Chemotherapy administration, intravascular (IV)

Chemotherapy administration, intravascular (IV)

Revised: September 15, 2025

Introduction

Administration of chemotherapy is common via the IV route, which allows rapid absorption of the drug into the patient's system. As with all chemotherapeutic agents, IV administration requires special preparation and handling precautions. [1] [2] (See the "Chemotherapeutic drug preparation and handling" procedure.)

Chemotherapeutic drug dosages must also be exact to avoid possibly fatal complications. For these reasons, only a practitioner or registered nurse who has completed competency training in the administration and safe handling of chemotherapeutic drugs can administer chemotherapeutic drugs.[1] [3]

◆ ***Clinical alert:*** Administer vinca alkaloids in a minibag of compatible IV solution, and never administer them using an IV pump through a peripheral IV catheter.[2] Also, don't administer them using a syringe, *because administration of vinca alkaloids should only occur by the IV route.* The administration of vinca alkaloids by the intrathecal route may cause severe neurologic toxicity, including coma and death.[4] ◆

Chemotherapeutic drug dosages are usually based on the patient's total body surface area (BSA), previous response to chemotherapy or radiation therapy, and function of major body systems.[5]

The nurse must use sterile no-touch technique when administering IV chemotherapy to reduce the risk of vascular catheter–associated infection.[6]

◆ ***Hospital-acquired condition alert:*** Keep in mind that the Centers for Medicare and Medicaid Services considers vascular catheter–associated infection a hospital-acquired condition *because it can be reasonably prevented using a variety of best practices.* Make sure to follow evidence-based infection prevention practices, such as performing hand hygiene, maintaining sterile no-touch technique, limiting catheter manipulations, and removing the catheter as soon as it's no longer necessary, *to reduce the risk of vascular catheter–associated infections.*[6] [7] [8] [9] [10] ◆

The appropriately trained registered nurse administering IV chemotherapy is responsible for the prevention, early detection, and management of infusion-related complications, including hypersensitivity, anaphylaxis, cytokine release syndrome, infiltration, extravasation, irritation, and local allergic reaction.[2] Skill in performing venipuncture and assessing and managing various types of central venous access devices and drug administration systems also is essential.

Equipment

- 10-mL prefilled syringes containing preservative-free normal saline solution (or smaller syringes designed to generate lower injection pressure)
- Administration set
- Antiseptic pads (chlorhexidine-based, povidone-iodine, or alcohol)
- Appropriate detergent and supplies to clean and decontaminate surfaces
- Chemotherapy sharps container
- Disinfectant pads
- Electronic infusion device (preferably a smart pump with dose-error reduction software and interoperability with electronic health records)
- Emergency equipment (code cart with emergency medications, defibrillator, handheld resuscitation bag with a mask, suction equipment, oxygen, intubation equipment)
- Extravasation equipment

- Eye and face protection (face shield and goggles or a combination of goggles, a mask, and a face shield)[2]
- Fluid-impermeable pad
- Hazardous drug spill kit
- Hazardous-waste container approved for cytotoxic waste
- Labels
- National Institute for Occupational Safety and Health (NIOSH)–approved full-facepiece respirator (N95 or powered air-purifying respirator) or a NIOSH-approved chemical cartridge–type respirator[2] [11]
- Needleless luer-lock connectors
- Nonlinting, nonabsorbent disposable gown made of polyethylene-coated polypropylene[12]
- Powder-free chemotherapy gloves
- Prescribed chemotherapy drugs
- Prescribed IV solution
- Safety data sheet (SDS) for each prescribed chemotherapy drug
- Stethoscope
- Vital signs monitoring equipment
- Optional: biological safety cabinet (BSC), closed-system transfer device, CYTOTOXIC drug label, dextrose 5% in water (D_5W), gauze pads, hazardous label for transport bag, IV catheter insertion equipment, medication label, other personal protective equipment, other prescribed medications, scale and stadiometer, sealable transport bag, syringe with locking solution, topical anesthetic

Preparation of Equipment

Make sure that a hazardous drug spill kit, a NIOSH-approved full-facepiece respirator (for administering an aerosolized chemotherapy drug or cleaning up a large spill) or a NIOSH-approved chemical cartridge–type respirator (if gas or vapors are present), and extravasation equipment are readily available.[2] [11] [13] [14] Make sure that emergency equipment is functioning properly and readily available.

Inspect all IV equipment and supplies. If a product is expired, is defective, or has compromised integrity, remove it from patient use, label it as expired or defective, and report the expiration or defect as directed by your facility.[15]

The pharmacy can prepare the medication for you. If you must prepare the medication, perform hand hygiene and put on personal protective equipment (a nonlinting, nonabsorbent disposable gown made of polyethylene-coated polypropylene; two pairs of powder-free chemotherapy gloves; eye and face protection if splashing is likely; and a NIOSH-approved full-facepiece respirator mask if aerosolization is possible).[2] [11] Use a closed-system transfer device, and prepare the medication under a biological safety cabinet following appropriate safety standards.[16] Cap the end of the primed administration set tubing or the luer-lock end of the syringe. Label the medication with the patient's full name and second identifier, name of the prescribing practitioner, complete generic medication name, route of administration, total dose to be given, total volume required to administer the dosage, date and time of preparation, date and time of administration, and date and time of expiration (when a syringe isn't for immediate use).[3] Place a warning on the medication indicating that it's a cytotoxic medication. Wipe the outside of the solution container or syringe with a moist gauze pad, and then place it in a sealable transport bag, being sure not to contaminate the outside of the transport bag. Label the outside of the bag to indicate that its contents are hazardous. Discard material that has come into contact with the cytotoxic medication in a hazardous-waste container approved for cytotoxic waste. Use detergent and water to wash surfaces that have come into contact with the medication. Remove and discard your gown and outer gloves. Remove and discard your inner gloves. Wash your hands with soap and water.[2] [3] [12] [16]

Implementation

- Avoid distractions and interruptions when preparing and administering each medication *to prevent medication errors*.[17] [18]
- Review the patient's medical record for the following:
  - initial cancer diagnosis and staging or current cancer status
  - recent treatments, including surgery, radiation therapy, hormone therapy, chemotherapy, and complementary therapy
  - medical, psychiatric, and surgical history

    - presence of allergic or hypersensitivity reactions
    - comprehension of chemotherapy treatment
    - pregnancy and reproductive status, including last menstrual period (if applicable)
    - laboratory and radiologic test results required by chemotherapy protocol, as ordered
    - physical examination that includes assessment of organ function appropriate for the planned treatment regimen.[2][3]
- Review an accurate list of all the patient's current medications and supplements. Check for drugs that may interact with chemotherapy, *because you shouldn't mix chemotherapy drugs with other medications.* If you have questions or concerns about giving the chemotherapeutic drug, consult with the practitioner or pharmacist before you administer it.[1][2][19][20]
- Determine whether the patient has received chemotherapy before and, if so, note the severity of any adverse reactions.[2]
- If required by your facility, confirm that informed consent has been obtained and that the signed consent form is in the patient's medical record.[1][2][3][21][22][23][24]
- Read the practitioner's order, making sure that it includes the following:
    - patient's full name and a second patient identifier[2][3]
    - patient's date of birth[3]
    - name of prescribing practitioner[3]
    - date[3]
    - diagnosis[2]
    - allergies[2][3]
    - regimen or protocol name and number[2][3]
    - cycle number and day when applicable[2][3]
    - full generic name of the medications ordered[2][3]
    - dose of medications[2][3]
    - height, weight (in kilograms),[4] and any other variables used to calculate the dose[2][3]
    - method of dose calculation[2][3]
    - route of administration[2][3]
    - frequency or dates of administration[2][3]
    - rate of administration[2][3]
    - length of infusion (if applicable)[2]
    - supportive care measures, such as premedications for hypersensitivity and nausea (if necessary)[2][3]
    - criteria to administer or parameters to hold or modify a dose (such as laboratory or diagnostic test results and the patient's clinical status)[2][3]
    - sequence of medication administration (if applicable)[2][3]
    - planned duration of the treatment (such as number of cycles the order is valid for).[3]
- In collaboration with the patient's multidisciplinary team, review the patient's laboratory test results (specifically, electrolytes, hepatitis B antibodies, thyroid function tests, complete blood count, blood urea nitrogen level, platelet count, creatinine level, creatinine clearance, total bilirubin, and liver function study results, as indicated).[1]
- Review the patient's height, weight (in kilograms), and BSA. If the patient's recent weight isn't available, weigh the patient.[1][4]
- Recalculate and verify the chemotherapy drug dosage using the patient's BSA, and check your calculations against the written order.[1][3]
- Have a second qualified practitioner or nurse verify the chemotherapy order independently before medication preparation, confirming the two patient identifiers; medication name, dose, and volume; route of administration; calculation for dosing; and treatment cycle and day of cycle.[1][2][3]
- Verify that the prescribed medication dose is appropriate for the patient, diagnosis, and treatment plan. If you have concerns, consult with the prescribing practitioner or pharmacist.[25][26][27][28]
- Become familiar with the information contained within the SDS specific to each prescribed drug.[14]
- Gather and prepare the necessary equipment and supplies.
- Prepare the medication or obtain it from the pharmacy.

- When you receive the drug from the pharmacy, compare the medication label with the order in the patient's medical record.[25][26][27][28] Make sure that it's labeled properly with the patient's full name and a second identifier, name of the prescribing practitioner, full generic drug name, drug administration route, total dose to be given, total volume required to administer the dose, date of administration, and date and time of preparation and expiration. The container also should have a label that clearly identifies the drug as hazardous. Inspect the syringe or bag and compare the volume to the label; return the drug to the pharmacy if a discrepancy exists.[3]
- If you must prepare the drug yourself, make sure you label it properly. (See the "Chemotherapeutic drug preparation and handling" procedure.)

- Compare the medication label to the order in the patient's medical record.[25][26][27][28]
- Check the expiration date on the medication. If the medication is expired, return it to the pharmacy and obtain new medication.[25][26][27][28]
- Visually inspect the solution for particles, discoloration, and other signs of loss of integrity; don't administer the medication if integrity is compromised.[25][26][27][28]
- Perform hand hygiene.[29][30][31][32][33][34]
- Confirm the patient's identity using at least two patient identifiers.[35]
- Provide privacy.[36][37][38][39]
- Explain the procedure to the patient and family (if appropriate) according to their individual communication and learning needs *to increase their understanding, allay their fears, and enhance cooperation.*[40]
- Confirm that the patient received verbal and written or electronic educational materials at an appropriate reading level that included information about the diagnosis, goals of therapy, chemotherapy plan, possible long- and short-term adverse effects, risks associated with the regimen, reportable signs and symptoms, monitoring, sexual relations, contraception, special precautions, and follow-up care.[2][3] If the patient is receiving the medication for the first time, teach the patient and family (if appropriate) about potential adverse reactions or other concerns related to the medication and answer any questions before administering chemotherapy.[25][26][27][28]
- Review current medications with the patient, including over-the-counter medications and complementary and alternative therapies; notify the practitioner of any changes.[3][19][20]
- Verify allergies, previous reactions, and treatment-related toxicities with the patient.[2][3]
- Ask the patient about any psychosocial concerns and cultural or spiritual issues that may affect treatment; take action, as indicated.[3]
- Confirm the treatment plan with the patient.[3]
- Administer any prescribed premedications following safe medication administration practices.[25][26][27][28]
- Raise the bed to waist level before providing care *to prevent caregiver back strain.*[41]
- Perform hand hygiene.[29][30][31][32][33][34]
- Put on personal protective equipment, as needed, *to comply with standard precautions.*[42][43][44]
- Assess the patient's clinical and performance status (functional capacity, including the patient's ability to perform activities of daily living).[2][3]
- Obtain the patient's vital signs.[2][4]
- Determine the best site to administer the drug. When selecting the administration site, consider drug compatibilities, frequency of administration, and the vesicant and irritant potential of the drug; *you shouldn't administer continuous vesicant infusions through a peripheral IV catheter because of the risk of extravasation.*[1][2] (See *Classifying chemotherapeutic drugs*.) Use a central venous access catheter or implanted port to administer a vesicant drug that will be infusing for longer than 30 minutes.[2]

CLASSIFYING CHEMOTHERAPEUTIC DRUGS

Chemotherapeutic drugs are classified as vesicants, nonvesicants, irritants, or irritants with vesicant properties, indicating their potential to cause tissue damage.[2] Understanding these classifications helps you administer chemotherapy safely.

Vesicants	Nonvesicants	Irritants	Irritants with vesicant properties
• CISplatin (greater than 20 mL of 0.5 mg/mL)	• asparaginase • cyclophosphamide	• bleomycin • CARBOplatin	• bendamustine

• DACTINomycin • DAUNOrubicin • DOXOrubicin • epiRUBicin • IDArubicin • mechlorethamine • mitoMYcin • mitoXANTRONE • trabectedin • valrubicin • vinBLAStine • vinCRIStine sulfate • vindesine	• cytarabine • floxuridine • fluorouracil	• carmustine • dacarbazine • etoposide • gemcitabine • ifosfamide • streptozocin • topotecan	• DOCEtaxel[2] • irinotecan • melphalan • oxaliplatin • PACLitaxel[2] • vinorelbine

- If a central venous access catheter or implanted port isn't available and you must administer the drug through a peripheral IV catheter, note the following cautions:
  - Avoid using an IV site that's more than 24 hours old.[1][2]
  - Assess the IV site for signs of inflammation and infiltration.
  - If the integrity of the IV site is uncertain, insert a new IV catheter at another site.[1][2]
- To identify an administration site, examine the patient's veins, starting with the hand and proceeding to the forearm. Veins of choice are pliable and smooth; large veins of the forearm are preferred.[2] Select the smallest gauge and shortest catheter necessary to accommodate the prescribed therapy and avoid the use of steel needles.[2] (See the "IV catheter insertion" procedure.)

◆ ***Clinical alert:*** If you're using a topical anesthetic before peripheral IV insertion, use one with a short duration of action, *because longer-acting topical anesthetics, such as eutectic mixture of local anesthetics (EMLA) cream (lidocaine 2.5% and prilocaine 2.5%), may mask changes in sensation at the IV site that signal possible vesicant extravasation.*[45] ◆

- Remove and discard your personal protective equipment, if worn.[44]
- Perform hand hygiene.[29][30][31][32][33][34]
- Put on necessary personal protective equipment, including two pairs of powder-free chemotherapy gloves; a nonlinting, nonabsorbent disposable gown made of polyethylene-coated polypropylene; eye and face protection *(because splashing is likely);* and a respirator if necessary.[1][11][13][16] Be sure to wear your inner glove cuffs under the gown cuffs and the outer glove cuffs extending over the gown cuffs *to protect your skin fully.* Inspect your gloves *to make sure they're physically intact.*[12] Wear personal protective equipment through all stages of handling and administering the chemotherapy drug.[13] (See *Safe handling of chemotherapeutic drugs*.)
- Change your gloves every 30 minutes. If a drug spill occurs or your gloves become punctured or torn, remove and discard them immediately, wash your hands with soap and water, and then put on new gloves.[2][12][11][13][16][46]

EQUIPMENT

SAFE HANDLING OF CHEMOTHERAPEUTIC DRUGS

When preparing and administering chemotherapeutic drugs, you must strictly enforce safe handling and personal protection *to prevent accidental exposure to cytotoxic drugs.* NIOSH recommends reducing exposure risk by using the following personal protective equipment.[12][46]

Gowns

- Use a nonlinting, nonabsorbent disposable gown made of polyethylene-coated polypropylene; it should have long sleeves with tight-fitting cuffs.[12] The gown shouldn't have seams or closures that may permit drugs to pass through.

- Dispose of your gown after each use; *reusing a gown increases the risk of exposure to hazardous drugs.*
- Wear a gown whenever splashing or spilling is possible, such as when compounding or administering drugs.
- Don't wear your gown outside the compounding or administration area *to avoid contaminating other areas with the hazardous drug*.
- If gown permeation information isn't available, change your gown every 2 to 3 hours or immediately if a drug spill or splash occurs.[2] [12] [46]

Gloves

- Use powder-free chemotherapy gloves.
- Inspect your gloves for defects before use.
- Remove and discard your gloves every 30 minutes; remove and discard them immediately if they become damaged and when you know or suspect they've come into contact with the chemotherapy drug.
- Wear two pairs of gloves when compounding, administering, and disposing of hazardous drugs. Wear the inner gloves under the gown cuffs and the outer gloves over the cuffs. Place gloves with long cuffs over the cuffs of the gown *to protect the wrist and forearm.*
- Turn gloves inside out when removing them *so contaminated surfaces don't touch uncontaminated surfaces.*
- Wash your hands thoroughly with soap and water after taking off your gloves.
- Wear sterile chemotherapy gloves when compounding sterile preparations.[2] [12] [46]

Eye and face protection

- Wear a face shield and goggles or a combination of goggles, a mask, and a face shield whenever splashing is likely; *face shields alone don't provide adequate eye and face protection*.[2] [13]
- Wear a face shield and goggles or a combination of goggles, a mask, and a face shield when compounding a drug outside the BSC or isolator (for example, in the operating room), working at or above eye level, cleaning a BSC or isolator, or cleaning a drug spill.[2]

Respirators

- Use a NIOSH-approved full-facepiece respirator when inhalation is possible, such as when administering an aerosolized chemotherapy drug or for cleaning up large drug spills (for instance, when an IV bag breaks or a line disconnects and leaks).[2] [11] [13]
- Use a NIOSH-approved chemical cartridge–type respirator when a known or suspected airborne exposure to vapors or gases occurs.[2] [11] [14] [46]

Consider all personal protective equipment worn when handling hazardous drugs as contaminated with hazardous drugs; contain and dispose of used personal protective equipment in a hazardous-waste container.[13]

According to NIOSH, you should prepare cytotoxic drugs, including oral drugs that you must compound or crush, in a primary engineering control (PEC), such as a BSC or a compounding sterile containment isolator. The PEC should provide vertical laminar airflow, eliminate exhaust with a high-efficiency particulate air filter (vented outside, ideally), and have a blower that runs continuously. The room in which a BSC is located should be in a buffer area with negative pressure and restricted to authorized personnel. The use of a PEC doesn't eliminate the need for personal protective equipment *to prevent inhalation, direct skin contact, and direct eye contact.*[2]

Use tubing and syringes with luer-lock connectors. Spike IV bags and prime tubing with a compatible IV solution before adding the cytotoxic drug. Apply a label that reads CYTOTOXIC AGENT or a similar distinct warning, and wipe the outside of the container with a moist gauze pad before placing it in a sealable bag for transport. Select a transport bag that can contain spillage if dropped. Label the outermost part of the bag *to indicate that the contents are hazardous.* Make sure that whoever transports the drug has access to a hazardous drug spill kit and knows how to use it.[2]

Storage and labeling of chemotherapeutic drugs should follow the facility's pharmacy guidelines. *To prevent accidental ingestion of cytotoxic agents,* never eat, drink, smoke, chew gum, apply cosmetics, or store food in

areas where chemotherapy is prepared or administered. All personnel who handle chemotherapeutic drugs also should have specific education related to hazardous waste and spill precautions.

- Establish blood return and patency, regardless of the IV access type, *to prevent extravasation injury.*[1][2][47]
  - Perform a vigorous mechanical scrub of the needleless connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.[7][48]
  - While maintaining sterility of the syringe tip, attach a prefilled 10-mL syringe or a syringe specifically designed to generate lower injection pressure containing preservative-free normal saline solution to the needleless connector. Unclamp the catheter and slowly aspirate for a blood return (if not contraindicated) that's the color and consistency of whole blood. If you don't obtain a blood return, take steps to locate an external cause of obstruction.[47]
  - If you obtain a blood return, inject preservative-free normal saline solution slowly into the catheter. Use a minimum volume of twice the internal volume of the catheter system. Don't forcibly flush the device; further evaluate the device if you meet resistance.[47]
  - Remove and discard the syringe.[44]

◆ ***Clinical alert:*** Don't test vein patency with a chemotherapeutic drug. *If the vein isn't patent, severe tissue damage may result.* Use preservative-free normal saline solution (or, less commonly, a D_5W solution if the medication is incompatible with normal saline solution) *to assess patency and flush the IV device.*[47] ◆

- If your facility uses bar-code technology, use it as directed by your facility.
- Perform a vigorous mechanical scrub of the needleless luer-lock connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.[7][48]
- If you're administering the chemotherapy drug by piggyback or short-term infusion, trace the IV tubing from the patient to the point of origin and then attach the tubing to the appropriate injection port using a needleless luer-lock connector. If you're administering by continuous infusion, trace the IV tubing from the patient to the point of origin and then attach the tubing directly to the IV catheter or into a compatible line of maintenance IV solution *to make sure that you're connecting the tubing to the proper port* and then begin the IV fluid infusion, as ordered.[49] Secure all connections with luer-lock devices. Route the tubing in a standardized direction if the patient has other tubing and catheters having different purposes. Label the tubing at both the distal end (near the patient connection) and proximal end (near the source container) *to reduce the risk of misconnection if multiple IV lines will be used.* If you're administering the drug by IV injection, refer to the practitioner's orders and pharmacy guidelines for recommended IV injection rates, diluents, and other drug-specific details.[2]
- Use an electronic infusion device for specific types of antineoplastic drugs and for all continuous infusions.[1][2]

◆ ***Clinical alert:*** Chemotherapy drugs are considered high-alert medications *because they can cause significant patient harm when used in error.*[50] ◆

- Before administering the drug, have another practitioner or nurse who's qualified to prepare or administer chemotherapy perform an independent double-check *to verify the patient's identity and to make sure that you have the correct medication in the prescribed strength or concentration; the medication's indication corresponds with the patient's diagnosis; the dosage calculations are correct and the dosing formula used to derive the final dose is correct; the prescribed route of administration is safe and proper for the patient; the prescribed time and frequency of administration is safe and proper for the patient; and, if an infusion, the pump settings are correct and the infusion line is attached to the correct port.*[3][50] Ensure that both you and the other qualified practitioner or nurse involved in the independent double-check sign your names in the patient's medical record *to indicate that the verification took place.*[1][2][3][51]
- After comparing the results of the independent double-check with the other qualified practitioner or nurse, administer the medication if there are no discrepancies. If discrepancies exist, rectify them before administering the drug.[51]
- Begin chemotherapy administration, as prescribed. Make sure that the administration set tubing is labeled clearly *to alert staff members that a hazardous drug is being administered.*[50]
- During IV administration, monitor the patient closely for signs and symptoms of a hypersensitivity reaction (agitation, chest tightness, shortness of breath, hypotension, rash, itching, facial edema, light-headedness,

dizziness, and abdominal cramping) or extravasation (swelling, redness, stinging, burning or pain at the access site, loss of blood return from the device, and slowing or stopping of the IV flow rate).[1][2]

- When administering a vesicant drug by short-term infusion using a peripheral vein, stay with the patient during the infusion. Monitor the access site for extravasation, and verify blood return every 5 minutes. When administering a vesicant drug by IV injection, verify blood return every 2 mL to 5 mL. When administering a vesicant drug through a central venous device or implanted port, check for blood return periodically.[1][2]
- After chemotherapy administration, place a fluid-impermeable pad underneath the connection site between the access device and administration set tubing *to absorb drug droplets that may spill.* Disconnect the tubing from the access site, and then remove the IV container with the tubing attached; don't remove the spike from the IV container or reuse the tubing.[2]
- Discard the IV container, tubing, and fluid-impermeable pad in a cytoxic hazardous-waste container. Discard syringes in a chemotherapy sharps container.[2][12][13]
- Perform a vigorous mechanical scrub of the needleless luer-lock connector for at least 5 seconds using an antiseptic pad. Allow it to dry completely.[7][48]
- While maintaining sterility of the syringe tip, attach a prefilled 10-mL syringe or a syringe specifically designed to generate lower injection pressure containing preservative-free normal saline solution to the needleless connector. Unclamp the catheter and inject preservative-free normal saline solution into the catheter at the same rate of injection as the prescribed medication. Use the amount of flush solution necessary to clear the medication adequately from the administration set lumen and the catheter. Don’t forcibly flush the device; further evaluate the device if you meet resistance. Consider using a pulsatile flushing technique, *because short boluses of the flush solution interrupted by short pauses may be more effective at removing deposits than a continuous low-flow technique.* Alternatively, if the medication is incompatible with normal saline solution, use D_5W, followed by preservative-free normal saline solution. Don’t allow D_5W to remain in the catheter lumen, *because it provides nutrients for biofilm growth.*[47]
- Remove and discard the syringe.[44]
- Proceed with locking the device if necessary.[47]
- Return the bed to the lowest position *to prevent falls and maintain the patient's safety.*[52]
- Clean and decontaminate surfaces that may have come into contact with the drug.[2][12][16]
- Remove your personal protective equipment and discard it in a hazardous-waste container.[13] Remove and discard your gown and outer gloves first, and then remove and discard your inner gloves.[2][12]
- Wash your hands with soap and water.[16]
- Clean and disinfect your stethoscope with a disinfectant pad.[53][54]
- Perform hand hygiene.[29][30][31][32][33][34]
- Document the procedure.[55][56][57][58][59]

Special Considerations

- Note that verbal orders aren't permitted for chemotherapeutic agents except to hold or stop chemotherapy administration.[1][2][3]
- For patients in a health care setting, measure weight at least weekly or as directed by your facility.[2][3] Measure height at least weekly and when appropriate to the treatment population or as directed by your facility.[2][3]
- Monitor the patient's cumulative chemotherapy dose *to make sure that the drug is discontinued if the maximum lifetime dose is achieved.*[1]
- Be aware that each chemotherapeutic agent has unique adverse effects. Assess and monitor the patient for anticipated adverse effects to the agent administered. Evaluate, grade, and document treatment-related toxicities using standard definitions and criteria.[3]
- The Joint Commission issued a sentinel event alert related to managing risk during transition to the new International Organization for Standardization tubing standards that were designed to prevent dangerous tubing misconnections, which can lead to serious patient injury and death. During the transition, trace the tubing and catheters from the patient to the point of origin before connecting or reconnecting any device or infusion, at any care transition (such as a new setting or service), and as part of the handoff process; route tubes and catheters having different purposes in different standardized directions; when there are different

access sites or several bags hanging, label the tubing at both the distal and proximal ends; use tubing and equipment only as intended; and store medications for different delivery routes in separate locations.[60]

- If the administration set tubing becomes disconnected, put on gloves and clamp the patient's IV catheter close to the IV access site. Put on personal protective equipment. Ensure the patency of the IV catheter, and take measures to maintain patency until you can resume chemotherapy administration.[2]
- If a chemotherapy drug comes into contact with your skin, wash the involved area thoroughly with soap (not a germicidal agent) and water. If eye contact occurs, flood the eye with water or normal saline solution for at least 15 minutes while holding the eyelid open. Obtain a medical evaluation as soon as possible after accidental exposure.[11] [16] Complete a safety event report, as directed by your facility.[2]
- Be aware that you must handle patient excreta (urine and feces) contaminated with cytotoxic drugs or their metabolic byproducts as cytotoxic waste materials for at least 48 hours following the last dose of chemotherapy.[3] [13] Some cytotoxic drug residue may be present in excreta for longer; if information about longer excretion time is known, use precautions for the entire time that cytotoxic drug residue is likely to be present.[2]
- If a chemotherapy drug spill occurs, take appropriate measures.[1] [13] (See the "Hazardous drug spill management" procedure.)
- During infusion, some drugs need protection from direct sunlight *to avoid possible drug breakdown.* In this case, cover the container with a brown paper bag or aluminum foil.[2]
- Note that any health care worker who's pregnant, trying to conceive, or breastfeeding must avoid exposure to chemotherapeutic agents.[2] [13] [14] [61]
- If you suspect extravasation, stop the infusion immediately, leave the IV catheter in place, and notify the practitioner.[62] (See *Managing extravasation*.)
- If the patient is enrolled in a clinical trial, review the trial's protocol for the correct drug dosage and administration schedule. Confirm that informed consent has been obtained for participation in the clinical trial.

COMPLICATIONS

MANAGING EXTRAVASATION

Extravasation—the infiltration of a vesicant drug into the surrounding tissue—may result from a punctured vein or leakage around a venipuncture site. If vesicant drugs or fluids extravasate, then blistering, peeling, and sloughing of the skin; tissue necrosis; damage to tendons, nerves, and joints; functional and sensory impairment of the affected area; and disfigurement may occur.[2] [62]

Extravasation of vesicant drugs requires emergency treatment.[62] Essential steps include the following:

- Immediately stop administering the vesicant drug and other IV fluids infusing through the access device.[2] [62]
- Disconnect the IV tubing from the access device, but don't remove the device or noncoring needle.[2] [62]
- Attempt to aspirate residual vesicant drug from the access device or noncoring needle using a small syringe (3 mL).[2] [62]
- Notify the practitioner.[2] [62]
- Remove the peripheral IV catheter or the noncoring needle after the treatment plan has been determined.[2] [62]
- Use a standardized scale to assess and document the extent of extravasation.[62]
- Estimate the amount of solution that has escaped into the tissue based on the rate of injection or infusion and the length of time since your last assessment.[62]
- Treat the access site, as prescribed; treatment can include elevating the extremity, cold or heat application, and antidote administration.[2] [62]
- Keep in mind that surgical intervention may be necessary in some cases.

Patient Teaching

Before a patient begins a chemotherapy regimen, provide verbal and written or electronic information about the diagnosis, goals of therapy, planned schedule and duration of chemotherapy administration, possible short- and long-term adverse effects, and regimen- or drug-specific signs and symptoms that require medical attention. The information should include emergency contact information for the practice or organization, signs and symptoms that should trigger a call, and the person to call. Also, provide a plan for monitoring and follow-up care. Make sure that the materials provided are appropriate for the patient's or family's (if applicable) reading level and understanding.[3]

Instruct the patient to flush the toilet with the lid down for the first 48 hours after receiving a dose of chemotherapy. Teach the patient and family (if applicable) how to handle contaminated bed linens and clothing. Suggest that, while wearing gloves, they place contaminated items in a pillowcase and then machine wash them twice in hot water with regular detergent, separately from other household items. Have them dispose of used gloves in an appropriately labeled hazardous-waste container.[1] [2] [13]

Complications

Complications associated with intravascular chemotherapy administration may include:

- alopecia
- anemia
- anorexia
- bone marrow suppression
  - neutropenia
  - thrombocytopenia
- cardiotoxicity
- constipation[2]
- diarrhea
- esophagitis
- extravasation
  - tissue damage into the subcutaneous or subdermal tissue or other unintended sites
- hearing loss
- hypersensitivity
  - anaphylaxis
  - cytokine release syndrome
- infiltration
- infusion reactions
- intestinal irritation
- irritation or inflammation at the access site
- local allergic reaction along the vein (flare reaction)
- nausea and vomiting (mild to debilitating)
- nephrotoxicity
- neurotoxicity
- pulmonary fibrosis
- radiation recall (if drugs are given with or soon after radiation therapy)
- stomatitis
- urticaria.[2]

Documentation

Documentation associated with intravascular chemotherapy administration includes:

- nursing documentation on a chemotherapy flow sheet (if required)
- premedication administered before the procedure
- location and description of the access site
- verification of blood return
- medication administered
  - medication name
  - medication strength
  - dose
  - route of administration
- sequence of drug administration
- needle type and size used
- amount and type of flushing solution
- site's condition after treatment
- adverse reactions

    - name of the practitioner notified
    - date and time of notification
    - prescribed interventions
    - response to those interventions
- treatment-related adverse reactions using standardized criteria[2] [63]
- teaching provided to the patient and family (if applicable)
    - understanding of that teaching
    - follow-up teaching needed
- treatment required after chemotherapy administration.

Related Procedures

- Chemotherapy administration, intravascular (IV), pediatric

Related UpToDate Patient Teaching Handouts

- Chemotherapy
- Chemotherapy – Discharge instructions
- Hazardous medicine safety at home
- What to watch for when you have an IV

References

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

1. Standard 58. Antineoplastic therapy. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S218–S221. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
2. Olsen, M. M., et al. (Eds.). (2024). *Chemotherapy and immunotherapy guidelines and recommendations for practice* (2nd ed.). Oncology Nursing Society.
3. Siegel, R. D., et al. (2024). Antineoplastic therapy administration safety standards for adult and pediatric oncology: ASCO-ONS standards. *JCO Oncology Practice, 20*(10) 1314–1330. Retrieved July 2025 from https://doi.org/10.1200/OP.24.00216 (Level VII)
4. Institute for Safe Medication Practices. (2024). *2024-2025 targeted medication safety best practices for hospitals.* Retrieved July 2025 from https://www.ismp.org/guidelines/best-practices-hospitals
5. Hinkle, J. L., & Cheever, K. H. (2021). *Brunner & Suddarth's textbook of medical-surgical nursing* (15th ed.). Wolters Kluwer.
6. Centers for Medicare and Medicaid Services. (2024). *ICD-10 HAC list.* Retrieved July 2025 from https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/icd10_hacs
7. Buetti, N., et al. (2022). SHEA/IDSA practice recommendation: Strategies to prevent central line-associated bloodstream infections in acute care hospitals, 2022 update. *Infection Control and Hospital Epidemiology, 43*(5), 553–569. Retrieved July 2025 from https://doi.org/10.1017/ice.2022.87 (Level I)
8. Centers for Disease Control and Prevention. (2011, revised 2017). *Guidelines for the prevention of intravascular catheter-related infections.* Retrieved July 2025 from https://www.cdc.gov/infection-control/media/pdfs/Guideline-BSI-H.pdf (Level I)
9. Standard 47. Vascular access device-related infection. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S170–S174. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
10. Association of Professionals in Infection Control and Epidemiology (APIC). (2015). *APIC implementation guide: Guide to preventing central line-associated bloodstream infections.* Retrieved July 2025 from http://apic.org/Resource_/TinyMceFileManager/2015/APIC_CLABSI_WEB.pdf (Level IV)
11. Power, L. A., & Coyne, J. W. (2018). ASHP guidelines on handling hazardous drugs. *American Journal of Health-System Pharmacy, 75*(24), 1996–2031. Retrieved July 2025 from https://doi.org/10.2146/ajhp180564 (Level VII)
    Abstract | Complete Reference
12. National Institute for Occupational Safety and Health (NIOSH). (2004). *NIOSH alert: Preventing occupational exposures to antineoplastic and other hazardous drugs in health care settings.* Retrieved July 2025 from https://www.cdc.gov/niosh/docs/2004-165/pdfs/2004-165.pdf (Level VII)
13. Standard 15. Hazardous drugs and waste. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S58–S61. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
14. Occupational Safety and Health Administration. (n.d.). *Controlling occupational exposure to hazardous drugs*. Retrieved July 2025 from https://www.osha.gov/hazardous-drugs/controlling-occex (Level I)

15. Standard 12. Product management. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S52–S53. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
16. United States Pharmacopeial Convention (USP). (2020). *USP general chapter <800>: Hazardous drugs—handling in healthcare settings.* Retrieved July 2025 from http://www.usp.org/compounding/general-chapter-hazardous-drugs-handling-healthcare (Level VII)
17. Westbrook, J., et al. (2010). Association of interruptions with an increased risk and severity of medication administration errors. *Archives of Internal Medicine, 170*(8), 683–690. Retrieved July 2025 from https://doi.org/10.1001/archinternmed.2010.65 (Level IV)
Abstract | Complete Reference
18. Institute for Safe Medication Practices. (2012). Side tracks on the safety express: Interruptions lead to errors and unfinished…Wait, what was I doing? *Nurse Advise-ERR, 11*(2), 1–4. Retrieved July 2025 from https://www.medscape.com/viewarticle/778966
19. The Joint Commission. (2025). Standard NPSG.03.06.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
20. Accreditation Commission for Health Care. (2025). Standard 25.02.03. *Accreditation requirements for acute care hospitals.* (Level VII)
21. DNV GL-Healthcare USA, Inc. (2024). PR.2.SR.3. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 24.* (Level VII)
22. Accreditation Commission for Health Care. (2025). Standard 15.01.04. *Accreditation requirements for acute care hospitals.* (Level VII)
23. The Joint Commission. (2025). Standard RI.01.03.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
24. Centers for Medicare and Medicaid Services. (2024). Condition of participation: Patient's rights. 42 C.F.R. § 482.13(b)(2).
25. The Joint Commission. (2025). Standard MM.06.01.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
26. Centers for Medicare and Medicaid Services. (2024). Condition of participation: Nursing services. 42 C.F.R. § 482.23(c).
27. Accreditation Commission for Health Care. (2025). Standard 16.01.03. *Accreditation requirements for acute care hospitals.* (Level VII)
28. DNV GL-Healthcare USA, Inc. (2024). MM.1.SR.3. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 24.* (Level VII)
29. The Joint Commission. (2025). Standard NPSG.07.01.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
30. Centers for Disease Control and Prevention. (2002). Guideline for hand hygiene in health-care settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *MMWR Recommendations and Reports, 51*(RR-16), 1–45. Retrieved July 2025 from https://www.cdc.gov/mmwr/pdf/rr/rr5116.pdf (Level VII)
31. World Health Organization (WHO). (2009). *WHO guidelines on hand hygiene in health care: First global patient safety challenge, clean care is safer care.* Retrieved July 2025 from https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1 (Level VII)
32. Centers for Medicare and Medicaid Services. (2024). Condition of participation: Infection control. 42 C.F.R. § 482.42.
33. Accreditation Commission for Health Care. (2025). Standard 07.02.05. *Accreditation requirements for acute care hospitals.* (Level VII)
34. DNV GL-Healthcare USA, Inc. (2024). IC.1.SR.3f. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 24.* (Level VII)
35. The Joint Commission. (2025). Standard NPSG.01.01.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
36. Centers for Medicare and Medicaid Services. (2024). Condition of participation: Patient's rights. 42 C.F.R. § 482.13(c)(1).
37. Accreditation Commission for Health Care. (2025). Standard 15.01.07. *Accreditation requirements for acute care hospitals.* (Level VII)
38. The Joint Commission. (2025). Standard RI.01.01.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
39. DNV GL-Healthcare USA, Inc. (2024). PR.2.SR.5. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 24.* (Level VII)

40. The Joint Commission. (2025). Standard PC.02.01.21. *Comprehensive accreditation manual for hospitals.* (Level VII)
41. Waters, T. R., et al. (2009). *Safe patient handling training for schools of nursing.* Retrieved July 2025 from https://www.cdc.gov/niosh/docs/2009-127/pdfs/2009-127.pdf (Level VII)
42. Siegel, J. D., et al. (2007, revised 2024). *2007 guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings.* Retrieved July 2025 from https://www.cdc.gov/infection-control/media/pdfs/Guideline-Isolation-H.pdf (Level VII)
43. Accreditation Commission for Health Care. (2025). Standard 07.02.04. *Accreditation requirements for acute care hospitals.* (Level VII)
44. Occupational Safety and Health Administration. (2019). *Bloodborne pathogens, standard number 1910.1030.* Retrieved July 2025 from https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1030 (Level VII)
45. Schulmeister, L. (2010). Preventing and managing vesicant chemotherapy extravasations. *Journal of Supportive Oncology, 8*(5), 212–215. Abstract | Complete Reference
46. National Institute for Occupational Safety and Health. (2008). *Workplace solutions: Personal protective equipment for health care workers who work with hazardous drugs.* Retrieved July 2025 from https://www.cdc.gov/niosh/docs/wp-solutions/2009-106/pdfs/2009-106.pdf (Level VII)
47. Standard 38. Flushing and locking. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S126–S131. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
48. Standard 34. Needleless connectors. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S114–S118. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
49. U.S. Food and Drug Administration. (2023). *Examples of medical device misconnections.* Retrieved July 2025 from https://www.fda.gov/medical-devices/medical-device-connectors/examples-medical-device-misconnections
50. Institute for Safe Medication Practices (ISMP). (2024). *ISMP list of high-alert medications in acute care settings.* Retrieved July 2025 from https://www.ismp.org/system/files/resources/2024-01/ISMP_HighAlert_AcuteCare_List_010924_MS5760.pdf
51. Institute for Safe Medication Practices. (2019). *Independent double checks: Worth the effort if used judiciously and properly.* Retrieved July 2025 from https://home.ecri.org/blogs/ismp-alerts-and-articles-library/independent-double-checks-worth-the-effort-if-used-judiciously-and-properly (Level VII)
52. Ganz, D. A., et al. (2013). *Preventing falls in hospitals: A toolkit for improving quality of care* (AHRQ publication no. 13-0015-EF). Agency for Healthcare Research and Quality. Retrieved July 2025 from https://www.ahrq.gov/sites/default/files/publications/files/fallpxtoolkit.pdf (Level VII)
53. Rutala, W. A., et al. (2008, updated 2024). *Guideline for disinfection and sterilization in healthcare facilities, 2008.* Retrieved July 2025 from https://www.cdc.gov/infection-control/media/pdfs/Guideline-Disinfection-H.pdf (Level I)
54. Accreditation Commission for Health Care. (2025). Standard 07.04.01. *Accreditation requirements for acute care hospitals.* (Level VII)
55. The Joint Commission. (2025). Standard RC.01.03.01. *Comprehensive accreditation manual for hospitals.* (Level VII)
56. Centers for Medicare and Medicaid Services. (2024). Condition of participation: Medical record services. 42 C.F.R. § 482.24(b).
57. Accreditation Commission for Health Care. (2025). Standard 10.00.03. *Accreditation requirements for acute care hospitals.* (Level VII)
58. DNV GL-Healthcare USA, Inc. (2024). MR.2.SR.1. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 24.* (Level VII)
59. Standard 10. Documentation in the health record. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S45–S48. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
60. The Joint Commission. (2014). *Sentinel event alert 53: Managing risk during transition to new ISO tubing connector standards.* Retrieved July 2025 from https://digitalassets.jointcommission.org/api/public/content/df1ada467ed147518c77827f35acd1ea?v=101e5070 (Level VII)
61. Lawson, C. C., et al. (2012). Occupational exposures among nurses and risk of spontaneous abortion. *American Journal of Obstetrics and Gynecology, 206*(4), 327.e1–327.e8. Retrieved July 2025 from

https://doi.org/10.1016/j.ajog.2011.12.030 (Level IV)
Abstract | Complete Reference

62. Standard 44. Infiltration and extravasation. Infusion therapy standards of practice (9th ed.). (2024). *Journal of Infusion Nursing, 47*(Suppl. 1), S154–S163. Retrieved July 2025 from https://doi.org/10.1097/nan.0000000000000532 (Level VII)
63. U.S. Department of Health and Human Services. (2017). *Common terminology criteria for adverse events (CTCAE) version 5.0.* Retrieved July 2025 from https://ctep.cancer.gov/protocoldevelopment/electronic_applications/docs/CTCAE_v5_Quick_Reference_5x7.pdf

Additional References

- National Institute for Occupational Safety and Health (NIOSH). (2024). *NIOSH list of antineoplastic and other hazardous drugs in healthcare settings, 2024.* Retrieved July 2025 from https://www.cdc.gov/niosh/docs/2025-103/pdfs/2025-103.pdf?id=10.26616/NIOSHPUB2025103 (Level VII)
- Sharour, L. A. (2020). Oncology nurses' knowledge about exploring chemotherapy-related — extravasation care: A cross-sectional study. *Clinical Epidemiology and Global Health, 8*(3), 780–784. Retrieved July 2025 from https://doi.org/10.1016/j.cegh.2020.01.019 (Level VI)

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

The following leveling system is adapted from *Evidence-Based practice in nursing & healthcare: A guide to best practice,* Fifth edition, by Bernadette Mazurek Melnyk and Ellen Fineout-Overholt (2023).

Level I	Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)
Level II	Evidence from well-designed single RCTs (experimental)
Level III	Evidence from well-designed nonrandomized controlled trials (quasi-experimental), systematic reviews of a complete body of evidence, and intervention studies using mixed methods
Level IV	Evidence from well-designed case-control and cohort studies (observational)
Level V	Evidence from systematic reviews of qualitative and descriptive studies
Level VI	Evidence from single descriptive and qualitative studies, evidence-based practice implementation, and quality improvement projects
Level VII	Evidence from expert opinion, expert committee reports, and literature reviews

Data from Gyatt, G., & Rennie D. (2002). Users' guides to the medical literature. American Medical Association; Harris, R. P., et al. (2001). Current methods of the U.S. Preventative Services Task Force: A review of the process. American Journal of Preventative Medicine, 20, 21-35.