall irritation, such as:
- Multiple manipulations of infusion delivery system
- Large catheter gauge size
- Catheter material and diameter
- Failure to stabilize catheter adequately
- Failure to stabilize the joint, if insertion site in or near a joint must be used

Bacterial causes of phlebitis result from:
- Inadequate hand hygiene and/or failure to use gloves
- Inadequate skin antisepsis before venipuncture
- Failure to adhere to aseptic technique during catheter placement and infusion administration
- Failure to stabilize catheter or joint, causing catheter movement and dragging skin organisms into puncture site
- Contamination of the catheter segment or hub lumen during insertion

The risk for phlebitis is reduced when risk factors are mitigated, including the following:
- Using the smallest-gauge catheter to accommodate the prescribed therapy
Avoiding catheter placement in areas of flexion
• Adhering to aseptic technique with catheter placement and all infusion access and medication/solution administration
• Allowing the antiseptic to dry thoroughly before inserting catheter
• Stabilizing the catheter to minimize movement at the insertion site
• Considering using a midline catheter or a central vascular access device (CVAD) for infusates identified as causing phlebitis, depending on length of infusion time and anticipated duration of therapy (see Vascular Access Device [VAD] Planning)

Use a standardized phlebitis scale definition to rate the grade of phlebitis.

Phlebitis is seen more often in children older than 10. Standardized pediatric site assessment tools can assist in the recognition of phlebitis.

**Patient Education**
Provide the patient and his or her caregiver with instructions about how to recognize signs and symptoms of phlebitis and how and to whom to report. Continue to reinforce this education throughout therapy treatment.

**Assessment**
Identify signs and symptoms of phlebitis through gentle palpation of site through the dressing, observation of the site, and evaluation of subjective complaints from the patient:
• Pain/tenderness at site
• Erythema
• Warmth
• Swelling
• Induration
• Purulent drainage
• Palpable venous cord

**Interventions**
1. Discontinue infusion.
2. Remove catheter.
3. Evaluate potential causes of the phlebitis
   a. Chemical
   b. Mechanical
   c. Bacterial
4. Notify licensed independent practitioner (LIP) of severe phlebitis (grade 3 or 4).
5. Implement interventions to relieve discomfort associated with phlebitis: limb elevation, application of warm compresses, and analgesics as ordered.
6. Reassess vascular access needs based on evaluation of probable cause of phlebitis.
   a. Insert new short peripheral catheter in opposite extremity or
   b. Discuss with patient and health care team consideration for a CVAD if phlebitis is likely due to chemical causes and there is need for ongoing infusion therapy (see Vascular Access Device [VAD] Planning).

7. Observe site for signs of postinfusion phlebitis after removal of all catheters.
   a. Postinfusion phlebitis may appear after removal when no signs/symptoms were present at removal or signs/symptoms could worsen when present at removal.

**Documentation**

Document in the patient’s health record:
- Patient assessment data
- Interventions taken and outcome
- LIP notification
- Patient’s condition and response to interventions

Complete an Adverse Event Report based on severity of phlebitis in accordance with organizational policy.

Use a standardized phlebitis scale definition to rate the grade of phlebitis (Tables 5.3 and 5.4).

**Table 5.3. INS Phlebitis Scale**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No symptoms</td>
</tr>
<tr>
<td>1</td>
<td>Erythema at access site with or without pain</td>
</tr>
<tr>
<td>2</td>
<td>Pain at access site with erythema and/or edema</td>
</tr>
</tbody>
</table>
| 3     | Pain at access site with erythema  
    Streak formation  
    Palpable venous cord |
| 4     | Pain at access site with erythema  
    Streak formation  
    Palpable venous cord > 1 inch in length  
    Purulent drainage |

Table 5.4. Visual Infusion Phlebitis (VIP) Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>IV site appears healthy</td>
</tr>
</tbody>
</table>
| 1     | One of the following is evident:  
|       | Slight pain near IV site OR slight redness near IV site |
| 2     | Two of the following are evident:  
|       | • Pain at IV site  
|       | • Erythema  
|       | • Swelling |
| 3     | All of the following signs are evident:  
|       | • Pain along path of cannula  
|       | • Induration |
| 4     | All of the following signs are evident and extensive:  
|       | • Pain along path of cannula  
|       | • Erythema  
|       | • Induration  
|       | • Palpable venous cord |
| 5     | All of the following signs are evident and extensive:  
|       | • Pain along path of cannula  
|       | • Erythema  
|       | • Induration  
|       | • Palpable venous cord  
|       | • Pyrexia |

Abbreviation: IV, intravenous.


**Bibliography**


Vascular Access Device (VAD)-Associated Infection

Policy
The clinician employs preventive interventions, identifies signs/symptoms, and promptly intervenes when vascular access device (VAD)-associated infection is suspected.

Key Points
Infection can occur locally at the venipuncture site or may be systemic. Primary infections located distant from the catheter-skin junction may also contribute to VAD-related infections, as well as systemic infections. Patient noncompliance with care and maintenance strategies may contribute to infectious compromise. Reinforcement of patient education, especially being aware of patients with cognitive impairments, is necessary.

Health care-associated infections are most prevalent among the older adult and pediatric populations, who tend to be the sickest and most immunocompromised, undergo invasive procedures, and have VADs. Infections due to antibiotic resistance are of great concern in these populations.

Risk factors for infection and catheter-associated bloodstream infection include:
- Inadequate skin antisepsis before VAD insertion
- Multiple manipulations of VAD hub and infusion delivery system
- Patient age, condition, acuity
- Presence of infection at another anatomical location (ie, urinary, surgical site)
- Education and skill of clinician(s)
- Inadequate VAD insertion technique
- Inadequate care and maintenance practices

Infection is a preventable complication when risk factors are mitigated, including the following:
- Perform hand hygiene before placing and before providing any VAD-associated interventions.
- Use maximal sterile barrier precautions during central vascular access device (CVAD) insertion and midline catheter insertion.
- Choose the optimal CVAD site. The subclavian vein is the preferred site for nontunneled catheters.
- Use chlorhexidine for skin antisepsis before CVAD insertion.
- Perform skin antisepsis using an acceptable antiseptic before peripheral catheter insertion.
- Use sterile gloves to palpate the site of a peripheral catheter insertion after application of skin antiseptic agent.
• Disinfect needleless connectors before each entry into the VAD lumen.
• Maintain aseptic technique during all infusion administration and VAD care.
• Change administration set and any add-on devices at recommended intervals.
• Minimize use of add-on devices.
• Remove VAD when no longer needed.
• Use appropriate site-protection devices during showers or bathing.

**Patient Education**

Teach patients to avoid allowing VAD dressing and attached administration sets to get wet during handwashing or bathing.

Teach patients/caregivers who will self-manage their VAD/infusion hand hygiene, aseptic technique, disinfection of needleless connectors, and site protection during bathing.

**Assessment**

Identify signs and symptoms of exit site infection:
- Tenderness
- Erythema
- Induration
- Purulence within 2 cm of catheter-skin junction

Identify signs and symptoms of port-pocket infection:
- Erythema
- Dehiscence of surgical incision used for implanted port insertion
- Necrosis of skin over reservoir of implanted port
- Tenderness
- Induration
- Purulent exudate from needle access site
- Purulent exudate from subcutaneous pocket containing reservoir

Identify signs and symptoms of infection in the tract of a subcutaneously tunneled catheter:
- Erythema
- Tenderness
- Induration in tissues overlying catheter and more than 2 cm from catheter exit site

Identify signs and symptoms of catheter-associated bloodstream infection:
- Chills
- Backache
- Fever
- Hypothermia
- Nausea
Be aware that fever as a single sign is not an indication to remove a CVAD.

**Interventions**

1. If signs and symptoms of exit site infection are present:
   a. Obtain culture of purulent exudate.
   b. Notify licensed independent practitioner (LIP) of signs and symptoms.
   c. Assess infusion therapy needs and potential for changing therapy to another route, if possible.
   d. Implement orders as appropriate (eg, antimicrobial therapy), usually including VAD removal.

2. If signs and symptoms of port-pocket or tunnel-tract infection are present:
   a. Notify LIP of signs and symptoms.
   b. Anticipate removal of device.

3. If signs and symptoms of catheter-associated bloodstream infection are present:
   a. Notify LIP immediately.
   b. Obtain blood cultures from VAD and from a separate peripheral vascular access site, as ordered (see *Phlebotomy: Blood Sampling from a Vascular Access Device [VAD]*).
   c. Culture infusate if there is possibility of infusion-related contamination, if appropriate, as ordered.
   d. Initiate parenteral anti-infective therapy as ordered.
   e. If unsuccessful in treating suspected bloodstream infection, VAD may need to be removed.

4. Additional interventions:
   a. Monitor patient, including ongoing assessment of VAD site, vital signs, review of laboratory findings, and response to interventions.
   b. Perform site care and maintenance, if VAD is not removed.
   c. Replace administration sets as follows:
      i. Replace primary and secondary continuous administration sets used to administer solutions other than lipid, blood, or blood products no more frequently than every 96 hours.
      ii. Replace administration sets for parenteral nutrition solutions (total nutrient admixtures and amino acid/dextrose formulations) at least every 24 hours.
iii. Replace the administration set whenever the peripheral catheter site is changed or when a new CVAD is placed.

iv. Change intermittent administration sets every 24 hours and aseptically attach a new, sterile, compatible covering device to the male luer end of the administration set after each intermittent use. Do not attach the exposed male luer end of the administration set to a port on the same set (“looping”).

**Documentation**

Document in the patient’s health record:

- Patient assessment data
- LIP notification
- Interventions taken and outcome
- Patient’s condition and response to interventions

Complete an Adverse Event Report according to organizational policy.

**Bibliography**


6. OTHER INFUSION-RELATED PROCEDURES

Preparing Parenteral Medications .................................................. 157

Implanted Vascular Access Port: Accessing and Deaccessing .................................................. 160

Phlebotomy: Blood Sampling from a Vascular Access Device (VAD) .................................................. 166
Preparing Parenteral Medications

Policy
Sterile parenteral medications are provided in a ready-to-administer form to minimize the need for manipulation outside the pharmacy sterile compounding area.

Only pharmacy-prepared or commercially available prefilled syringes of appropriate intravenous (IV) solution are used to flush and lock vascular access devices (VADs).

If an immediate-use compounded sterile preparation (CSP) is prepared for infusion, the infusion is started within 1 hour after the start of the preparation or it is discarded.

If it is necessary to prepare more than 1 medication in a single syringe for IV push administration, limit preparation to the pharmacy.

IV solutions in containers intended for infusion, including minibags, are not used to dilute or reconstitute medications.

Single-dose containers (bottles, bags, vials, and syringes) are used within 1 hour of opening or needle entry; any contents remaining in the container are not saved for future use.

Immediate-use compounded medications are prepared in a clean, orderly area using appropriate aseptic or clean technique.

Key Points
An immediate-use compounded sterile preparation is used only in emergent situations or in situations when adhering to low-risk compounding procedures would add additional risk due to delays in patient care.

It is important to note the difference between “compounding” and preparation of parenteral medications:

- **Preparation** refers to the act of diluting, mixing, reconstituting, or otherwise preparing a single medication (active ingredient) in accordance with the manufacturers’ instructions or product labeling for administration to a single patient based on a specific order, in which the prepared medication is not stored for future use.

- **Compounding** describes the process of combining, mixing, or altering ingredients to create a medication that is tailored to the needs of an individual patient. Medication preparations considered to be “compounding” include but are not limited to: (1) batch preparations of medications, (2) medication preparations that deviate from manufacturers’ instructions or product labeling, and (3) sterile product preparations that will be stored for future use.
Always employ safe injection practices:
- Use a new needle and syringe for every injection.
- Discard a single-dose vial after a single entry.
- Dedicate a multidose vial for a single patient.
  - Use the multidose vial up to a maximum of 28 days of opening or puncture (except for vaccines or when original manufacturers’ expiration date is shorter), or when the manufacturers’ expiration date is reached if it is not opened in a direct patient-care area.
  - Label the multidose vial with the beyond-use-date (BUD) and store the vial according to the manufacturers’ recommendations. Discard if the vial lacks a BUD, the sterility is compromised or questionable, and after the BUD has been met.

**Supplies**
- Medication (vial/ampoule)
- Appropriate diluent, as needed
- Gloves
- Antiseptic solution
- Syringes
- Needleless transfer device
- Filter needle (if withdrawing from glass ampoule)
- Label

**Procedure**
1. Obtain and review licensed independent practitioner’s order for:
   a. Absence of allergy or previous adverse reaction to prescribed medication
   b. Appropriateness of prescribed infusion solution or medication for the patient’s age and condition, VAD, dose, rate, and route of administration
2. Confirm order for medication and check compatibility with diluent (if indicated).
3. Perform hand hygiene.
4. Gather supplies.
5. Don gloves.
6. **Withdrawing from vial:**
   a. Scrub vial top and injection port of the diluent container and medication vial with antiseptic solution allow to dry
   b. If medication must be reconstituted, inject appropriate amount of diluent and thoroughly mix medication according to manufacturers’ directions for use. Direct stream of diluent towards wall of vial. **Do not shake biologic preparations.** Observe liquid and confirm no powder remains and inspect vial for particulate matter and color.
c. Apply needleless transfer device to vial or use other transfer device in accordance with manufacturers’ directions for use.
d. Attach syringe to needleless transfer device and withdraw medication from vial.
e. If not immediately administered, label medication syringe with patient’s name, medication, dose, date and time prepared, initials of person preparing medication, and exact 1-hour BUD and time.
f. Start medication administration no later than 1 hour after preparation.
g. See IV (Intravenous) Administration: Continuous Infusion, IV Push, Intermittent Infusion.

7. **Withdrawing from ampoule:**
   a. Attach filter needle to syringe.
   b. Disinfect the neck of the ampoule and allow to dry prior to entry.
   c. Break ampoule with disinfectant pad and withdraw contents.
   d. Remove filter needle and replace with an appropriate sterile tip cap for medication administration.
   e. If not immediately administered, label medication syringe with patient’s name, medication, dose, date and time prepared, initials of person preparing medication, and exact 1-hour BUD and time.
   f. Start medication administration no later than 1 hour after preparation.
   g. See IV (Intravenous) Administration: Continuous Infusion, IV Push, Intermittent Infusion.

**Bibliography**


Implanted Vascular Access Port: Accessing and Deaccessing

Considerations for the Ambulatory Infusion Patient

Provide appropriate transition care information to home care agency that may follow patient, which includes access needle gauge and length, toleration of access, and medication regime.

Policy

Radiographic confirmation of tip location will be performed prior to initiation of infusion therapy at intervals established by the organization or as indicated by complications.

Implanted vascular access ports are accessed using only a noncoring safety needle.

Power injection is performed only with implanted vascular access ports and noncoring needles identified and labeled as power-injection compatible.

When administering an infusion via an implanted port, the noncoring needle is replaced at least every 7 days.

A sterile dressing is maintained over the access site, if the implanted vascular access port remains accessed.

Key Points

Decreases in tissue turgor, changes in nerve conduction contributing to hypersensitive or delayed response to pain, and delayed wound healing will contribute to changes in skin integrity, bruising and hematoma development, skin tearing, and infectious processes. Patients may be anxious or fearful about accessing the implanted port. As with every patient, assessment of pain and fear about infusion-related procedures should be incorporated into the plan of care.

A combination of pharmacologic and nonpharmacologic measures may be necessary to minimize the anxiety and pain associated with port access procedure.

Most often, implanted vascular access ports will be located in the chest; they may also be placed in the forearm as an alternative site for patients in whom chest ports cannot be implanted.

The preferred skin antiseptic agent is > 0.5% chlorhexidine in alcohol solution; for any contraindications to alcoholic chlorhexidine solution, alternative antiseptic solutions include tincture of iodine, an iodophor (povidone-iodine), or 70% alcohol.
Implanted vascular access ports are locked with preservative-free 0.9% sodium chloride (USP) or heparin lock solution in accordance with organizational policy. Recommendations include:

- Lock accessed implanted vascular access ports daily.
- For vascular access ports that are not actively accessed for infusion therapy, there is insufficient evidence to recommend the optimal frequency for flushing and locking. Refer to manufacturers’ directions for use and organizational policy.

Use the smallest-gauge noncoring needle to accommodate the prescribed therapy.

Reduce the risk of needle dislodgment during access by choosing the length of the noncoring needle that allows it to sit flush to the skin and securely within the port; the needle may require padding and support, if it does not sit level with skin.

Consider orienting the bevel of an implanted port access needle in the opposite direction from the outflow channel where the catheter is attached to the port body. In vitro testing demonstrates a greater amount of protein is removed when flushing with this bevel orientation.

**Assessment**

Patient’s pain tolerance and preferences regarding use of local anesthetic prior to port access

Port site for redness, tenderness, swelling, and drainage or leakage of infusing or injected fluids, also dehiscence of surgical incision or erosion of port body through the skin by visual inspection and palpation

For subclavian insertion sites, assess for swelling or pain near the clavicle, as this could indicate pinch-off syndrome; notify licensed independent practitioner, if present (see *Catheter Damage*).

Prior to use for power injection, confirm power-injectable capabilities by using assessment techniques recommended in the manufacturers’ directions for use.

**Patient/Caregiver Education**

Provide appropriate patient/caregiver education for patients who are returning home with an accessed port:

- Type of port placed (e.g., power injectable, number of lumens)
- Importance of carrying port identification card
- Expectations of routine care, including frequency of flushing
- Checking the dressing daily
- How to dress and undress to avoid pulling at the noncoring needle
- Protecting the site during bathing
• Making sure women's bra straps or car seat belts do not rub over the accessed area
• Reporting any signs or symptoms of pain, burning, stinging, or soreness at the site
• How to stop infusion pump, if any wetness, leaking, or swelling is noted at the site
• Potential complications and interventions, and how and to whom to report

Supplies
• Central vascular access device dressing kit (preferred)
• If no dressing kit:
  ◦ Mask
  ◦ Sterile gloves
  ◦ Sterile gauze
  ◦ Sterile barrier drape
  ◦ Antiseptic solution (alcoholic chlorhexidine preferred)
  ◦ Transparent semipermeable membrane (TSM) dressing
  ◦ Sterile tape
• Noncoring needle and extension set with clamp
• Sterile gauze or foam pad as needed
• Needleless connector
• Packaged sterile, prefilled 10-mL syringe of preservative-free 0.9% sodium chloride (USP) (package should indicate sterile and able to drop onto sterile field); alternative is a vial of 0.9% sodium chloride (USP) with vial adaptor and sterile packaged 10-mL syringe
• Local anesthetic, if applicable (Note: Ice placed over port site for a few minutes prior to access procedure can be a successful pain management strategy.)

Port Access

Procedure
1. Perform hand hygiene.
2. Gather supplies.
3. Verify the patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
4. Explain procedure to patient.
5. Administer local anesthetic, as indicated. If using transdermal anesthetic cream, apply at least 1 hour prior to port access procedure (see Local Anesthesia).
6. Place patient in a comfortable position with head turned away from implanted port.
7. Assess skin over and around implanted port; palpate port to locate septum.
8. Perform hand hygiene.
9. Establish sterile field and place sterile supplies on field (noncoring needle, needleless connector, and sterile syringe).
10. Don mask and sterile gloves.
11. Attach needleless connector to hub of extension set on noncoring needle with extension set, and prime set with preservative-free 0.9% sodium chloride (USP).
   a. Alternative procedure if packaged sterile sodium chloride syringe not available
      i. Don mask.
      ii. Scrub (disinfect) top of vial and allow to dry.
      iii. Put first sterile glove on dominant hand.
      iv. Use nondominant, ungloved hand to hold nonsterile vial, pick up sterile syringe with sterile gloved hand, and draw up 10 mL of 0.9% sodium chloride. (The sterile gloved hand touches only the sterile syringe.)
      v. Place sterile syringe of sodium chloride on sterile field.
      vi. Put second sterile glove on nondominant hand.
12. Cleanse skin with antiseptic solution; allow to dry completely.
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. The use of concentric circles or a back-and-forth motion has not been studied.
13. With nondominant hand, stabilize implanted port.
14. Insert noncoring needle perpendicular to the skin, through septum of the port, until the needle tip comes in contact with the back of the port.
15. Slowly inject preservative-free 0.9% sodium chloride (USP) into implanted port, noting any resistance or sluggishness of flow; slowly aspirate for blood return the color and consistency of whole blood, and then complete 0.9% sodium chloride (USP) flush.
   a. ALERT: If an antimicrobial locking solution was used, withdraw solution from the port prior to flushing and discard. Flushing the lock solution into the patient’s bloodstream could increase development of antibiotic resistance and other adverse effects.
   b. Never inject against resistance.
   c. Inability to flush or absence of a blood return requires further investigation about the cause (eg, mechanical problem, fibrin/thrombosis over vascular access device tip, extravascular tip location) (see Central Vascular Access Device [CVAD] Malposition; Central Vascular Access Device [CVAD] Occlusion).
A pulsatile flushing technique may be effective at removing solid deposits.

16. Place sterile gauze or foam pad to support wings of noncoring needle if needed, making sure gauze does not obscure needle insertion site. Cover with TSM dressing.

17. Initiate infusion therapy as prescribed (see IV [Intravenous] Administration: Continuous Infusion, IV Push, Intermittent Infusion).

18. Discard supplies in appropriate receptacle(s).

19. Remove gloves and perform hand hygiene.

**Port Deaccess Procedure**

1. Perform hand hygiene.
2. Gather supplies.
3. Verify the patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
4. Explain procedure to patient.
5. Apply nonsterile gloves.
6. Flush port with 5 to 10 mL of preservative-free 0.9% sodium chloride (USP), and lock port with prescribed locking solution (eg, sodium chloride, heparin, antimicrobial solution (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).
7. Remove dressing, noting any drainage, and discard.
8. Stabilize port using thumb and forefinger of nondominant hand.
9. Grasp needle with dominant hand and remove device, engaging safety mechanism according to manufacturers’ directions for use, and discard into sharps container.
10. Apply dressing to site if bleeding occurs.
11. Discard materials in appropriate receptacles.
12. Remove gloves and perform hand hygiene.

**Documentation**

Document in the patient’s health record:

- Appearance of port site
- Performance of procedure
- Noncoring needle gauge/length
- Medication/solution administration
- Pain management interventions
- Flush/lock solution and volume
- Patient education
- Patient’s response to the procedure
Bibliography


Phlebotomy: Blood Sampling from a Vascular Access Device (VAD)

Policy
Patient and sample identification are performed using the same unique numbers.

All blood sample containers are labeled immediately after sample collection in the presence of the patient.

Competency is validated for clinicians who perform blood sampling procedures from peripheral and central vascular access devices (CVADs).

Blood conservation techniques are used to reduce the risk of facility-acquired anemia.

Key Points
Laboratory assays are necessary to ascertain disease progress and management strategies. Consideration should be given to careful and creative integration of parenteral medication and infusate administration schedules in order to minimize venipuncture procedures. Careful venipuncture site selection for laboratory assay procedures will also preserve venous access while minimizing vein trauma.

In some patients, decreases in skin turgor, changes in nerve conduction contributing to hypersensitive or delayed response to pain, and delayed wound healing will contribute to changes in skin integrity, bruising and hematoma development, skin tearing, and infectious processes. Changes in physiologic coagulation functions or as a result of medication protocols will have an impact on bruising and hematoma potential.

Indwelling short peripheral catheters (SPCs) may be used for short duration blood sampling. Longer-term therapies and very frequent blood sampling may require placement of a CVAD.

The use of vacuum tubes/holders may not be recommended for use on smaller CVADs (eg, 1.9 Fr and 2.6 Fr peripherally inserted central catheters).

Most errors that occur with blood sampling occur before the sample reaches the laboratory (“preanalytical phase”).

Reduce the risk for bloodstream infection associated with vascular access device (VAD) access/blood sampling with proper hand hygiene, appropriate use of gloves, single-patient tourniquets, single-use venipuncture and sampling devices, use of safety-engineered devices, and appropriate skin antisepsis.

The needle and vacuum tube holder are discarded as 1 unit.
Never remove the rubber stopper from the vacuum tube, as this may produce errors in sample analysis.

Tourniquets or blood pressure cuffs may be used to promote venous dilation; however, the total time should be no more than 1 minute to reduce hemolysis and inaccurate chemistry laboratory values.

To reduce facility-acquired anemia, use blood conservation strategies that include eliminating unnecessary laboratory tests; reducing the frequency of obtaining blood samples; drawing blood samples based on clinical need rather than a routine schedule; using small-volume collection tubes, (eg, requiring less than 2 mL of blood); using point-of-care testing methods; and using closed loop systems for VADs, as these systems return the blood to the patient; and using the push-pull or mixing method.

Methods used to obtain blood samples from a CVAD include the discard method and the push-pull or mixing method. The discard method is most commonly used. The advantage to the push-pull method is reduction in blood loss, because there is no discarded blood. The push-pull or mixing method produces accurate outcomes in measuring levels of actinomycin-D and vincristine, obtaining chemistry panels and complete blood counts, and therapeutic drug monitoring for gentamicin and doxorubicin from CVADs.

Do not use the reinfusion method (eg, delivery of the discard specimen into the VAD after obtaining the sample) due to risk of contamination and blood clot formation.

For therapeutic drug monitoring, draw the blood sample from a dedicated lumen not used for infusion of the drug being monitored. When a dedicated CVAD lumen cannot be used, test results may be falsely elevated, requiring careful evaluation if dosage adjustment is dependent upon the accuracy of the test results. Retesting via direct venipuncture may be necessary. Conflicting studies show elevated antibiotic levels with blood sampling from CVADs, while others have shown no difference.

Do not obtain blood samples for culture from an SPC.

There is no evidence available regarding risks, benefits, or limitations related to blood sampling from midline catheters.

Obtaining blood samples for culture from a CVAD should be limited to diagnosis of a catheter-related bloodstream infection (CR-BSI). Do not discard the initial sample drawn to capture planktonic organisms from the intraluminal biofilm.

Avoid routine use of CVADs infusing parenteral nutrition for blood sampling, as this is a significant risk factor for CR-BSI.
Assessment
Risks versus benefits for blood sampling from a VAD:
- Risks of venipuncture include anxiety, pain, damage to skin and nearby nerves, and hematoma in patients receiving anticoagulants or with bleeding disorders.
- Risks associated with use of a VAD include increased hub manipulation and the potential for intraluminal contamination, alterations in VAD patency, and erroneous lab values associated with adsorption of medications infused through the VAD.

Identify the appropriate fasting period, if required, for the requested laboratory values.

Identify the laboratory tests needed, choose the correct vacuum tubes, and identify correct order for obtaining the laboratory tests, as recommended by the manufacturers’ directions for use or laboratory guidelines.

Patient Education
Purpose and process of the procedure

Blood Sampling From an SPC

Supplies
- Gloves
- Disinfectant pads
- For syringe method:
  - 2 syringes, 3- or 5-mL fill volume as needed for the volume of blood to be aspirated
  - Needleless transfer device
- For vacuum tube method:
  - Vacuum tube holder with luer-lock mechanism
- Vacuum tubes, as appropriate, for the ordered laboratory tests
- 10 mL of preservative-free 0.9% sodium chloride (USP)

Procedure
1. Obtain and review the licensed independent practitioner’s (LIP’s) order for the laboratory tests.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Assess for history of allergies to analgesics, adhesives, or antiseptic solutions.
4. Gather supplies.
5. Obtain informed consent.
6. Place patient in sitting or recumbent position, as appropriate.
7. Perform hand hygiene.
8. Don clean gloves.
9. Assess peripheral catheter site for signs and symptoms of complications (eg, redness, edema, pain), and do not use for blood sampling if present.

10. Stop all infusions through the catheter, close the clamp on the extension set, and wait for 2 minutes.

11. **For syringe method:**
   a. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad and allowing to dry, and attach an empty syringe to the needleless connector.
   b. If a separate injection site is not available, detach the administration set from the extension set on the SPC. Cover the male luer end of the administration set with a sterile end-cap. Do not allow the male luer end to touch any other object to prevent contamination.
   c. Attach an empty syringe to the needleless connector or extension set hub and open the clamp on the extension set.
   d. Aspirate 1 to 2 mL of blood, detach syringe, and discard.
   e. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad and allowing to dry.
   f. Attach an empty syringe and aspirate the needed blood volume. Use slow, gentle technique to withdraw syringe plunger rod. The flow of blood is improved with a small syringe (eg, 3 mL) over a large syringe (eg, 10 mL).
   g. If unsuccessful, place a tourniquet on the arm several inches above the catheter site and attempt withdrawal again.
   h. Detach filled syringe.
   i. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad, and allowing to dry.
   j. Flush the catheter and extension set with 10 mL of preservative-free 0.9% sodium chloride (USP); attach the administration set and regulate fluid flow rate, resuming infusion as ordered.
   k. Using a needleless transfer device, fill the appropriate vacuum tubes with the designated volume of blood in the correct sequence.

12. **For vacuum tube method:**
   a. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad, and allowing to dry.
   b. If a separate injection site is not available, detach the administration set from the extension set on the peripheral catheter. Cover the male luer end of the administration set with a sterile end-cap. Do not allow the male luer end to touch any other object to prevent contamination.
   c. Attach the luer vacuum tube holder to the needleless
connection or extension set hub and open the clamp on the extension set.

d. Insert a vacuum tube into the holder, aspirate 1 to 2 mL of blood, and discard.
e. Insert the vacuum tubes into the holder in the correct sequence and allow each tube to fill to the needed volume.
f. If unsuccessful, place a tourniquet on the arm several inches above the catheter site and attempt withdrawal again.
g. Detach the holder after all tubes are filled and discard in sharps container.
h. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad, and allow to dry.
i. Flush the catheter and extension set with 10 mL of preservative-free 0.9% sodium chloride (USP); attach the administration set and regulate fluid flow rate, resuming infusion as ordered.

13. Label blood samples before leaving the patient’s side with:
   a. Patient’s name
   b. Patient’s identification number
   c. Date and time of specimen collection

14. Remove gloves and perform hand hygiene.

15. Send samples to testing laboratory or place blood specimen in sealed container for transport to a designated testing laboratory. Specimens may need to be placed on ice during transport; check with laboratory used by the organization.

**Blood Sampling from a CVAD**

**Supplies**

- Gloves
- Disinfectant pads
- For syringe method:
  - 2 syringes, 3- or 5-mL fill volume as needed for the volume of blood to be aspirated
  - Needleless transfer device
- For vacuum tube method:
  - Vacuum tube holder with a luer-lock mechanism
- Vacuum tubes as appropriate for the ordered laboratory tests
- Needleless connector
- 10 mL of preservative-free 0.9% sodium chloride (USP)

**Procedure**

1. Obtain and review the LIP’s order for the appropriate laboratory tests.
2. Verify patient’s identity using 2 independent identifiers according to
organizational policy (eg, name and date of birth).
3. Assess for history of allergies to analgesics, adhesives, or antiseptic solutions.
4. Gather supplies.
5. Obtain informed consent.
6. Place patient in sitting or recumbent position, as appropriate.
7. Perform hand hygiene.
8. Don clean gloves.
9. Remove needleless connector and replace with new connector, if withdrawing blood for blood culture to decrease the risk of false-positive culture results.
10. Stop all infusions through the catheter, clamping lumens and/or stopping infusions as appropriate. Withdraw blood from most distal lumen, if drawing from staggered multilumen CVAD or use the lumen recommended by the manufacturer.
11. **For syringe method:**
   a. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad and allowing to dry and attach an empty syringe to the needleless connector.
   b. If a continuous infusion, detach the administration set from the CVAD hub and attach an empty syringe. Cover the male luer end of the administration set with a sterile end-cap. Do not allow the male luer end to touch any other object to prevent contamination.
   c. Open CVAD clamp, if present, and aspirate 4 to 5 mL of blood into syringe, and discard into sharps container.
   d. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad and allowing to dry.
   e. Attach an empty syringe and aspirate the needed blood volume. Use slow, gentle technique to withdraw blood. The flow of blood is improved with a small syringe (eg, 3 mL) over a large syringe (eg, 10 mL).
   f. Detach filled syringe.
   g. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad; change needleless connector after phlebotomy according to the manufacturers’ directions for use or according to organizational policy.
   h. Flush the CVAD with 10 mL of preservative-free 0.9% sodium chloride (USP), and lock CVAD or reattach the administration set, and resume infusion as ordered.
   i. Using a needleless transfer device, fill the appropriate vacuum tubes with the designated volume of blood in the correct sequence.
12. **For vacuum tube method:**
   a. Disinfect the needleless connector by scrubbing with a new disinfectant pad, allow to dry, and attach the vacuum tube holder to needleless connector.
   b. Insert a vacuum tube into the holder, aspirate 4 to 5 mL of blood, and discard this tube of blood into sharps container.
   c. Insert the vacuum tubes into the holder in the correct sequence and allow each tube to fill to the needed volume.
   d. After all tubes are filled and withdrawn from the holder, detach the holder and discard into sharps container.
   e. Disinfect the needleless connector, if present, by scrubbing with a new disinfectant pad; change needleless connector after phlebotomy according to the manufacturers’ directions for use or according to organizational policy.
   f. Flush CVAD with 10 mL of preservative-free 0.9% sodium chloride (USP), and lock CVAD or resume infusion as ordered.

13. **For push-pull or mixing method:**
   a. Disinfect the needleless connector by scrubbing with a new disinfectant pad and allowing to dry.
   b. Attach 10 mL of preservative-free 0.9% sodium chloride (USP) to needleless connector and flush CVAD.
   c. Without removing syringe, aspirate 6 mL of blood, then reinject blood into CVAD.
   d. Repeat this process. There is no consensus on the required number of push-pull cycles or the volume of blood to be pulled; however, 3 to 5 cycles are common.
   e. Remove the empty syringe and attach new syringe/vacuum tube holder to obtain needed blood sample as per procedures above.

14. Label blood samples before leaving the patient’s side with:
   a. Patient’s name
   b. Patient’s identification number
   c. Date and time of specimen collection

15. Remove gloves and perform hand hygiene.

16. Send samples to testing laboratory or place blood specimen in sealed container for transport to a designated testing laboratory. Specimens may need to be placed on ice during transport; check with laboratory used by the organization.

**Documentation**

Document in the patient’s health record:
- Date and time of phlebotomy
- Route and specific VAD or lumen used for phlebotomy
- Amount of blood withdrawn and specific laboratory tests
- VAD flushing and locking
Bibliography


7. OTHER INFUSION ACCESS

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Intraspinal Access Device: Care and Management

Considerations for the Ambulatory Infusion Patient
In non-acute care settings, intraspinal (epidural/intrathecal) infusions are administered to patients who require pain management (eg, chronic malignant and nonmalignant pain) and for spasticity control.

Policy
Intraspinal access devices and administration sets are identified and labeled as a specialized infusion administration system and differentiated from other infusion administration and access systems.

Medications administered via an intraspinal route (intrathecal, epidural, ventricular reservoir) are preservative-free and labeled for “intraspinal infusion only.”

A 0.2-micron surfactant-free, particulate-retentive, and air-eliminating filter is used for the administration of intraspinal medications.

Removal of a temporary intraspinal access device (intrathecal and epidural) is performed either by or on the order of a licensed independent practitioner (LIP), in accordance with rules and regulations promulgated by the state’s board of nursing and in accordance with organizational policy.

Access and administration of medications via a ventricular reservoir or an implanted infusion pump are performed by a LIP or a specially trained registered nurse, as allowed by the individual’s state nursing practice act.

Competency is validated for clinicians who provide intraspinal access device care and administer intraspinal medications.

Key Points
Clinicians must be aware of contraindications to the use of intraspinal medications in certain patient populations, such as the older adult. Contraindications may include spinal column deformities, a laminectomy, lower back pain, severe headaches, backaches, inability to cooperate, and unstable neurological disease. Due to the potential for underlying comorbidities, placement of intraspinal access devices—such as epidural, intrathecal, and intraventricular devices—must be carefully assessed for the appropriateness of the specific device and therapy.

Preservative-free medications administered via an intraspinal route include, but are not limited to, morphine, fentanyl, hydromorphone, ziconotide, clonidine, bupivicaine, baclofen, and 0.9% sodium chloride (USP).

Antineoplastic agents and pain medications may be administered via an intraventricular access device.
Alcohol or alcohol-containing solutions, as well as acetone, are avoided for site preparation prior to accessing, during site care, and disinfection of the catheter hub/needleless connector.

A dressing should cover the intraspinal access insertion site; routine dressing changes for short-term catheters are not recommended due to the risk of dislodgment and infection.

For long-term catheters (eg, tunneled or implanted devices), a transparent semipermeable membrane (TSM) dressing is used to cover the site and changed every 7 days in conjunction with site antisepsis. After the first 24 hours of placement of a ventricular reservoir, the site is usually not covered with a dressing.

Use of chlorhexidine-impregnated dressings is considered for short-term intraspinal catheters to reduce the risk of central nervous system-associated infection.

Due to the risk of neurotoxicity in the pediatric population, the use of chlorhexidine-impregnated dressings to reduce the risk of central nervous system-associated infection must be carefully evaluated.

Removal of long-term implanted ports/reservoirs/pumps or tunneled intraspinal devices is considered a surgical procedure.

**Assessment**

Perform a medication reconciliation with every patient encounter, asking patients to report every medication including prescription, over-the-counter, and complementary/herbal medications. Concomitant medication use may increase the risk of complications of intraspinal therapy.

Assess and monitor patients after initiating or restarting an intraspinal infusion in a fully equipped and staffed environment according to organizational policy.

Be especially vigilant when monitoring high-risk patients, such as those with sleep apnea, psychiatric conditions, or patients taking concomitant medications (eg, sedatives or other analgesics).

Assessment of ambulatory infusion patients receiving home care should occur with every patient encounter and should encompass the following:

- Pain rating using a validated, appropriate pain scale based on the patient’s age and condition (eg, 0-10), both at rest and with activity
- Blood pressure, pulse, respiratory rate, temperature
- Level of sedation if opioid is being administered
- Number of bolus doses, if used (eg, patient-controlled epidural analgesia)
- Presence of any side effects: pruritis, nausea, urinary retention, orthostatic hypotension, motor block
Other Infusion Access

- Signs of catheter insertion site infection or epidural abscess, such as back pain, tenderness, erythema, swelling, drainage, fever, malaise, neck stiffness, progressive numbness, or motor block
- Dressing for intactness and absence of moisture/leakage
- Catheter and administration set connections
- Changes in sensory or motor function that may indicate an epidural hematoma, including unexplained back pain, leg pain, bowel or bladder dysfunction, and motor block
- Oxygen saturation levels via pulse oximeter and carbon dioxide levels as prescribed
- Electronic infusion device for history of analgesic use and correct administration parameters
- Competency of caregiver

Identify catheter tip dislodgment by routinely assessing for changes in external catheter length; clinical evidence of catheter tip dislodgment may include decrease in pain control (eg, intrathecal placement dislodges to epidural space) or an increase in side effects (eg, epidural placement dislodges to intrathecal space).

**Patient/Caregiver Education**

Stress the importance of reporting alcohol and/or opioid use

Stress the importance of reporting all medication consumed, including prescription, over-the-counter, and complementary/herbal medications

Signs and symptoms to report, including changes in pain perception, new or worsening side effects, and fever, and how and to whom to report

Clinical signs of overdose, including dizziness, sedation, euphoria, anxiety, seizures, and respiratory depression

Caution patients with implanted infusion pump systems from engaging in active, repetitive bending or twisting of the spine. This may increase the risk for catheter damage or dislodgment. Increased pain and/or withdrawal symptoms may be indicative of problems.

**Site Care and Dressing Change for Long-Term External Intraspinal Catheter**

**Supplies**

- Clean gloves
- Dressing kit (preferred) or components (sterile barrier, sterile gloves, mask, povidone-iodine, gauze, TSM dressing, sterile tape, sterile tape measure)
- Antimicrobial dressing (CHG dressing preferred), based on organizational policy
Procedure
1. Obtain and review LIP’s order.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Place patient in comfortable position.
4. Perform hand hygiene.
5. Gather supplies.
6. Establish sterile field; place sterile supplies on field.
7. Don mask and clean gloves, and carefully remove existing dressing and discard.
8. Remove gloves.
10. Don sterile gloves.
11. Observe insertion site for redness, drainage, swelling, or pain.
12. Measure external catheter length with sterile tape measure.
13. Cleanse the skin with povidone-iodine and allow to air dry completely.
14. Place antimicrobial dressing around the insertion site if used.
15. Place TSM dressing over entire area, centering it over the catheter insertion site, anchoring catheter with extra tape on skin as needed.
16. Remove gloves and mask and discard all used supplies properly.
17. Complete label indicating date, time, and initials of clinician providing site care and dressing change.
18. Perform hand hygiene.

Documentation
Document in the patient’s health record:
- External length of catheter, site assessment
- Dressing and stabilization method used (date and initial on dressing)
- Patient’s response to the procedure

Medication Administration via External Intraspinal Catheter

Supplies
- Gloves
- Mask
- Povidone-iodine
- Sterile gauze
- Prescribed preservative-free medication in syringe or solution container attached to primed administration set
- Sterile 3- to 5-mL syringe (used only to assess for aspiration of cerebrospinal fluid [CSF] or blood)
- Preservative-free 0.9% sodium chloride (USP), 10-mL prefilled syringe, for intermittent infusion only
Procedure

1. Obtain and review LIP’s order for:
   a. Absence of allergy or previous adverse reaction to prescribed medication
   b. Appropriateness of prescribed infusion solution or medication for the patient’s age and condition, intraspinal administration, dose, rate, and route of administration

2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).

3. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.

4. Compare medication label against order for accuracy.
   a. Use available technology for medication verification in accordance with organizational procedures (eg, bar-code scanning).

5. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.

6. Assess vital signs and neurological status, then explain procedure.

7. Place patient in comfortable position.

8. Perform hand hygiene.

9. Gather supplies.

10. Don mask and gloves.

11. Disinfect catheter hub or needleless connector using povidone-iodine solution and allow solution to dry.

12. Attach empty 10-mL syringe to catheter hub/needleless connector and gently aspirate from the device prior to the injection of medication.
   a. Epidural: observe for the absence of CSF or blood. If > 0.5 mL of clear fluid or blood is obtained, do not inject medication. Notify LIP.
   b. Intrathecal: observe for the presence of CSF. If blood is present, do not inject medication. Notify LIP.

13. For a continuous infusion, attach primed administration set and begin infusion via electronic infusion device (EID) as ordered.

14. For an intermittent dose, slowly administer the medication in accordance with the pharmacy label. Flush the catheter with 1 to 2 mL of preservative-free 0.9% sodium chloride (USP) to ensure medication has reached epidural or intrathecal space.

15. Discard used supplies.

16. Remove gloves and mask, and discard.

17. Perform hand hygiene.
Documentation
Document in the patient’s health record:
- Medication, amount and type of diluent, infusion rate, and method
- Patient’s response to the procedure

Implanted Epidural/Intrathecal Port Access and Medication Administration

Supplies
- Noncoring safety needle with attached extension tubing size 22 gauge or smaller (needle length dependent on port depth, usually ¾ to 1 inch)
- Sterile 10-mL syringe
- Needleless connector (intermittent infusion)
- Dressing kit (preferred) or components (sterile barrier, sterile gloves, mask, povidone-iodine, sterile gauze, TSM dressing, sterile tape)

Port Access and Medication Administration

Procedure
1. Obtain and review LIP’s order for:
   a. Absence of allergy or previous adverse reaction to prescribed medication
   b. Appropriateness of prescribed infusion solution or medication for the patient’s age and condition, intraspinal administration, dose, rate, and route of administration
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.
4. Compare medication label against order for accuracy.
   a. Use available technology for medication verification in accordance with organizational procedures (eg, barcode scanning).
5. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.
6. Assess vital signs and neurological status, then explain the procedure.
7. Place patient in a comfortable position with head turned away from implanted port.
8. Perform hand hygiene.
9. Gather supplies.
10. Assess skin over and around implanted port; palpate port to locate septum.
11. Perform hand hygiene.
12. Establish sterile field; place sterile supplies on field.
13. Don mask and sterile gloves.
14. Disinfect implanted port access site using povidone-iodine and allow to air dry completely.
15. Attach needleless connector (if port accessed for intermittent infusions) to noncoring safety needle with extension set and prime set with preservative-free 0.9% sodium chloride (USP).
16. With nondominant hand, palpate and stabilize implanted port.
17. Insert noncoring needle perpendicular to the skin, through septum of the port until the needle tip comes in contact with the back of the port.
18. Attach syringe to catheter hub/needleless connector and gently aspirate from the device prior to the injection of medication:
   a. Epidural: observe for the absence of CSF or blood. If > 0.5 mL of clear fluid or blood is obtained, do not inject medication. Notify LIP.
   b. Intrathecal: observe for the presence of CSF. If blood is present, do not inject medication. Notify LIP.
19. Stabilize noncoring needle with sterile tape; place sterile gauze to support wings of noncoring needle if needed, making sure gauze does not obscure needle insertion site.
20. Apply TSM dressing.
21. For a continuous infusion, attach primed administration set and begin infusion via EID as ordered.
   a. Primed administration set can be attached directly to the hub of the noncoring needle extension set.
22. For an intermittent dose, slowly administer the medication in accordance with the pharmacy label. Flush the port with up to 3 mL of preservative-free 0.9% sodium chloride (USP) to ensure medication has reached epidural or intrathecal space.
23. Discard used supplies.
24. Remove gloves and mask and discard.
25. Perform hand hygiene.

**Documentation**
Document in the patient’s health record:
- Date and time of insertion, access procedure
- Patient’s response to the procedure
Removal of Intraspinal Access Devices

Procedure

1. Only clinicians with specialized training may remove intrathecal or epidural catheters; consult organizational policy and procedure.

2. Implanted ports and ventricular reservoirs are considered permanent devices and are not intended to be removed.

Bibliography


Subcutaneous Access Device: Placement and Infusion Administration

Policy
The clinician assesses the patient for appropriateness of the subcutaneous route in relation to the prescribed medication or solution, the patient’s clinical condition, and the presence of adequate subcutaneous tissue.

Key Points
Continuous subcutaneous therapy is the subcutaneous administration of isotonic infusates to correct short-term fluid and electrolyte disturbances. Subcutaneous infusion of isotonic solutions (eg, 5% dextrose in water, 0.9% sodium chloride) may be used as an alternative to intravenous infusion for treatment of mild to moderate dehydration.

The subcutaneous route may be used for continuous opioid (eg, morphine, hydromorphone) and other infusion therapies/medications (eg, immune globulin therapy, terbutaline).

An optimal subcutaneous infusion rate is unknown. Medication infusion rates of 3 to 5 mL per hour are reported, and hydration infusion rates of up to 1500 mL over 24 hours are reported. More than 1 subcutaneous infusion site may be used to accomplish a larger fluid volume. Subcutaneous access devices that allow for infusion into 2 or more sites simultaneously are available.

Vascular routes for parenteral fluid delivery may be diminished or difficult to assess due to dehydration and previous insertion attempts. Other considerations should include:
• Fluid requirements less than 3000 mL/day
• No evidence of coagulation disorders
• Intact available skin sites

Hyaluronidase may be ordered by the licensed independent practitioner (LIP) to increase absorption and dispersion of subcutaneously administered medications and solutions. If hyaluronidase is not added to the infusate, absorption may be slowed and erythema at the access site may be observed.

Pediatric patients may require multiple sites to deliver the prescribed therapy. Multiple sites may be used simultaneously, based on the volume to be infused, the medication concentration, and the patient’s comfort.

The administration rate and amount of fluid given should be monitored closely to avoid overhydration. In pediatric patients the daily dosage should not exceed 25mL/kg of body weight.

An angled infusion set that is placed manually allows adjustment of the angle...
of insertion at a 25- or 30-degree angle and may provide better placement into the fatty tissue of children versus using a 90-degree or “straight-in” automatically inserted catheter.

It is important to assess the patient’s subcutaneous tissue to determine appropriate needle length for all patients receiving subcutaneous infusion or injection.

Site rotation recommendations:
- Rotate the subcutaneous access site used for hydration solutions every 24 to 48 hours or after 1.5 to 2 liters of solution have infused, and as clinically indicated based on the access site assessment findings.
- Rotate the subcutaneous access site used for medication administration every 7 days, and as clinically indicated based on the access site assessment findings.

Refer to the manufacturers’ recommended subcutaneous administration rate/infusion method for immunoglobulin product specific infusions.

Assessment
Assess the subcutaneous infusion site for erythema, swelling, leaking of fluid, bruising, bleeding, burning, or pain. Remove the device and rotate site based on assessment.

Subcutaneous immunoglobulin (SCIg) infusions: local site reactions, including some swelling and site erythema, pain, and pruritus are common, and the site is not necessarily rotated based on these. Such reactions tend to decrease over time. Persistent reactions may require a slower infusion rate or decreased volume per site, a longer needle, or a site change.

Assess for adverse reactions of hyaluronidase or mild local access site reactions such as redness, pain, anaphylactic-like reactions, and allergic reactions.

Patient/Caregiver Education
Subcutaneous access device and infusion procedure, including benefits, management, potential complications and how to report them and to whom

It is preferred that the patient receive his or her first SCIg infusion in an ambulatory infusion setting and then be transferred home for continued SCIg infusion. Educate patient on supplies, monitoring of the infusion site, the stability of medication once it is prepared for use, site rotation, clarity, expiration, expiration date of drug, storage of medication, contact for a specialty pharmacy, what to do with missed doses, and what to report during and after the infusion/injection.
Supplies

- Gloves
- Transparent semipermeable membrane (TSM) dressing
- Tape
- Subcutaneous needle or subcutaneous infusion set, 24 to 27 gauge, ½ inch
- Syringe
- Antiseptic solution (alcoholic chlorhexidine preferred)
- Administration set
- Prefilled medication container or cassette
- Electronic infusion device (EID), if used

Procedure

1. Obtain and review LIP’s order for:
   a. Absence of allergy or previous adverse reaction to prescribed medication
   b. Appropriateness of prescribed infusion solution or medication for the patient’s age and condition, subcutaneous administration, dose, rate, and route of administration
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.
4. Compare medication label against order for accuracy.
   a. Use available technology for medication verification in accordance with organizational procedures (eg, barcode scanning).
5. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.
6. Place patient in a comfortable position.
7. Perform hand hygiene.
8. Gather supplies.
9. Don gloves.
10. Identify an appropriate insertion site based on the clinical situation and the manufacturers’ directions for the specific device, as each device has approval for specific sites:
    a. Areas with adequate subcutaneous tissue and intact skin
    b. Based on patient’s anticipated mobility and comfort
    c. Sites may include upper arm, subclavicular chest wall, abdomen (at least 2 inches away from umbilicus), upper back, or thighs
    d. Avoid areas that are scarred, acutely inflamed, with evidence of infection
11. Wash site with soap and water, if needed.
12. Remove excess hair from the intended insertion site with clippers or scissors if necessary.
13. Apply antiseptic solution; allow to dry completely.
   b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of concentric circles or a back-and-forth motion for this skin preparation has not been studied.
14. Grasp skin between thumb and forefinger and insert device according to manufacturers’ directions for use.
15. Aspirate the subcutaneous device to ascertain the absence of blood. If blood is present with aspiration, remove device, discard, and place new device in a different site.
16. Attach administration set, and infuse fluids or medication:
   a. Medications: infuse via an EID
   b. Hydration fluids: infuse using a manual flow regulator; EIDs are not typically used
   c. SCIg: infuse via syringe pump (most common); manually pushing the SCIg is also an option for some patients. Refer to manufacturers’ guidelines for specific volume limitations as some product guidelines may vary.
17. Apply a TSM dressing. Label with the date and time of insertion and initials of the clinician inserting the subcutaneous device.
18. Discard used supplies in the appropriate receptacles.
19. Remove gloves and perform hand hygiene.

**Documentation**

Document in the patient’s health record:
- Date and time of insertion, site preparation, and location
- Medication or solution, amount and type of diluent, infusion rate, and method
- Site assessment
- Patient’s response to the procedure
- Patient and caregiver education
Bibliography


Intraosseous Access Device: Placement, Care, and Management

Considerations for the Ambulatory Infusion Patient
The emergent placing of an intraosseous (IO) access device may not be appropriate in some ambulatory infusion settings.

Policy
IO access is used in emergent situations if intravenous access is not available or cannot be quickly obtained.

The dwell time of the IO device is limited to no longer than 24 hours, and a plan should be established for placement of an appropriate alternative vascular access device.

Key Points
The IO route may be considered for emergent and nonemergent use in patients with limited or no vascular access; when the patient may be at risk of increased morbidity or mortality if access is not obtained, such as during shock, life-threatening or status epilepticus, extensive burns, major traumatic injuries, or severe dehydration; and/or when delay of care is compromised without rapid vascular access.

The insertion of an IO device is painful. It is recommended that the procedure be limited to patients who are unconscious or receiving analgesia. Consider the use of lidocaine as a local anesthetic during insertion (subcutaneously at the intended site). For infusion-related pain, consider IO administration of 2% preservative-free and epinephrine-free lidocaine given slowly prior to infusion initiation.

Semiconscious patients should receive a local anesthetic.

Young children may be at greater risk for extravasation and subsequent compartment syndrome because of small bone size and/or inappropriate needle length.

Pediatric advanced life-support guidelines recommend the IO route as the initial vascular access route.

Use of IO infusion is also reported in anesthesia.

There are 3 types of IO devices: manual needles, impact driven, and drill-powered.

The most common reported complication is infiltration/extravasation from dislodgment and compartment syndrome.
The risk for infiltration/extravasation is reduced by:

- Avoiding multiple attempts at IO access at the same site
- Ensuring proper needle placement
- Securing IO device
- Rechecking IO placement, especially before infusing highly irritating solutions/known vesicants and large volume infusions
- Ongoing and frequent assessment of the IO site and extremity

Rarely reported complications include iatrogenic fracture, infection, fat emboli, and osteomyelitis.

**Assessment**

Monitor appearance of IO site, IO needle placement and securement, and intactness of dressing

Identify signs of complications such as:

- Improper access device placement or dislodgment, which increases the risk of infiltration/extravasation
- Inflammation at site

**Patient Education**

Rationale for IO access and what to expect

Risks, benefits, common complications, and how and to whom to report

**Supplies**

- Personal protective equipment
- Gloves
- IO access device
- IO insertion kit
- Antiseptic solutions (alcoholic chlorhexidine preferred)
- Transparent semipermeable membrane (TSM) dressing
- Lidocaine, if ordered
  - Administration set
  - Electronic infusion device (EID)

**Procedure**

1. Obtain and review licensed independent practitioner’s (LIP’s) order for:
   a. Absence of allergy or previous adverse reaction to prescribed medication
   b. Appropriateness of prescribed infusion solution or medication for the patient’s age and condition, IO administration, dose, rate of administration
2. Obtain informed consent according to organizational policy or
patient assent as appropriate based on level of consciousness and/or availability of a surrogate in an emergent situation.

3. Verify patient’s identity using 2 independent identifiers, according to organizational policy (e.g., name and date of birth).

4. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.

5. Compare medication label against order for accuracy.
   a. Use available technology for medication verification in accordance with organizational procedures (e.g., barcode scanning).

6. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.

7. Perform hand hygiene.

8. Gather supplies.

9. Don gloves.

10. Identify the most appropriate site based on the situation and the manufacturers’ directions for the specific device, since each device has approval for specific sites.
    a. Insertion sites most commonly reported in the literature for use in both adults and children include the proximal and distal tibia and the proximal humerus, the distal femur for children, and the sternum in adults.
    b. Other sites less frequently reported in the literature and which may be off-label for IO access include the radius, ulna, pelvis, and clavicle.

11. Wash site with soap and water if needed.

12. Remove excess hair from the intended insertion site with clippers or scissors if necessary.

13. Administer local anesthesia if patient is conscious and according to organizational protocol or LIP order.
    a. Subcutaneously at the insertion site (see Local Anesthesia)
    b. May also inject into the IO space after access is established and before infusion

14. Apply antiseptic solution; allow to dry completely.
    b. Povidone-iodine: apply using applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to completely dry for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of concentric circles or a back-and-forth motion for this skin preparation has not been studied.

15. Stabilize extremity.
16. Insert IO device in accordance with manufacturers’ directions for use.
17. Confirm proper placement of the IO device.
   a. Assess needle position.
   b. Sense loss of resistance on bone penetration.
   c. Note absence of any signs of infiltration with flushing with 5 to 10 mL (adult) or 2 to 5 mL (pediatric) of 0.9% preservative-free sodium chloride (USP) that should enter by free flow or infuse without resistance.
   d. Ability to aspirate blood or bone marrow may be difficult in some patients (eg, dehydration); inability to aspirate is not an indication of improper placement with confirmation of the above factors.
18. Attach administration set and infuse solutions or medication via gravity or EID.
19. Apply a TSM dressing. Label with the date and time of insertion and name of the clinician inserting the IO device.
20. Stabilize the IO needle to prevent dislodgment. Dressings and tape or specially designed devices may be used.
21. Discard used supplies in the appropriate receptacles.
22. Remove gloves and perform hand hygiene.
23. After access device removal, inspect site and change dressing until site has epithelialized and drainage has ceased.

**Documentation**

Document in the patient’s health record:

- Patient assessment data
- IO site and site preparation
- Number/location of attempts
- Patency
- Medications/solutions administered
- Anesthetic, if used
- Patient’s condition and response to interventions

**Bibliography**


8. INFUSION THERAPIES

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Intravenous (IV) Administration: Continuous Infusion, IV Push, Intermittent Infusion

Considerations for the Ambulatory Infusion Patient

Organizations should develop a list of medications/solutions that are acceptable for administration in an ambulatory infusion setting based on patient safety, risk versus benefits, and the competency of the clinicians within the organization.

The most common intravenous (IV) push medications given outside of the acute care setting include certain IV antibiotics appropriate for IV push administration (e.g., cefazolin, ceftriaxone). The safety and appropriateness of any IV push medications in such settings should be confirmed with the infusion pharmacy.

Whenever possible, the patient should receive the first dose of an infusion medication in a controlled environment with access to emergency medical equipment and medications (e.g., hospital or ambulatory infusion center); (see First Dose Administration).

Policy

Organizationally approved medication resources, including special considerations for IV preparation and administration, are readily available.

The clinician reviews information regarding the prescribed medication, including indications, contraindications, dosing, appropriateness of IV administration, compatibility data, and adverse/side effects, prior to administration.

Clinician concerns about the appropriateness of orders are addressed with the pharmacist, prescribing licensed independent practitioner (LIP), supervisor, and/or risk management as defined in organizational policy.

Hazardous infusion medications used in the organization are identified, safely handled, and administered (see Antineoplastic Therapy).

Informed consent is obtained according to organizational policy and procedure.

Competency is validated for clinicians who prepare and administer IV medications and solutions.

Key Points

Clinicians who work in the realm of oncology and who administer antineoplastic medications are well educated in vesicant drugs and extravasation prevention, as this is an expectation of oncology practice.
There are also nonantineoplastic medications/solutions that are vesicants, defined as agents capable of causing tissue damage upon escape from the intended vascular pathway into surrounding tissue. Examples include, but are not limited to, calcium preparations; high-concentration dextrose (> 10%); phenytoin; promethazine; sodium bicarbonate; vasopressin; and vasopressors, such as dopamine, epinephrine, and norepinephrine. It is important to consult drug references and resources to establish a list of known vesicant drugs. See Antineoplastic Therapy for safe practices and the procedure for vesicant administration.

Most hazardous drugs are antineoplastic medications; however, there are a few infusion medications from other categories classified as hazardous (eg, ganciclovir, pentamidine); refer to the National Institute for Occupational Safety and Health bibliographic reference at the end of this section. Also, certain antineoplastic medications are administered for noncancerous indications (eg, methotrexate). Use of personal protective equipment, safe administration, and disposal of hazardous drugs are addressed in the Antineoplastic Therapy procedure.

Choose an appropriate flow-control device for infusion, taking into account factors such as age, acuity, and mobility of the patient; severity of illness; type of therapy; dosing considerations; health care setting; and the potential for side effects or adverse effects of the therapy. Correlate these risk factors to the accuracy of each method of flow control.

An electronic infusion device (EID) is used for the administration of infusion therapies that require precise flow control and for patient safety.

Manual flow-control devices, such as flow regulators, and mechanical pumps, such as elastomeric balloon pumps, spring-based pumps, and negative-pressure pumps, may be used for infusions that do not require strict rate control (eg, many antibiotics).

Smart pumps with dose error-reduction software are associated with reduced risk for infusion-related medication errors, including error interceptions (eg, wrong rate) and reduced adverse drug events.

Consider using a filter for solution and medication filtration in critically ill patients to decrease the risk of system inflammatory response syndrome.

Avoid using a filter with very small drug volumes, as the filter will retain the drug and decrease the amount of medication delivered.

Use a 0.2-micron filter for crystalline solutions and a 1.2-micron filter for lipid-containing admixtures, and use an air-eliminating filter for patients with a right-to-left shunting heart defect.

Maintain aseptic technique during procedure: prevent all touch contamination (eg, hands, patient’s skin, clothing, linens) of syringe tip, the spike end of the
administration set, and the male luer end of the administration set after cover removal. After disinfection of needleless connectors and injection ports, do not touch or allow these surfaces to come into contact with nonsterile surfaces.

**Assessment**

Patency of the vascular access device (VAD), including aspiration of a blood return the color and consistency of whole blood; absence of any resistance when flushing the catheter with 0.9% sodium chloride; absence of any patient complaints of pain or discomfort of any kind; absence of signs and symptoms of all VAD complications

Integrity of the infusion system, including secure luer-locked connections and correct flow rate for infusing fluids, if present

Compatibility of the intermittent medication with the solutions and/or medications in the primary continuous infusion, if present

Medication label or medication resources (eg, computer program or medication book) for appropriate rate of administration, and expiration date

Special patient populations (eg, pediatric, pregnant, older adults): physiologic characteristics and effects on drug dosage and volume limitations, pharmacologic actions, interactions, side effects/toxicities, monitoring parameters

Signs/symptoms of adverse drug reactions of the prescribed medication or other special precautions (eg, risk for extravasation)

IV push: signs of a systemic reaction (“speed shock”) as a result of too rapid administration (eg, dizziness, facial and neck flushing, pounding headache, chest tightness, hypotension, irregular pulse)

**Patient Education**

Reason for medication

Side effects/adverse reactions to report and how and to whom to report

For patients/caregivers who will learn to self-administer infusions, include the following in the teaching plan:

- Proper storage of solution containers in the refrigerator; remove from the refrigerator 30 to 60 minutes prior to infusion or as directed on container label
- Storage of infusion supplies safe from children and pets
- Inspection of the IV solution prior to administration for evidence of particulate matter, cloudiness, or solution separation, and for expiration date
- Check label for accuracy
• Infection prevention, including hand hygiene and aseptic technique
• Infusion pump management, including administration set, priming, program resetting, alarms
• Proper disposal of used infusion supplies
• Supply inventory
• Emergency preparedness in event of power outage, as appropriate
• Action to take for missed/late administration
• Patient self-monitoring as indicated (eg, central vascular access device/peripheral site, laboratory work schedule)

**Continuous Infusion**

**Supplies**

• Acceptable agent for disinfection of needleless connector/injection port (isopropyl alcohol, iodophors, alcoholic chlorhexidine gluconate [CHG])
• Prescribed medication/solution
• Administration set
• Flow-control device (manual or EID)
• Prefilled syringes: preservative-free 0.9% sodium chloride (USP) flushes

**Procedure**

1. Obtain and review LIP’s order for:
   a. Appropriateness of prescribed infusion solution or medication for the patient’s age, health status, medical diagnosis, acuity, VAD type and tip location, dose, frequency, and route of administration
   b. Ascertain absence of allergy or previous adverse reaction to prescribed medication/solution.
2. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Check medication/solution for expiration or beyond-use dates; inspect for leaks, cracks, particulate matter, and clarity of medication/solution.
5. Compare medication/solution label against order for accuracy.
   a. Use available technology for medication verification in accordance with organizational procedures (eg, barcode scanning).
6. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.
7. Prepare EID.
   a. Obtain appropriate administration set.
b. Spike solution container/prime administration set/insert into EID according to manufacturers’ directions for use while maintaining sterility of the spike.
c. Attach filter or extension set if needed.
d. Purge all air from the entire administration set.
e. If used, program the smart pump according to the parameters set in the drug library for the specific infusing solution to reduce risk of infusion errors. Do not override alerts.

8. Confirm VAD patency. Attach 10-mL syringe of 0.9% sodium chloride (or compatible flush solution) and confirm patency by aspiration of blood return and ability to easily flush the VAD, and absence of patient complaints (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).
   a. Never forcibly flush any VAD with any syringe size. If resistance is met and/or no blood return noted, take further steps (eg, checking for closed clamps or kinked sets, removing dressing, etc.) to locate an external cause of the obstruction (see Central Vascular Access Device [CVAD] Occlusion; Central Vascular Access Device [CVAD] Malposition).
   b. Flush 1 to 2 mL then aspirate for a blood return, observing for the color and consistency of whole blood. Flush the remaining volume into the VAD and disconnect syringe.

9. Attach male luer end of administration set directly to catheter hub or alternatively to needleless connector after disinfection.

10. Enter the correct infusion flow rate and other required information (eg, volume to be infused), and start the EID.

11. Observe infusion site and assess patient for any adverse reaction (eg, peripheral IV infiltration, reactions such as rash, urticaria). NOTE: Stop infusion immediately and notify LIP of any adverse reaction.

12. Assess patient response and any side effects/adverse reactions initially and during infusion; ensure ongoing plan in place for continued monitoring as appropriate.

13. Discard expended equipment and used supplies appropriately.


15. Verify infusion rate of continuous IV solutions and VAD site condition and patency based on frequency indicated by the solution/medication and patient factors.

**IV Push**

**Supplies**
- Acceptable agent for disinfection of needleless connector/injection port (isopropyl alcohol, iodophors, alcoholic CHG)
Infusion Therapies

- Prescribed medication prepared and labeled in syringe
- Prefilled syringes: preservative-free 0.9% sodium chloride (USP) flushes
- Prefilled syringe of heparin flush solution, if indicated by LIP order or protocol

Procedure
1. Obtain and review LIP’s order for:
   a. Appropriateness of prescribed infusion solution or medication for the patient’s age, health status, medical diagnosis, acuity, VAD type and tip location, dose, frequency, and route of administration
   b. Ascertain absence of allergy or previous adverse reaction to prescribed medication.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.
5. Compare medication label against order for accuracy.
   a. Use available technology for medication verification in accordance with organizational procedures (eg, barcode scanning).
6. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.
7. Disinfect needleless connector on VAD hub.
   b. Passive disinfection: when a disinfectant cap has been in place for the required amount of time over a needleless connector or injection port, remove, discard, and proceed with site and VAD assessment through flushing.
8. If administering the IV push medication through an existing continuous IV infusion:
   a. Select an injection port on the administration set that is closest to the patient. Do not disconnect the administration set from the VAD hub.
   b. Based on compatibility information, stop continuous infusion, if necessary.
9. Attach 10-mL syringe of 0.9% sodium chloride (or compatible flush solution) and confirm patency of VAD by aspiration of blood return and ability to easily flush the VAD, and absence of patient complaints
(see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).

a. Never forcibly flush any VAD with any syringe size. If resistance is met and/or no blood return noted, take further steps (eg, checking for closed clamps or kinked sets, removing dressing, etc.) to locate an external cause of the obstruction (see Central Vascular Access Device [CVAD] Occlusion; Central Vascular Access Device [CVAD] Malposition).

b. Flush 1 to 2 mL, then aspirate for a blood return, observing for the color and consistency of whole blood. Flush the remaining volume into the VAD and disconnect syringe.

10. Disinfect needleless connector or injection port of administration set with a new swab pad, and discard. Allow to dry completely.

11. Attach medication syringe and administer medication per rate on label using a syringe appropriately sized for the medication being injected; use a watch or clock with a second hand to time IV push administration. Consult organizational medication resources if rate is not specified.

12. Observe infusion site and assess patient for any adverse reaction (eg, peripheral IV infiltration, reactions such as rash, urticaria). NOTE: Stop infusion immediately and notify LIP of any adverse reaction.

13. Detach medication syringe and disinfect needleless connector on VAD hub or injection port of administration set with a new swab pad, and discard.

14. Attach 10-mL syringe of 0.9% sodium chloride (or compatible flush solution) to needleless connector or injection port, flushing at the same rate as the drug was injected until the entire drug dose has been cleared from the infusion system and VAD lumen and to prevent precipitation due to solution/medication incompatibility.

15. For continuous infusion, resume correct flow rate, if stopped. If not stopped, verify that the correct rate is infusing.

16. If no continuous infusion, disinfect the needleless connector on the VAD hub, attach syringe with the appropriate locking solution, and inject into the VAD lumen. Detach and discard the syringe.

17. Assess patient response and any side effects/adverse reactions; ensure ongoing plan in place for continued monitoring as appropriate.

18. Discard expended equipment and used supplies appropriately.

19. Perform hand hygiene.

**Intermittent Medication Infusion**

**Supplies**

- Acceptable agent for disinfection of needleless connector/injection
Infusion Therapies

- Port (isopropyl alcohol, iodophors, alcoholic CHG)
- Prescribed medication
- Administration set
- Prefilled syringes: preservative-free 0.9% sodium chloride (USP) flushes
- Prefilled syringe of heparin flush solution, if ordered

**Procedure**

1. Obtain and review LIP’s order for:
   a. Appropriateness of prescribed infusion solution or medication for the patient’s age, health status, medical diagnosis, acuity, VAD type and tip location, dose, frequency, and route of administration
   b. Ascertain absence of allergy or previous adverse reaction to prescribed medication.
2. Verify patient’s identity using 2 independent identifiers, according to organizational policy (eg, name and date of birth).
3. Perform hand hygiene.
4. Check medication for expiration or beyond-use date; inspect infusion container for leaks, cracks, particulate matter, and clarity of medication.
5. Compare medication label against order for accuracy.
   a. Use available technology for medication verification, in accordance with organizational procedures (eg, barcode scanning).
6. Employ an independent double check by 2 clinicians for high-risk medications in accordance with organizational procedures.
7. Choose appropriate length of medication administration set.
   a. For piggybacking into a continuous infusion on an EID, determine if the most appropriate injection port is above or below the pumping mechanism.
   b. For piggybacking into a continuous gravity infusion, use a short secondary administration set.
   c. For attaching directly to a VAD hub, choose a regular administration set with enough length to allow for correct height of the fluid container.
8. Prepare infusion.
   a. Open the administration set and close the roller clamp.
   b. Remove the cover from the solution container outlet.
   c. Remove the cover from the spike of the administration set and insert into the solution container without touch contamination.
   d. Hang secondary administration set higher than the primary
solution container if infusing by gravity.

e. Squeeze drip chamber, and prime administration set by purging all air.

9. Disinfect the chosen injection port on the continuous administration set or the needleless connector on the VAD hub with a new swab pad. Allow to dry completely.

10. Confirm VAD patency. Attach 10-mL syringe of 0.9% sodium chloride (or compatible flush solution) and confirm patency by aspiration of blood return and ability to easily flush the VAD, and absence of patient complaints (see Maintaining Vascular Access Device [VAD] Patency: Flushing and Locking).

   a. Never forcibly flush any VAD with any syringe size. If resistance is met and/or no blood return noted, take further steps (eg, checking for closed clamps or kinked sets, removing dressing, etc.) to locate an external cause of the obstruction (see Central Vascular Access Device [CVAD] Occlusion; Central Vascular Access Device [CVAD] Malposition).

   b. Flush 1 to 2 mL, then aspirate for a blood return, observing for the color and consistency of whole blood. Flush the remaining volume into the VAD and disconnect syringe.

11. Remove the cap from the male luer end of the chosen administration set and attach to the injection port or needleless connector.

12. Open roller clamp of attached medication administration set and regulate flow according to order/label on medication container.

   a. Calculate drip rate for gravity infusions and regulate by manually counting drops per minute.

   b. Alternative: for manual flow regulators, set rate according to printed numbers on the dial, but double check the accuracy of this setting by counting drops or observing for a specific quantity of fluid infusion in a designated amount of time. Accuracy of these devices is the same as roller clamps.

   c. For an EID with the medication attached above the pumping mechanism, assess if multiple flow rates can be programmed into it. Enter the correct infusion flow rates and volume to be infused for primary and secondary solutions, according to manufacturers’ directions for use.

   d. For an EID with the medication attached below the pumping mechanism, manually regulate the medication flow rate by counting drops.

13. Observe infusion site, and assess patient for any adverse reaction (eg, peripheral IV infiltration, reactions such as rash, urticaria). NOTE: Stop infusion immediately and notify LIP of any adverse reaction.

14. When the secondary medication has infused, close clamp of medication administration set.
15. If attached to a continuous infusion, do not detach administration set from the injection port or remove the empty solution container. Allow this set to remain connected and use the back-priming method for administering the next medication dose with the same administration set.
   a. When the subsequent dose of medication is needed, hold the empty medication container below the primary solution container and allow primary solution to backflow through the secondary set to fill with solution and move air into the empty container.
   b. Remove the cover from the new medication container.
   c. Detach the empty container and insert spike into the new container, being careful to prevent touch contamination of the spike.
   d. Hang medication container (above the primary container for gravity infusion), open roller clamp, and regulate flow rate as appropriate for gravity or EID.
   e. All primary and secondary administration sets should be replaced simultaneously at 96 hours.

16. If attached directly to a needleless connector on the VAD hub without continuous infusion, detach the administration set and place new sterile end-cap over the male luer end if the set will be used again; sets used for this type of intermittent medication administration should be replaced every 24 hours.
   a. Disinfect needleless connector or injection port of administration set with a new swab pad and discard. Allow to dry completely.
   b. Attach 10-mL syringe of 0.9% sodium chloride (or compatible flush solution) to needleless connector or injection port, flushing at the same rate as the drug was injected until the entire drug dose has been cleared from the infusion system and VAD lumen and to prevent precipitation due to solution/medication incompatibility.
   c. Disinfect needleless connector or injection port of administration set with a new swab pad and discard. Allow to dry completely.
   d. Attach syringe containing the appropriate locking solution and inject into the VAD lumen.

17. If primary continuous solutions are infusing, ensure that the correct flow rate has resumed.

18. Assess patient response and any side effects/adverse reactions; ensure ongoing plan in place for continued monitoring as appropriate.

19. Discard expended equipment and used supplies appropriately.

20. Perform hand hygiene.
**Documentation**

Document in the patient’s health record:
- Medication, amount, and type of diluent
- Date, time of administration
- Route, specific VAD or lumen used for administration
- Patient’s response to the procedure

**Bibliography**


Transfusion Therapy

Considerations for the Ambulatory Infusion Patient

A safe transfusion program must include:

- Comprehensive policies and procedures in concert with an established relationship with a transfusion service
- Comprehensive staff education and competency program
- Patient selection criteria: history of transfusions with no identified adverse events
- Immediate access to the licensed independent practitioner (LIP) by phone during the transfusion
- Ability to transport blood product in cooling containers verified for correct temperature
- Ability to dispose of medical waste appropriately
- Well-designed patient and caregiver education process, including clearly written instructions regarding transfusion reactions

Policy

Blood and blood components are filtered using an in-line or add-on filter appropriate for the prescribed therapy.

Verification of the correct patient and blood product is performed prior to transfusion.

Each unit of blood or blood component must be completed within 4 hours. When slower transfusion is required, ask the transfusion service to divide a unit of red blood cells or whole blood into smaller aliquots.

The administration set is changed after the completion of each unit or every 4 hours; if more than 1 unit can be infused in 4 hours, the transfusion set can be used for a 4-hour period.

Informed consent is obtained according to organizational policy and procedure.

Competency is validated for clinicians who perform transfusions.

Key Points

Blood transfusion is a critical issue for patients with chronic diseases, such as heart failure, chronic kidney disease, anemia, and malignancy. Blood transfusion reactions following transfusions are not rare.

The aim of transfusion management is to restore patient functionality and quality of life by restoring effective red cell volume. Before deciding on a blood transfusion, the possibility of an adverse reaction should be considered. The most frequent complications of transfusion are febrile and chill-rigor reactions,
nonhemolytic reactions, and the most serious complication, acute hemolytic reaction as a result of ABO incompatibility. Early recognition of symptoms suggestive of a transfusion reaction and prompt reporting are essential.

This procedure is indicated for the transfusion of human blood and blood components, including whole blood, red blood cells, plasma and plasma components, platelets, granulocytes, and cryoprecipitate.

Blood and blood components should be transfused only after alternative therapy has been considered. Blood and blood components are transfused in accordance with evidence-based indications to ensure patient safety, optimal patient outcomes, and unnecessary transfusions.

Appropriate vascular access devices for transfusion include:

- **Short peripheral catheters**: 20- to 24-gauge based on vein size and patient preference. When rapid transfusion is required, a larger-size catheter gauge is recommended (14-18 gauge).
- **Central vascular access devices (CVADs)** are acceptable for transfusions; infusion may be slower with peripherally inserted central catheters due to catheter length and lumen size.

Filter all blood components and follow the manufacturers’ directions for filter use.

- **Standard blood administration sets** include a 170- to 260-micron filter that removes blood clots and harmful particles.
- **Microaggregate filters** are not routinely used but are used for reinfusion of blood that is shed and collected during surgery.
- **Bedside leukocyte reduction filters** are not routinely used because they are associated with dramatic hypotension in some patients; leukocyte-reduction filtration is generally preferred “prestorage” or shortly after blood collection. Use of leukocyte-reduced blood products (red cells and platelets) decreases the risk of febrile transfusion reactions, risk of human leukocyte antigen alloimmunization, and cytomegalovirus transmission.
- **Leukocyte filtration** is never used with transfusions of granulocyte or hematopoietic progenitor cells.

Electronic infusion devices (EIDs) can be used to deliver blood or blood components without significant risk of red blood cell hemolysis; use EIDs that have a labeled indication for blood transfusion and follow manufacturers’ directions for use.

Blood-warming devices are used when clinically indicated (eg, large-volume or rapid transfusions, exchange transfusions, patients with clinically significant conditions, and in the pediatric population). The risk of clinically important hypothermia is increased when blood is transfused through a CVAD.

When rapid transfusion is required, an externally applied compression device or electronic rapid infusion device may be used in accordance with
manufacturers’ directions for use. Externally applied compression devices should be equipped with a pressure gauge; totally encase the blood bag and apply uniform pressure against all parts of the blood container. Pressure should not exceed 300 mm Hg. For rapid infusion, a larger-gauge catheter may be more effective than a pressure device. Closely monitor the blood level in the container, as pressure devices are associated with air embolism.

Circulatory overload may be prevented or detected early through:
- Identifying conditions that may increase risk (eg, heart failure or renal disease)
- Administering infusions at a slower rate
- Administering a diuretic when beginning infusions in at-risk patients
- Monitoring intake and output and daily weights
- Monitoring vital signs and for signs and symptoms
- Using electronic flow control and ensuring accuracy of prescribed flow rate

Platelets should be administered over 30 minutes to 4 hours.

Each unit of plasma should be administered as quickly as tolerated by the patient or over 15 to 60 minutes.

Blood and blood components are only administered with 0.9% sodium chloride. No other solutions or medications are added to or infused through the same administration set with blood or blood components unless they have been approved by the US Food and Drug Administration for this use.

Ensure adequate and patent vascular access prior to obtaining the unit of blood from the blood bank.

Do not place blood container in any refrigerator outside of the transfusion service. Blood and blood components may be transported from a transfusion service in designated coolant containers.

Ensure transfusion is started within designated time of removal from the transfusion service (eg, 30 minutes).

Establish parameters for vital signs that require LIP notification before starting transfusion (eg, elevated body temperature).

**Assessment**

Baseline physical assessment prior to obtaining blood for transfusion:
- Vital signs
- Breath sounds
- Identification of conditions that may increase the risk of transfusion-related adverse reactions (eg, current fever, heart failure, renal disease or risk of fluid volume excess)

Patency of vascular access device (VAD)
Current laboratory values, especially hemoglobin and hematocrit levels

During/after transfusion: monitor for signs/symptoms of immediate transfusion reaction.*
- Hemolytic (eg, fever, chills, tachycardia, hypotension, dyspnea, red/dark urine)
- Febrile nonhemolytic (eg, fever rise of 2°F, chills, headache, vomiting)
- Allergic (eg, itching, urticaria, flushing, runny eyes, angioedema)
- Anaphylactic/anaphylactoid (see Allergic Reaction and Anaphylactic/Anaphylactoid Reactions)
- Transfusion-related acute lung injury (eg, fever, chills, dyspnea, cyanosis, hypoxemia, hypotension, bilateral pulmonary edema)
- Transfusion-associated circulatory overload (see Circulatory Overload)

*This is not a complete list; education and competency assessment should include all potential transfusion reactions, both immediate and delayed, and actions to take.

Patient Education
Rationale for transfusion
Rationale for frequent monitoring during transfusion

Signs and symptoms of transfusion reaction to report (eg, itching, swelling, dizziness, dyspnea, low back/chest pain), and how and to whom

Signs and symptoms of VAD-related complications (eg, pain, swelling, redness at site)

Supplies
- Gloves
- Solution container of 0.9% sodium chloride
- Blood component
- Blood administration set
- Antiseptic wipes

Preprocedure
1. Obtain and review LIP’s order for transfusion.
2. Perform baseline physical assessment, including vital signs.
3. Obtain appropriate vascular access or check patency of existing VAD.
4. Obtain informed consent per organizational policy and/or patient assent.
**Procedure**

1. Obtain blood product from the transfusion service.
2. Perform patient and blood identification process at time of obtaining blood
   a. Verify recipient’s 2 independent identifiers according to organizational policy (e.g., name and date of birth), ABO group, and Rh type, if required; donation identification number; crossmatch test interpretation, if performed; special transfusion requirements; expiration date/time; and date/time of issue.
   b. Inspect each blood component prior to transfusion; do not use if container is not intact or if the appearance is not normal (e.g., excessive hemolysis, significant color change in blood bag compared to tubing, presence of floccular material, cloudy appearance), and return it to the transfusion service.
3. Perform patient and blood identification process according to organizational policy, using an independent double check by 2 adults in the presence of the patient
   a. Verify patient identity using 2 independent patient identifiers according to organizational policy and ask the patient to state his or her name and date of birth, if possible.
   b. Verify the blood component
   c. Review the LIP’s order for transfusion
   d. Patient blood-type compatibility with the unit to be transfused
   e. Crossmatch test interpretation, if performed
   f. Donor identification number
   g. Unit expiration date/time
   h. Any product modification, such as irradiation or cytomegalovirus seronegative
4. Prepare to transfuse.
   a. Perform hand hygiene.
   b. Don gloves.
   c. Open blood administration set and close all clamps.
   d. Spike bag of 0.9% sodium chloride with one of the Y-administration set spikes.
   e. Hang on intravenous pole and prime administration set according to manufacturers’ directions for use.
   f. Attach primed administration set to VAD either directly to catheter hub or to needleless connector after disinfection.
   g. Initiate slow infusion of 0.9% sodium chloride solution.
5. Initiate transfusion.
   a. Spike blood component with the other Y-administration set spike; close clamp to sodium chloride container.
   b. Open clamp and initiate transfusion.
c. Start the transfusion slowly at approximately 2 mL per minute for the first 15 minutes and remain near the patient; increase the transfusion rate, if there are no signs of a reaction and to ensure the completion of the unit within 4 hours.

   a. Check vital signs within 5 to 15 minutes after starting transfusion, after the transfusion, and as needed depending on patient condition.
   b. Compare to baseline vital signs to identify any early signs of a transfusion reaction.
   c. Observe VAD site.

7. Stop the transfusion immediately if any signs and symptoms of a transfusion reaction are present; disconnect the blood administration set from the catheter hub. Start a 0.9% sodium chloride infusion with new primed administration set and infuse at a rate to maintain catheter patency.
   a. Notify the LIP and transfusion service, administer emergency medications as prescribed, and obtain prescribed blood sample for additional lab tests as prescribed. Return blood container with remaining blood and set attached to the transfusion service.

8. Complete red blood cell/platelet transfusion within 4 hours; plasma within 1 hour.
   a. Close clamp to blood product on completion.
   b. Open clamp to 0.9% sodium chloride to clear the administration set and VAD of blood.
   c. Discard empty blood container and administration set in biohazard container.

9. Continue to monitor patient, as reactions may occur after the completion of the transfusion; instruct patient in signs and symptoms to report.

**Documentation**

Document in the patient’s health record:
- Pretransfusion assessment and vital signs
- VAD placement, if indicated, and VAD assessment
- Blood component, blood unit/donor/recipient identification, compatibility, and expiration date
- Vital signs and assessment during posttransfusion
- Volume of blood component/0.9% sodium chloride administered
- Patient education
- Patient’s response to the procedure
Bibliography


Considerations for the Ambulatory Infusion Patient

Once the patient leaves the ambulatory care setting, the patient may continue to receive parenteral nutrition (PN) and generally will self-administer and manage his or her PN in the home setting.

Recognize that home care patients and families often need help fitting PN into daily life. That may include alterations in body image and lifestyle, and dependence on medical equipment and health care personnel.

Policy

PN solutions are filtered; use a 0.22-micron filter for PN solutions without lipids; use a 1.2-micron filter for 3-in-1 PN solutions that contain dextrose, amino acids, and lipid emulsions.

Medications are not added to or coinfused with the PN solutions/emulsions before or during infusion without consultation with a pharmacist regarding compatibility and stability.

The hang time for a container of PN solution should not exceed 24 hours; the hang time is limited to 12 hours for fat emulsions alone.

The administration set for all PN solutions is changed every 24 hours.

Administration sets used with lipid-based infusates, such as IV fat emulsions, will be free of di(ethylhexyl)phthalate.

PN solutions/emulsions with a final concentration exceeding 10% dextrose or an osmolarity of greater than 900 mOsm/L are administered through a central vascular access device (CVAD).

Informed consent is obtained according to organizational policy and procedure.

Competency is validated for clinicians who administer PN.

Key Points

The enteral route is used in preference to the parenteral route for nutrition support whenever feasible.

The use of standardized order forms or templates and computerized prescriber order entry is recommended to reduce the risk of errors related to PN prescriptions.

Because there may be periodic shortages of PN components, consider development of licensed independent practitioner-approved written protocols for PN component substitution or conservation methods.
PN is administered using an electronic infusion device with anti–free-flow protection.

PN is administered as a continuous infusion or as a cyclic infusion. A cyclic infusion lasts a portion of the day, usually overnight (eg, 8-16 hours). Advantages of this infusion method include freedom from the infusion/pump, increased mobility, more physiologic hormonal responses, and prevention/treatment of liver toxicity associated with continuous PN.

The risk for bloodstream infection in patients receiving PN may be reduced by:

- Avoiding blood sampling via the CVAD used for PN when feasible
- Using a designated single-lumen catheter to administer lipid-containing PN solutions

PN solutions are refrigerated and protected from light until shortly before the time of administration to avoid oxidation of vitamins.

All PN solutions are hyperosmolar and, when infused through a peripheral vein, are associated with an increased risk of phlebitis; phlebitis-mitigating techniques should be employed (see Phlebitis).

**Assessment**

Nutritional assessment, including physical assessment

Signs of nutritional deficiencies (eg, changes in hair, skin, nails, mouth)

Anthropometric measurements (height, weight)

Signs/symptoms of electrolyte imbalance

Signs/symptoms of infection, since catheter-related bloodstream infection is a serious complication associated with PN

Monitor all laboratory findings (eg, serum albumin, serum transferrin, prealbumin, glucose, nitrogen balance, hemoglobin/hematocrit, electrolytes, vitamin/trace element levels)

Cyclic infusions:

- Monitor blood glucose on and off PN during initial cycling.
- Test for rebound hypoglycemia 1 hour after discontinuation and upon any symptoms associated with hypoglycemia (eg, tremors, sweating, anxiety, lethargy).
- Monitor cardiovascular status due to the risk of fluid overload with an increased rate of PN rate due to fewer hours of infusion.
Patient/Caregiver Education

For patients going home requiring PN, patient and caregiver education should address the following:

- Purpose and expected duration of PN
- Proper storage of PN containers in the refrigerator; remove them from refrigerator 60 minutes prior to infusion
- Storage of infusion supplies safe from children and pets
- Inspection of the PN solution prior to administration for evidence of particulate matter, cloudiness, or solution separation
- Checking label for accuracy
- How to safely inject any additives into PN solution; multivitamins must be added to the PN solution just prior to administration
- Infection prevention, such as hand hygiene and maintaining sterile components of the infusion system
- Infusion pump management, including intravenous (IV) administration set priming, program resetting, alarms
- Proper disposal of used infusion supplies
- Supply inventory
- Emergency preparedness in the event of power outage
- Action to take for missed/late administration
- Signs and symptoms of metabolic intolerance (hypo- and hyperglycemia; alterations in electrolytes (eg, potassium, calcium), infection, and CVAD complications
- Teach the need for self-monitoring response to PN, which includes monitoring weight, temperature, blood glucose, output (urine/stool/ostomy/wound), CVAD site.
- Teach about the schedule for ongoing laboratory work studies.
- Provide patients with information about the Oley Foundation (www.oley.org). Founded in 1983, the organization provides support and education for patients/families requiring home enteral and parenteral nutrition.

Procedure

See Intravenous (IV) Administration: Continuous Infusion, IV Push, Intermittent Infusion.

Documentation

Document in the patient’s health record:

- Specific vascular access device (VAD) lumen used
- VAD patency and presence of blood return
- PN solution administered, including lipids
- Pertinent patient assessment
- Pertinent laboratory results
- Patient/caregiver education
- Patient’s response to the procedure
Bibliography


Antineoplastic Therapy

Considerations for the Ambulatory Infusion Patient
A list of antineoplastic drugs that are acceptable for administration in an ambulatory infusion setting should be developed based on patient safety, risk versus benefits, and the competency of clinicians.

Policy
Antineoplastic agents are administered only on written orders, including new orders or changes to existing orders. Verbal orders are acceptable only if antineoplastic agents are to be placed on hold or discontinued.

Antineoplastic therapy requires dosing and administration considerations according to an individual’s age, functional status, and comorbidity.

Hazardous antineoplastic drugs are identified, safely handled, and administered.

Informed consent is obtained according to organizational policy and procedure.

Competency is validated for clinicians who administer antineoplastic therapy.

Key Points
The informed consent should include a description of risks, benefits, and treatment alternatives, an opportunity to ask questions, and the right to accept or refuse treatment.

Only qualified clinicians administer antineoplastic therapy based on completion of a specialized education and competency program with a recommendation for annual assessment of competency.

Clinicians must be aware if a drug is a hazardous drug and handle appropriately.

- Personal protective equipment (PPE) and engineering controls must be in place.
- Provide access to PPE, safety datasheets (formerly material safety datasheets), spill kits, containment bags, eyewash stations, and designated waste disposal containers in all areas where hazardous drugs are handled.
- During drug administration, employ the following: double gloves, protective gown, eye protection if liquid could splash, respiratory protection if inhalation potential, and a closed system drug transfer device. Drug administration sets should be attached and primed prior to administration.
Antineoplastic drugs are high-alert medications and safeguards should be in place to reduce the risk of errors such as:

- Use of standardized orders, standardized dosage calculation, established dosage limits, computerized prescriber order entry, barcode technology, and smart pumps
- Consultation with the pharmacist to review drug interactions with each change in the patient’s medication list
- At the time of the order: independent verification of the antineoplastic order by 2 clinicians qualified in antineoplastic administration that includes confirmation of 2 patient identifiers, drug names, dose, volume, route, rate, calculation for dosing, treatment cycle, and day
- Just prior to administration: independent verification of the antineoplastic order by 2 clinicians qualified in antineoplastic administration that includes drug name, dose, volume, rate of administration, expiration date, infusion pump rate, and appearance/physical integrity of the drug
- Involve the patient and family members in medication identification.
- Monitor cumulative antineoplastic dose, as appropriate, to ensure that the drug is discontinued if the maximum lifetime dose is reached.

Some antineoplastic drugs are vesicants, defined as agents capable of causing tissue damage on escape from the intended vascular pathway into surrounding tissue. Antineoplastic vesicants include, but are not limited to, dactinomycin, daunorubicin, doxorubicin, epirubicin, idarubicin, mechlorethamine, melphalan, mitomycin, videsine, vinblastine, vincristine and vinorelbine. There are additional drugs that have vesicant potential. It is important to consult with antineoplastic references and resources to establish a list of known vesicant drugs. Safe practices must be in place, including:

- Limit peripheral vesicant infusion to intravenous (IV) push or infusions lasting less than 30 to 60 minutes.
  - Do not use an infusion pump for peripheral vesicant administration.
  - Do not use scalp veins in the neonate and pediatric patient.
  - Never administer a vesicant in the absence of a blood return.
  - Provide dilution by administering through a free-flowing infusion of a compatible solution.
  - Assess and verify blood return every 2 to 5 mL for IV push and every 5 to 10 minutes during an infusion, remaining with the patient during the entire infusion.
- For vesicant infusion via a central vascular access device (CVAD): do not administer if signs of inflammation, swelling, leaking, or signs of venous thrombosis are present (see Central Vascular Access Device [CVAD]-Associated Venous Thrombosis).
• Ensure proper placement, and adequately secure and stabilize the noncoring needle within implanted vascular access ports.

**Assessment**
Prior to each treatment cycle the clinician should assess:
- Results of current laboratory data/diagnostic tests
- Current medications, including over-the-counter and complementary/herbal medications
- Vital signs and weight
- Side effects of therapy from prior course and interventions implemented
- Need to institute or modify symptom management plan prior to current drug administration course
- Presence of new signs or symptoms of toxicity

For initial cycle, patient height must be measured, not verbally reported

Patency of the vascular access device (VAD), including aspiration of a blood return, absence of any resistance when flushing the catheter with 0.9% sodium chloride, absence of any patient complaints of pain or discomfort of any kind, absence of signs and symptoms of all VAD complications

Integrity of the infusion system, including secure luer-locked connections, and correct flow rate for infusing solutions, if administered

Patient level of understanding of treatment

Patient psychosocial concerns

**Patient Education**
Antineoplastic therapy: how it works, potential side effects, signs and symptoms to report/whom to call, physical and psychological effects, interventions to reduce VAD-related complications (eg, pain, swelling, redness at site)

Vesicant infusions: instruct in the importance of immediately reporting any pain, burning, sensation changes, or feeling of fluid on skin during the infusion.

**Vesicant Administration**

**Supplies**
- Acceptable agent for disinfection of needleless connector/injection port (isopropyl alcohol, iodophors, alcoholic chlorhexidine gluconate)
- Prescribed IV medication with preattached, preprimed administration set
- Prefilled syringes: preservative-free 0.9% sodium chloride (USP) flushes
• Prefilled syringe of heparin flush solution, if indicated by licensed independent practitioner (LIP) order or protocol
• PPE
• Solution container of 0.9% sodium chloride

Preprocedure
1. Obtain and review LIP’s order for antineoplastic medication(s).
2. Verify patient’s identity using 2 independent identifiers according to organizational policy (eg, name and date of birth).
3. Confirm prescribed dose by comparing order to references such as drug therapy monographs or published dosing guidelines.
4. Ascertain absence of allergy or previous adverse reaction to prescribed medication.
5. Verify results of pertinent laboratory studies/diagnostic tests.
6. Verify dosage accuracy at the time of the order:
   a. Using an independent double check by 2 qualified clinicians, verify the dose by calculating the patient’s body surface area (BSA) or area under the curve, and calculate all drug doses to be delivered. A significant variation in BSA greater than 10% must be addressed with the prescribing LIP. Dose amounts are compared to labeled dosage. Any discrepancies in dose of greater than 10% must be reconciled.
7. Obtain informed consent according to organizational policy.
8. Perform baseline physical assessment including vital signs.
9. Establish appropriate vascular access or check patency of existing VAD. For peripheral IV vesicant administration:
   a. Avoid the following sites: dorsal hand, wrist, antecubital fossa, near a joint, and in the limb where there is impaired circulation or lymphatic drainage and/or history of lymph node dissection.
   b. Do not use an established IV site that is greater than 24 hours old. If a new IV site is initiated, use the smallest catheter possible. If the IV attempt is unsuccessful, additional attempts should be proximal to the previous attempt or on the opposite arm.
10. Turn off all ceiling fans and humidifiers to reduce risk for spread of cytotoxic solution agent by aerosolization or vaporization.

Procedure
1. Perform hand hygiene.
2. Don appropriate PPE:
   a. Gloves: wash hands thoroughly with antimicrobial soap and water before applying the designated disposable chemotherapy
gloves. Gloves should be disposed of immediately after use, if torn, punctured, if a drug spill occurs, or after 30 minutes of use.

b. Protective disposable gown made of lint-free, low-permeability fabric with a closed front, long sleeves, and tight-fitting elastic or knit cuffs. Gowns are to be worn for one-time individual patient use.

c. Eye protection if liquid could splash

d. Respiratory protection if inhalation potential

3. Cover working area with disposable, absorbent, plastic-backed barrier pad.

4. Gather supplies, and place on barrier pad.

5. Check medication for expiration or beyond-use dates; inspect syringe for leaks, cracks, particulate matter, and clarity of medication.

6. Verify antineoplastic order using an independent double check by two qualified clinicians to include drug name, dose, volume, rate of administration, expiration date, infusion pump rate, and appearance/physical integrity of the drug.

7. Administer an IV push medication through an existing continuous IV infusion.
   a. Select an injection port on the administration set that is closest to the patient. Do not disconnect administration set from the VAD hub.
   b. Disinfect needleless connector on VAD hub using a vigorous scrubbing action for disinfection for a designated length of time. Discard each disinfectant swab pad immediately. Allow to dry completely.

8. Attach 10-mL syringe of 0.9% sodium chloride, and confirm patency of VAD by aspiration of blood return, ability to easily flush the VAD, and absence of patient complaints.
   a. Flush 1 to 2 mL, then aspirate for a blood return, observing for the color and consistency of whole blood. Flush the remaining volume into the VAD and disconnect syringe.


10. Administer vesicant.
    a. IV push: attach medication syringe and administer IV push medication per rate on label using a syringe appropriately sized for the medication being injected; use a watch or clock with a second hand to time IV push administration.
    b. Short infusion: initiate short intermittent infusion at specified rate.
    c. Continuous infusion: initiate infusion and observe patient for at least 20 minutes following infusion initiation for any adverse reaction
11. Assess and verify blood return.
   a. Peripheral IV catheters: every 2 to 5 mL for IV push or every 5 to 10 minutes during infusions remaining with patient
   b. CVADs: every 2 to 5 mL for IV push or every 5 to 10 minutes during infusions of 30 minutes or less
   c. Assess for absence of swelling/edema and ask patients about presence of pain/burning or change in sensation before, during, and after infusion.
   d. Stop infusion at first sign of extravasation (see Infiltration/Extravasation).

12. Detach medication syringe and disinfect needleless connector on VAD hub or injection port of administration set with a new swab pad and discard. Allow to dry completely.

13. Attach 10-mL syringe of 0.9% sodium chloride to injection port, flushing at the same rate as the drug was injected (IV push) until the entire drug dose has been cleared from the infusion system and VAD lumen, and to prevent precipitation due to solution/medication incompatibility.

14. Assess patient response and any side effects/adverse reactions; ensure ongoing plan in place for continued monitoring as appropriate.

15. Dispose of all open, unused drug(s), equipment, and disposable gowns and gloves used to administer the drugs into the specially marked, covered container designated with the label indicating chemotherapy/biohazard waste.

16. Perform hand hygiene.

Documentation
Document in the patient’s health record:
- Location/type of VAD
- Number/locations of venipuncture attempts for peripheral catheter
- VAD patency and presence of blood return
- Drug, dosage, diluent
- Time of administration
- Any evidence of adverse reactions and actions taken
- Pertinent patient assessment
- Patient education
- Patient’s response to the procedure
Bibliography


Biologic Therapy

Considerations for the Ambulatory Infusion Patient

A list of biologic drugs that are acceptable for administration in an ambulatory infusion setting should be developed based on patient safety, risks versus benefits, and the competency of clinicians.

After initial biologic treatment in a controlled setting, nurse-administered home administration of intravenous (IV) immunoglobulin may provide advantages, such as improved adherence to therapy and decreased cost, for long-term, stable patients who require extended therapy for primary immune deficiency diseases.

After first subcutaneous immunoglobulin (SClG) dose administration in a controlled setting under medical supervision, self-administered SClG is an option for some patients. There is a low incidence of systemic effects with SClG due to the slow equilibration of Ig into the circulation. (see Subcutaneous Access Device: Placement and Infusion Administration)

Policy

Biologic infusion therapy is administered in a setting in which the clinician is prepared to recognize and manage severe adverse reactions.

Biologic infusion therapies include, but are not limited to, colony-stimulating factors, gene therapy, monoclonal antibodies, fusion proteins, interleukin inhibitors, and immunoglobulins. Infusion administration includes both the IV and subcutaneous routes. Biologic therapies are used in the treatment of cancer and a variety of immune system disorders (eg, autoimmune diseases and immune deficiencies).

Current medication order is provided by a licensed independent practitioner (LIP).

Patients are screened for the absence of contraindications to administration prior to the beginning of therapy and prior to each administration.

Drugs for treatment of adverse reactions, including drugs to treat anaphylaxis, are available in the treatment setting.

Informed consent is obtained according to organizational policy and procedure.

Competency is validated for clinicians who prepare and administer biologic therapy.

Clinicians obtain any required risk evaluation and mitigation strategies (REMS) training as required to administer medications safely in the outpatient setting.
**Key Points**

Clinician competency should address knowledge of the clinical implications, safe preparation of the biologic, infection prevention, ability to establish venous access, knowledge of appropriate subcutaneous infusion sites, provision of patient/caregiver education, and management of therapy-related adverse events.

It is common to have orders in place for premedications, such as acetaminophen, diphenhydramine, and methylprednisolone, which may prevent infusion reactions common to many biologic therapies.

Biologics cannot be mixed with other medications and should be administered separately.

Refer to the manufacturers’ package inserts for information regarding storage, preparation, and administration of biologic infusion products. Special considerations when receiving refrigerated medications include inspection of shipping containers to confirm required temperatures are maintained during shipping process. Equipment used to store refrigerated medications require routine maintenance set forth by the facility. Daily refrigerator temperature log will be maintained in infusion suite.

Collaborate with the LIP and pharmacy regarding special safeguards; due to serious risks associated with some biologic agents, REMS may be required by the US Food and Drug Administration.

Reconstitute or prepare parenteral products in a clean, designated area free from insanitary conditions and obvious sources of contamination (eg, standing or leaking water, biohazardous materials, or specimen).

Select the most appropriate flow-control method for the biologic therapy, taking into account factors such as manufacturers’ recommendations for infusion rates; infusion route; dosing considerations; volume; duration and use of filters; age, acuity, and mobility of the patient; health care setting; and the potential for side effects or adverse effects of the therapy.

**Assessment**

Risk factors before initiation of therapy include, but are not limited to:

- Comorbidities (eg, hypertension, cardiopulmonary/hepatic/renal/gastrointestinal disease)
- Ask if pregnant or chance of becoming pregnant
- Presence of infections (viral, fungal, or bacterial); results of tuberculosis testing, hepatitis B and C screening
- Vaccination list (eg, live vaccines are not recommended during treatment with biologics and may delay therapy)
- Allergy profile (food, medications, drug-drug interactions)
- History of any previous treatment with and reaction to biologic therapies
• History of malignancies
• Weight changes
• Possible drug interactions; obtain current medication list

Before/during each infusion:
• Any significant changes in health status prior to each infusion (eg, changes in weight, presence of any acute illness, infection, or diarrhea)
• Any recent surgeries or planned surgeries
• Any recent dental procedures or planned surgeries (eg, dental implants, dental extractions, gum tissue graft)
• Open wounds or compromised skin conditions
• Any changes in medication list (eg, antibiotics)
• Pertinent laboratory results (eg, complete blood count, liver/kidney function)
• Response to treatment
• Vital signs

Signs/symptoms of infusion reactions:
• Anaphylactic/anaphylactoid/allergic reactions (see Allergic Reaction and Anaphylactic/Anaphylactoid Reactions)
• Refer to the manufacturers’ information for specific biologic therapy.

If any changes to health history or presence of risk factors, clinician to consult with prescribing LIP prior to initiating or continuing therapy.

Patient Education
Risks and benefits of biologic therapy

Physical and psychological effects

Potential side and adverse effects, signs and symptoms to report, and how and to whom to report

Management of adverse events, such as infusion reactions and delayed reactions

Procedure
See Intravenous (IV) Administration: Continuous Infusion, IV Push, Intermittent Infusion; Subcutaneous Access Device: Placement and Infusion Administration.

Documentation
Document in the patient’s health record:
• Date
• Name and dose of biologic therapy administered
• Time of administration (start and stop)
• Administration rate
• Route, specific vascular access device or lumen used for administration, number of attempts and failed locations
• Pertinent patient assessment (eg, initial assessment for contraindications, ongoing assessments of vital signs and IV site integrity, changes in infusion rate)
• Pertinent laboratory results
• Patient/caregiver education
• Patient’s response during the procedure and at discharge

Bibliography


Patient-Controlled Analgesia (PCA)

Considerations for the Ambulatory Infusion Patient

The appropriateness of patient-controlled analgesia (PCA) administration in an ambulatory infusion setting should be assessed based on patient safety, risks versus benefits, and the competency of clinicians.

Policy

The patient and caregiver are educated in the use of PCA.

Patient and caregiver comprehension and ability to comply with procedures are evaluated and documented prior to and on initiation of therapy.

Informed consent is obtained according to organizational policy and procedure.

Key Points

PCA is a common method of pain management that allows the patient to deliver his or her own analgesic dose when needed.

Clinician competency should address knowledge of the appropriate drugs used with PCA, including pharmacokinetics and equianalgesic dosing, contraindications, side effects and their management, appropriate administration modalities, and anticipated outcomes. It is commonly used in postoperative patient care as well as in palliative care and hospice care settings.

In postoperative patient care, the PCA pump is programmed for an analgesic dose on demand. The PCA pump may also be used in conjunction with a continuous basal rate of analgesic, primarily in hospice and palliative care.

Authorized agent-controlled analgesia (AACA) may be used if the patient is unable to actively participate in PCA, or parent/nurse-controlled analgesia (PNCA) may be used for children. AACA allows for a consistent, available, and competent person authorized by the licensed independent practitioner (LIP) who is educated to activate the PCA dose.

Use standardized medication concentrations and standardized or preprinted order sets for PCA and AACA, which would include minimally:

- Concentration of opioid infusate
- Dose
- Lockout interval
- Maximum limit
- Loading dose
- Continuous rate, if ordered
Only the LIP ordering the PCA/AACA/PNCA may order additional central nervous system depressant medications.

Use an independent double check of the PCA pump settings by 2 qualified clinicians at the start of the PCA therapy, change in nursing assignment, change of infusion container, or change in PCA order (eg, drug, concentration, dose, rate). Verification includes:

- Correct patient
- Patient allergies
- Concentration of opioid infusate
- Correct dose
- Correct lockout interval
- Correct maximum limit
- Correct continuous rate, if ordered
- Correct loading dose, if ordered

While most PCA is via the IV route, PCA is also used with epidural analgesia and via the subcutaneous route.

**Assessment**

Prior to initiation of PCA:

- Appropriateness of PCA therapy and the patient’s comprehension of, and ability to participate in the intended therapy
- Appropriateness of AACA or PNCA
- Identify patients at high risk for respiratory depression who include, but are not limited to, the older adult, and those with morbid obesity, obstructive sleep apnea, chronic obstructive pulmonary disease, renal insufficiency, and continuous basal infusions for patients who have obstructive sleep apnea or are opioid naïve.

At baseline and after initiation of the PCA therapy, assess heart rate, blood pressure and respiratory rate, depth, and quality according to intervals determined by organizational policy.

Hold use of the PCA, and notify LIP if the following occurs:

- Respiratory rate less than 8 in a nonterminal patient
- Sedation score as specified by organization
- Patient becomes unarousable or has a significant change in cognition
- Patient has adverse reaction to prescribed medication

Administer naloxone as ordered.

Patient self-report of pain or objective measure of pain using a consistent pain assessment scale appropriate to the patient, including regular evaluation of PCA injections and attempts.
Patient/Caregiver Education

Purpose of PCA therapy

Use of the bolus dose function of the electronic infusion device

Use of pain rating scale

Expected outcomes

Precautions, potential side effects, and contact information for support services, and how and to whom to report

Procedure

See Intravenous (IV) Administration: Continuous Infusion, IV Push, Intermittent Infusion.

Documentation

Document baseline assessment and other parameters regularly, per policy, in the patient’s health record:

- Baseline assessment: pain including, but not limited to, characteristics, location, intensity; level of consciousness; respiratory including rate, depth, quality, and effort; oxygenation saturation; and other assessments as indicated
- Medication, concentration, PCA dose, and basal dose and rate, if used
- Medication received and cumulative dose
- Number of attempts, number of injections
- Sedation assessment
- Respiratory assessment: rate and depth, and other assessments as indicated
- Patient/caregiver education
- Patient’s response and pain intensity rating

Bibliography


Moderate Sedation/Analgesia

Considerations for the Ambulatory Infusion Patient

The appropriateness of moderate sedation/analgesia administration in an ambulatory infusion setting should be assessed based on patient safety, risks versus benefits, and the competency of clinicians.

Policy

The registered nurse (RN) may administer moderate sedation/analgesia using intravenous (IV) infusion in accordance with rules and regulations promulgated by the state’s board of nursing and in accordance with organizational policies and procedures.

The RN is competent in the administration of moderate sedation/analgesia, including knowledge of preprocedure assessment; different sedation levels; safe medication administration; reversal agents for moderate sedation/analgesia; airway management; monitoring of physiological parameters; common complications and interventions; and resuscitation through age-appropriate cardiac life-support validation.

Vascular access is maintained throughout the procedure and recovery for administration of medications and for potential need for emergency resuscitative medications and/or reversal agents.

An emergency cart and reversal agents are immediately accessible, and clinicians with expertise in airway management, emergency intubation, advanced cardiopulmonary life support, and management of potential complications are immediately available.

Informed consent is obtained according to organizational policy and procedure.

Key Points

A list of medications that may be administered by the RN is available in the organization: examples of medications for moderate sedation that may be administered include antihistamines (diphenhydramine); benzodiazepines (diazepam, midazolam); narcotics (fentanyl, meperidine); neuroleptic tranquilizers (droperidol); and propofol.

Recognize that moderate sedation may convert to deep sedation and loss of consciousness due to the types of agents used, the patient’s physical status, and drug sensitivities.

The RN who is monitoring the patient receiving moderate sedation should have no other responsibilities during the procedure.
A discharge plan should be established before the procedure (eg, the need to have a family member/caregiver/friend drive the patient home and observe the patient postprocedure).

Valid and reliable tools or established organizational criteria are used to assess adequacy of sedation and analgesia and readiness for discharge home or transfer to a hospital unit.

**Assessment**

**Preprocedure**
- Medical history/current condition
- Current medications
- Allergies
- Previous sedation experience
- Drug/alcohol/tobacco use
- Verification of nothing-by-mouth (NPO) status
- Consult with an anesthesia licensed independent professional, if problematic issues are identified during the assessment, such as significant opioid use, history of intolerance to moderate sedation, airway issues, allergies, and significant comorbidities.

**Procedure**
- Continuously monitor blood pressure, respiratory rate, oxygen saturation, cardiac rate and rhythm, and level of consciousness
- Capnography use is recommended to measure adequacy of ventilation.

**Postprocedure**
- Observe the patient for at least 90 minutes after the procedure, if reversal agent administration is required.

**Patient/Caregiver Education**
- Sedation/analgesia infusion
- What to expect before, during, and after the procedure
- Postprocedure restrictions
- Potential complications related to the infusion site and the procedure, signs and symptoms to report, and how and to whom to report
- Emergency instructions
- 24-hour contact phone number

**Procedure**
See *Intravenous (IV) Administration: Continuous Infusion, IV Push, Intermittent Infusion.*
**Documentation**

Document in the patient’s health record:
- Medication, amount and type of diluent
- Route and specific vascular access device used for administration
- Pertinent patient assessment
- Sedation assessment; respiratory assessment, rate and depth, and other assessments as indicated
- Patient education
- Patient’s response to the procedure

**Bibliography**


**Therapeutic Phlebotomy**

**Considerations for the Ambulatory Infusion Patient**

Therapeutic phlebotomy can be performed in an ambulatory infusion setting that has the capability to perform the procedure safely and manage the safe disposal of biohazardous waste.

**Policy**

A licensed independent practitioner’s (LIP’s) order is required for therapeutic phlebotomy, including the specific volume to be removed.

Blood withdrawn for therapeutic phlebotomy will be considered hazardous waste and disposed of according to organizational policies and procedures.

Informed consent is obtained by organizational policy and procedures.

Competency is validated for clinicians who perform therapeutic phlebotomy.

**Key Points**

Orders for therapeutic phlebotomy should include laboratory values to be assessed specific to the patient’s diagnosis, parameters for laboratory values guiding the indication for phlebotomy, frequency of phlebotomy, and specific amount of blood to be withdrawn expressed in a standard unit of measurement. Orders to withdraw “1 unit” are unacceptable; volume in mL or weight in grams should be used instead.

Suitable scales may be used to determine the amount of blood to be removed by weight rather than volume. One mL of blood weighs 1.06 grams. Consider the weight of the bag and anticoagulant contents, if present.

Appropriate vascular access device (VAD) choice is based on patient condition, anticipated length of treatments needed, and other infusion therapies:

- Short peripheral catheter using an 18- to 24-gauge device and inserted before phlebotomy and removed upon completion
- Central vascular access device if already placed, and therapeutic phlebotomy will not compromise other infusion therapies
- Apheresis catheter

Establish acceptable limits or parameters for weight, blood pressure, pulse, temperature and steps to take when these values are outside of these parameters.

Blood collection receptacles may include bags specifically designed for therapeutic phlebotomy or collection bags used for volunteer blood donation. Blood collection bags often have permanently attached 15- or 16-gauge needles, which may cause unnecessary pain and vein damage and bleeding upon removal. Large syringes may also be used for manual aspiration. For
patients with fragile veins prone to collapsing under negative pressure, smaller syringes (that generate less negative pressure than larger diameter syringes) may be considered. Do not use vacuum bottles to facilitate blood flow due to risk of air embolism.

**Assessment**
Pretreatment signs/symptoms associated with specific disease state
Pretreatment laboratory results as ordered (eg, hemoglobin, hematocrit)
Vital signs before and after the procedure, including blood pressure, heart rate, respiratory rate and temperature
Patient weight

**Patient Education**
Encourage oral hydration before and after the procedure.
Potential side effects such as a hematoma, syncope, and nausea/vomiting; and how and to whom to report
Type and amount of physical activity before and after the procedure

**Supplies**
- Nonsterile gloves
- Tourniquet
- Blood collection bag/container without a permanently attached needle or syringes for manual aspiration
- 18- to 20-gauge peripheral vascular access device (steel winged needle or plastic catheter)
- Macrobore administration set, if not already attached to collection bag
- Scale, if applicable
- Antiseptic solutions, preferably alcoholic chlorhexidine gluconate; however, povidone-iodine or alcohol are acceptable
- Local anesthesia, if needed
- Gauze
- Tape
- Labels

**Procedure**
1. Obtain and review LIP’s order for therapeutic phlebotomy procedure.
   Orders must include:
   a. Amount of blood to be drawn
   b. Frequency of withdrawal
2. Orders may also include:
a. Pre-phlebotomy hematocrit and hemoglobin levels
b. Goal for hematocrit and hemoglobin levels post-phlebotomy
c. Fluid replacement, including type of fluid, rate, route, and amount

3. Verify patient’s identity using 2 independent identifiers per organizational policy (eg, name and date of birth).


5. Obtain baseline vital signs.

6. Educate patient about the procedure.

7. Obtain informed consent.

8. Place patient in a supine position in a reclining chair or exam table/bed for the procedure.


10. Gather supplies.

11. Assess the upper extremities for an appropriate venipuncture site. Choose a large vein in the forearm.

12. Administer local anesthesia if indicated (see Local Anesthesia).

13. Perform hand hygiene.

14. Attach phlebotomy administration set to blood collection bag/container if needed. Collection container should remain below the venipuncture site, and the tubing remains straight throughout procedure. Close the clamp on the administration set or use a padded hemostat to clamp.

15. Don nonsterile gloves.

16. Cleanse insertion site with antiseptic solution; allow to dry completely.
   b. Povidone-iodine: apply with applicator and allow to remain on the skin for 1.5 to 2 minutes or longer to dry completely for adequate antisepsis. If povidone-iodine is used on patients with compromised skin integrity, it should be removed with sterile normal saline or sterile water once it has completely dried. The use of circles or a back-and-forth motion for their skin preparation has not been studied.

17. Apply tourniquet proximal to intended venipuncture site. A blood pressure cuff may be used as a tourniquet; activate and hold at approximately 50 to 75 mm Hg. Stabilize the selected vein below the intended venipuncture site with the nondominant hand.

18. Insert the needle/catheter following the manufacturers’ directions for use. Stabilize with a piece of tape. If the site is in or near the
antecubital fossa, remind patient not to bend the arm.

19. Connect phlebotomy administration set to winged needle/catheter.

20. Remove tourniquet as indicated by blood flow rate. For patients with thick, viscous blood (eg, polycythemia vera), blood flow may be facilitated by leaving the tourniquet on during the procedure. Use of a blood pressure cuff will allow for slowing of the blood flow rate by lowering the pressure on the cuff.

21. Slowly open clamp of administration set, allowing retrograde blood flow into administration set and collection container.

22. Monitor volume or weight of collected blood until prescribed quantity is withdrawn, then clamp administration set.

23. Withdraw needle/catheter and apply manual pressure to venipuncture site with gauze pad until the bleeding has stopped. Apply a dressing.

24. Monitor patient’s response and vital signs. Instruct the patient to remain in a reclining position for several minutes, and then to rise slowly.

25. Observe venipuncture site for bleeding.

26. Discard used supplies.

27. Label phlebotomy container.

28. Dispose of collected blood according to organizational policy for biohazardous waste handling/disposal.

**Documentation**

Document in the patient’s health record:

- Performance of procedure
- Total volume or weight of blood withdrawn
- Vital signs before and after procedure
- Dressing applied after VAD removal or VAD locking as appropriate
- Patient education
- Patient’s response to the procedure

**Bibliography**


Figure 1. Principal Veins of the Body

Figure 2. Superficial Venous Drainage of Upper Limb
Figure 2. Superficial Venous Drainage of Upper Limb

**Figure 3. Veins of Axilla**

Figure 4. Cubital Fossa: Surface Anatomy and Superficial Dissection
