Antineoplastic Drug Administration: Intravenous (Oncology) - CE

ALERT

Don appropriate personal protective equipment (PPE) based on the patient’s signs and symptoms and indications for isolation precautions.

Refer to Oncology Nursing Society (ONS) interim guidelines for PPE recommendations during an emergent shortage of PPE (e.g., pandemic).8

Ensure that a licensed independent practitioner is on site and immediately available during all antineoplastic drug administration.7

Only qualified physicians, physician assistants, advanced practice registered nurses (APRNs), or nurses with demonstrated competency administer antineoplastic therapies. Refer to the professional’s regulatory scope of practice and the organization’s practice.

Institute special precautions to prevent exposure to hazardous medications when handling, administering, and caring for patients receiving antineoplastic therapies.9 Exposure to hazardous medications, including antineoplastic drugs, poses health risks for caregivers and health care team members, including carcinogenicity, teratogenicity, genotoxicity, and impaired fertility.

Remember to route tubes and catheters having different purposes in different, standardized directions (e.g., IV lines routed toward the head; enteric lines toward the feet). This is especially important in the care of neonates.4

Take steps to eliminate interruptions and distractions during medication preparation.

OVERVIEW

In general, antineoplastic drug therapy is the use of chemical and biologic agents to destroy cancer cells. The use of these drugs is based on cellular kinetics, including the cell cycle, cell-cycle time, growth fraction, and tumor burden. Antineoplastic therapies are classified according to the phase of action during the cell cycle, mechanism of action, biochemical structure, or physiologic action.

Antineoplastic agents can be systemic treatments for malignancies such as solid tumors, including those that have metastasized regionally or distantly, as well as those of the hematopoietic system. They can also be administered regionally to provide a higher local dose of antineoplastic therapy to a focused area of the body that is impacted by cancer. Antineoplastic agents can be administered in adjuvant (primary treatment) and neoadjuvant settings (before the primary treatment), as single agents, in combination with other agents, or concurrently with radiation therapy. Treatment decisions are individualized to various patient specific factors including age, comorbidities, cancer cell specific factors (e.g. hormone or protein expression, molecular targets), tumor location, tumor burden, and potential toxicities or side effects.

Antineoplastic agents are administered across a variety of routes depending upon the disease state and goal of therapy (e.g. oral, intramuscular, intrahepatic, intraperitoneal, intrathecal, intravenous, and subcutaneous). Antineoplastic hazardous drugs are considered
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To present a hazard regardless of the route or setting in which they are given and must be handled differently than other medications.

The IV route is one of the most commonly used for administration of antineoplastic therapy. IV antineoplastic agents are administered using vascular access devices (VADs), such as short-term catheters (e.g., peripheral), long-term catheters (e.g., tunneled, nontunneled), implanted ports, and peripherally inserted central catheters (PICCs). IV antineoplastic agents may be given via IV push or short-term or continuous infusion depending on the agent and regimen. In some cases, IV antineoplastic therapy is administered via continuous infusion involving an infusion pump. When IV antineoplastic therapy is given this way, steps should be taken to avoid dosing errors, such as having the practitioner order the medication as single, daily doses, with directions to infuse continuously over a specified period of days, and teaching patients and caregivers to regularly check the pump settings to ensure that the medication is infusing correctly. Programmable infusion pumps with dose error–reducing software should be used for IV antineoplastic administration whenever possible. If vinca alkaloids are being administered, dispense in a minibag labeled “for intravenous use only – fatal if given by other routes” to help ensure that they are administered by the intravenous route only.

IV antineoplastic agent dosing is often based on the patient’s body surface area (BSA), which is the estimated total area of a person’s skin expressed in square meters (m²). An accurate height and weight in kilograms is necessary for calculating BSA. Another dosing method, used for agents such as carboplatin, is based on the area under the serum concentration time curve (area under the curve, or AUC). AUC refers to the amount of drug exposure over time or the total drug concentration in plasma over time. Drug dosing is aimed toward a target AUC as it relates to a patient’s specific renal function.

In addition to pretreatment assessment to determine their candidacy to receive antineoplastic therapy, patients being considered for IV antineoplastic therapy should have their venous access status assessed (and reassessed throughout treatment), particularly as it relates to the irritant or vesicant nature of the drugs (Table 1), the intended administration method, and the duration of prescribed therapy.

### Table 1 Selected IV Antineoplastic Vesicants and Irritants

<table>
<thead>
<tr>
<th>Vesicants</th>
<th>Irritants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dactinomycin</td>
<td>Bendamustine</td>
</tr>
<tr>
<td>Daunorubicin</td>
<td>Bleomycin</td>
</tr>
<tr>
<td>Docetaxel</td>
<td>Bortezomib</td>
</tr>
<tr>
<td>Doxorubicin</td>
<td>Carboplatin</td>
</tr>
<tr>
<td>Epirubicin</td>
<td>Carmustine</td>
</tr>
<tr>
<td>Idarubicin</td>
<td>Cisplatin</td>
</tr>
<tr>
<td>Mitomycin-C</td>
<td>Cyclophosphamide</td>
</tr>
<tr>
<td>Nitrogen mustard</td>
<td>Etoposide</td>
</tr>
<tr>
<td>Paclitaxel</td>
<td>Fludarabine</td>
</tr>
<tr>
<td>Vinca alkaloids (e.g. vinblastine, vincristine, vinorelbine)</td>
<td>5-fluorouracil</td>
</tr>
<tr>
<td></td>
<td>Gemcitabine</td>
</tr>
<tr>
<td></td>
<td>Ifosfamide</td>
</tr>
<tr>
<td></td>
<td>Irinotecan</td>
</tr>
<tr>
<td></td>
<td>Liposomal doxorubicin</td>
</tr>
</tbody>
</table>
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- Melphalan
- Methotrexate
- Oxaliplatin
- Topotecan

*List not all inclusive*

Use of VADs may be preferred when the duration of therapy is likely to be long or if vesicants or irritants are being administered. VAD use also allows for collection of blood specimens, which can be problematic in those with poor peripheral access. Extravasation of vesicant agents through the peripheral route can lead to tissue injury and necrosis. Vesicant agents should be administered through the central route whenever possible, and blood return should always be assessed before the initiation of any IV antineoplastic therapy. Nurses administering IV antineoplastic therapy must be alert to patients at risk for extravasation, as well as the signs and symptoms of an extravasation. Patients should be taught to report any symptom that occurs during IV antineoplastic administration. Each concern verbalized by the patient should be investigated. In areas where IV antineoplastic therapy is mixed, independent verification should be performed to ensure that the proper type and volume of medication and diluent are added before its addition to the final container. Institutions should also have defined processes on how to address overfill of IV solutions, particularly in continuous infusions. Emergency equipment, including epinephrine, should be readily available in the event of anaphylaxis, as well as antidotes in the event of extravasation.

Potential side effects exist for all IV antineoplastic agents and can be dose limiting. In addition, side effects can have a negative impact on overall quality of life (Table 2).

<table>
<thead>
<tr>
<th>System affected</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood or bone marrow</td>
<td>- Anemia</td>
</tr>
<tr>
<td></td>
<td>- Neutropenia</td>
</tr>
<tr>
<td></td>
<td>- Thrombocytopenia</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>- Cardiomyopathy</td>
</tr>
<tr>
<td></td>
<td>- Conduction pathway disorders (arrhythmias)</td>
</tr>
<tr>
<td></td>
<td>- Coronary arteries (acute myocardial infarction, unstable angina)</td>
</tr>
<tr>
<td></td>
<td>- Pericardial fluid accumulation</td>
</tr>
<tr>
<td></td>
<td>- Vasculature (hypertension, hypotension, Raynaud phenomenon)</td>
</tr>
<tr>
<td>Cutaneous</td>
<td>- Acneiform eruptions or papulopustular rash</td>
</tr>
<tr>
<td></td>
<td>- Acral erythema</td>
</tr>
<tr>
<td></td>
<td>- Alopecia</td>
</tr>
<tr>
<td></td>
<td>- Beau lines</td>
</tr>
<tr>
<td></td>
<td>- Dystrophy</td>
</tr>
<tr>
<td></td>
<td>- Erythema multiforme</td>
</tr>
<tr>
<td></td>
<td>- Hirsutism</td>
</tr>
<tr>
<td></td>
<td>- Hyperpigmentation</td>
</tr>
<tr>
<td></td>
<td>- Hypertrichosis</td>
</tr>
<tr>
<td></td>
<td>- Nail changes</td>
</tr>
</tbody>
</table>

Table 2 Potential Side Effects of IV Antineoplastic Therapy
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<table>
<thead>
<tr>
<th>Category</th>
<th>Symptoms</th>
</tr>
</thead>
</table>
| **Gastrointestinal and mucosal** | - Anorexia  
- Cachexia  
- Constipation  
- Diarrhea  
- Mucositis  
- Nausea  
- Perirectal cellulitis  
- Vomiting |
| **Nervous**                     | - Central nervous system deficits  
- Cranial nerve deficits  
- Peripheral nervous system deficits |
| **Other**                       | - Alterations in sexuality  
- Cognitive impairment  
- Fatigue  
- Hemorrhagic cystitis  
- Hepatotoxicity  
- Ocular toxicity  
- Pancreatitis  
- Reproductive alterations |
| **Pulmonary**                   | - Acute disorders (alveolar hemorrhage, bronchospasm, hypersensitivity pneumonia, interstitial pneumonitis, noncardiogenic pulmonary edema, pulmonary alveolar proteinosis, retinoic acid syndrome)  
- Chronic disorders (organizing pneumonia, pulmonary fibrosis, progressive interstitial pneumonitis, pulmonary veno-occlusive disease)  
- Indeterminate lung toxicities |
| **Renal**                       | - Acute kidney injury  
- Chronic kidney disease  
- Nephritic and nephrotic syndromes  
- Tubulopathies (Fanconi syndrome, syndrome of inappropriate antiuretic hormone secretion) |

(Data from Olsen, M.M., Lefebvre, K.B., Brassil, K.J. [Eds.]. [2019]. Chemotherapy and immunotherapy guidelines and recommendations for practice. Pittsburgh: Oncology Nursing Society.)
Certain agents (e.g., L-asparaginase, paclitaxel, docetaxel, cisplatin, carboplatin, etoposide, teniposide) have a high potential for causing immediate hypersensitivity reactions of varying severity, including anaphylaxis. Patients with a history of anaphylaxis, hypersensitivity, or infusion-related complications during administration may have similar complications with subsequent therapy. Continued use of the agent may be possible with appropriate premedication or desensitization, depending on the agent and the type of reaction experienced. Dose reduction or delays in subsequent courses because of toxicities and scheduling conflicts may have a negative impact on a patient’s response to treatment and survival. Proactive management of symptoms and patient education regarding the importance of maintaining the prescribed dosing scheduled and self-care management of toxicities are critical. Because of the hazardous nature of chemotherapy drugs, use of antineoplastic therapies during pregnancy necessitates a balance of risks and benefits for both maternal and fetal well-being. Fever in a neutropenic patient can result in life-threatening consequences. Patients should be instructed to contact their practitioner if they have a fever of 38°C (100.4°F) or higher, and they may be directed to go immediately to the emergency room for prompt cultures and initiation of empiric antibiotics. Safe handling precautions to prevent exposure to hazardous medications when handling, administering, and caring for patients receiving antineoplastic therapies should be implemented and strictly followed. Exposure to hazardous medications, including antineoplastic drugs, poses health risks for caregivers and health care team members, including carcinogenicity, teratogenicity, genotoxicity, and impaired fertility. Metabolites of the drug are present in the body fluids of patients having undergone IV antineoplastic administration, so safe handling practices for a patient’s bodily fluids should be followed by all caregivers for at least 48 hours after completion of antineoplastic therapy.

If the patient expresses concern regarding the accuracy of a medication, the medication should not be given. The patient’s concern should be explored, the practitioner notified, and the order verified.

**EDUCATION**

- Explain the rationale for the use of IV antineoplastic therapy.
- Provide the patient and caregiver with verbal information and written material on the name(s), route, dose, and frequency of the agents.
- Instruct the patient and caregiver regarding the potential side effects of the medication(s).
  - Provide verbal information and written instructions on self-care measures to minimize or prevent side effects.
  - Provide medical contact information, including when to notify the practitioner of adverse responses.
- Instruct the patient and caregiver on how and when to take the patient’s temperature.
- Instruct the patient and caregiver to alert the practitioner or to go to the emergency department if any side effects or signs and symptoms of infection occur.
  - Fever of 38°C (100.4°F) or higher
  - Persistent nausea and vomiting
  - Diarrhea or constipation
  - Inability to maintain oral intake
  - Decreased urine output
  - Change in mental status
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- New bleeding or bruising
- Instruct the patient and caregiver on the management of short- and long-term side effects.
- Instruct the patient on protective measures that he or she can follow to avoid infection.
- Instruct the patient and caregiver on critical safety guidelines after the patient receives antineoplastic therapy, noting that safety precautions should be observed for at least 48 hours following completion of drug therapy.
- Instruct the patient and caregiver on the importance of keeping appointments for laboratory tests and clinical examinations.
- Discuss the goals of therapy and how the response to therapy is measured.
- Discuss fertility issues with patients of childbearing age before treatments, during treatments, and upon completion of drug therapy.
- Encourage questions and answer them as they arise.

ASSESSMENT AND PREPARATION

Assessment
1. Perform hand hygiene and don PPE as indicated for needed isolation precautions.
2. Verify the correct patient using two identifiers.
3. Obtain the patient’s history.
   a. Type of cancer
   b. Previous therapy, including date(s)
      Rationale: Careful assessment and documentation of prior therapies enable the practitioner to calculate cumulative doses of agents with lifetime limits that may impact toxicities.
   c. Toxicities of previous therapy and severity (including radiotherapy)
   d. Self-care measures used to minimize toxicities and effectiveness of measures
   e. Nutritional status and intake
   f. Use of complementary and integrative health strategies
   g. Previous and concurrent medical and surgical problems
   h. List of current medications and supplements (including complementary and integrative health therapies)
   i. Allergies, including food, drug, and environmental (e.g., latex)
   j. Reproductive history
   k. Presence of pain, including location, intensity, quality, and what makes it better or worse
   l. Presence of fatigue
4. Assess the patient for specific contraindications to receiving the prescribed medication(s) and IV antineoplastic drug agent(s) and advise the practitioner accordingly.
   Rationale: Some antineoplastic agents and some radiotherapy locations may cause late or long-term side effects or have dose limitations that may contraindicate further treatment. For example, doxorubicin has a cumulative dose limit and can cause cardiotoxicity.
5. Explain the key points of treatment to the patient.
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a. Rationale for treatment
b. Goals of treatment
c. Agent(s) to be administered
d. Potential short- and long-term side effects

6. Perform a physical examination.

a. Hematologic: color of skin and mucous membranes; presence of bruising or petechiae; signs of infection, including fever, cough, erythema, or exudate of the throat; activity intolerance

   Rationale: Always assume that fever in a neutropenic patient is infectious in origin and take steps to manage care accordingly.

   Be aware that the fever response may be diminished in older adult patients, those with multiple comorbidities, and those taking certain medications (e.g., acetaminophen, nonsteroidal antiinflammatory drugs, steroid medications).

b. Neurologic: preexisting motor and sensory deficits; cognitive and behavioral functioning; presence of peripheral neuropathies
c. Pulmonary: rate, rhythm, and depth of respirations; use of accessory muscles; cough; dyspnea
d. Cardiovascular: heart sounds, pulses, rate, rhythm
e. Gastrointestinal: integrity of lips, gums, teeth, mucosa, and tongue; moisture of oral cavity; ability to swallow, presence of bowel sounds; pattern of bowel movements; presence of hemorrhoids, pain, or bleeding
f. Renal: pattern of urinary elimination, including frequency; color and amount of urine
g. General: body temperature, blood pressure

7. Obtain the patient’s psychosocial history.

a. Ability to perform self-care and activities of daily living
b. Support systems, including previous responses to stressors and effective coping strategies, financial resources and concerns, and transportation issues
c. Psychiatric comorbidities (e.g., depression, anxiety)
d. Mechanisms used to decrease stress

8. Determine the patient’s performance status using a standard measurement tool (e.g., Eastern Cooperative Oncology Group Performance Status, Karnofsky Performance Status).

9. Obtain laboratory tests and diagnostic data.

a. Complete blood count (CBC) with differential
b. Serum electrolytes, calcium, liver function tests, serum creatinine, blood urea nitrogen (BUN)

   Rationale: AUC calculations are done to determine carboplatin dose. AUC refers to the amount of drug exposure over time or the total drug
concentration in plasma over time. Carboplatin dosing is aimed toward a target AUC as it relates to a patient’s specific renal function.

c. Miscellaneous tests as warranted (e.g., a multigated acquisition scan or two-dimensional echocardiogram [2D echo] for a patient receiving anthracyclines, and a pregnancy test for a woman of childbearing age who has not had a complete surgical or chemical hysterectomy)

10. Review current laboratory results. Document any abnormal values and notify the practitioner before continuing with therapy.

   a. Consider a long-term VAD, such as a central VAD, if the patient is receiving long-term therapy and therapy consists of a vesicant or irritating drug or if there is a potential for multiple blood draws.
   
   b. Obtain supplies for a peripheral IV line if a VAD is not in place.

11. Verify the sequence of IV antineoplastic agents to be administered, if applicable.

**Preparation**

1. Ensure that informed consent is obtained and available for review per the organization’s practice.
2. Determine the presence of a VAD and whether it is patent and appropriate for the agent(s) to be administered.
3. Verify the patient’s actual height and weight in kilograms. Reweigh the patient if appropriate. ² Stated, estimated, or historical weight should not be used. ² Obtain the patient’s height.
4. Recalculate drug doses based on weight and height before each new cycle of antineoplastic therapy.

   **Doses of many IV antineoplastic agents are based on BSA. Accurate measurement of the patient’s height and weight is needed to perform this calculation. Patients may understate or overstate their height and weight, so measurements must be performed.**

5. Obtain and review the order for other medications (e.g., antiemetics, antipyretics, steroids) and IV fluids for pretreatment and posttreatment hydration.
6. Obtain emergency and safe-handling supplies (e.g., oxygen, agents for the treatment of anaphylaxis and extravasation if applicable, hazardous waste container, PPE, spill kit).
7. Obtain the medication and verify the expiration date.
8. Inspect the medication for particulates, discoloration, or other loss of integrity.

   **Do not use any medication that is cloudy or precipitated unless such is identified by its manufacturer as being safe; otherwise, this may lead to harmful reactions.**

9. Understand drug reference information pertinent to the medication’s action, purpose, onset of action and peak action, normal dose, common side effects, and nursing implications, if needed.
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PROCEDURE
1. Perform hand hygiene and don gloves and appropriate PPE based on the patient’s signs and symptoms and indications for isolation precautions. Use the ONS interim guidelines for PPE recommendations during an emergent shortage of PPE (e.g., pandemic) (Table 3).

<table>
<thead>
<tr>
<th>Table 3 Oncology Nursing Society (ONS) Recommendations and Interim Guidelines for Personal Protective Equipment (PPE) Use During Pandemic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PPE</strong></td>
</tr>
</tbody>
</table>
| Gown | Disposable poly-coated gown | • Regular disposable gown (water resistant)  
| | | • Cloth gown (facility laundered) for infection control and nonhazardous drugs |
| Mask | Mask with face and eye protection required only if splashing likely and for spill cleanup | • N95 mask for symptomatic or patients with COVID-19 and hazardous drug spills and cleanup  
| | | • PAPR |
| Eye protection | Mask with eye protection or goggles if splashing likely or spill cleanup | • Full facepiece air-purifying respirator or PAPR |
| Gloves | Double chemotherapy-tested gloves | • Single chemotherapy-tested gloves  
| | | • Double standard examination gloves  
| | | • Single standard examination gloves |
| Shoe covers | Only in area for compounding hazardous drugs | • Work-only, washable shoes |

COVID, coronavirus; PAPR, powered air purifying respirator; PPE, personal protective equipment  
*Highest-level recommended practice based on supplies of available PPE  

2. Introduce yourself to the patient.
3. Two practitioners or personnel approved to prepare or administer antineoplastic drugs verify the patient using two identifiers, confirm with the patient the planned treatment, and verify the drug name, dose, volume, rate and route of administration, expiration dates and times, and appearance and integrity of the drugs.
4. Ensure the six rights of medication safety: right medication, right dose, right time, right route, right patient, and right documentation. Use a bar code system or compare the medication administration record to the patient’s identification band.
5. Ensure that independent double-checks of dose calculations are completed by the two practitioners, per the organization’s practice, regarding any variances between the ordered dose and the recalculated or rounded dose.
6. Label all medications, medication containers, and other solutions, including those that are on a sterile field. The only exceptions are medications that are still in their original container or medications that are administered immediately by the person who prepared them.
7. Obtain vital signs before the initiation of therapy and as needed during the injection or infusion depending on the agent(s) being administered.
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8. If a peripheral IV line is to be used, identify an appropriate site and perform venipuncture. Choose a vein that is large, smooth, and pliable, and use the patient’s nondominant arm whenever possible. Notify the practitioner promptly if unable to obtain peripheral venous access to determine the next steps for the procurement of reliable venous access.

Avoid the ventral surface of the wrist, areas of flexion, lower extremities, and the arm of a patient who has had an axillary lymph node dissection.

Whenever possible, avoid using an IV site that is more than 24 hours old.11

9. Trace tubing or catheter from the patient to point of origin (1) before connecting or reconnecting any device or infusion, (2) at any transition (e.g., new setting), and (3) as part of the hand-off process.4

10. Label the tubing at the connection site closest to the patient and at the connection site closest to the source when there are different access sites or several bags.4

Rationale: Tubing should be labeled to reduce the chance of misconnection, especially in circumstances where multiple IV lines or devices are in use.

11. Use distinctly different pumps for IV applications (rather than using similar pumps for intrathecal and epidural applications).4

Rationale: Using distinctly different pumps reduces the possibility that an intrathecal medication will accidentally be delivered intravenously and vice versa.

12. Check vital signs immediately after making any connection per the organization’s practice.4

13. Do not force connections and avoid workarounds.4

Rationale: Forced connections or workarounds could indicate that the connection should not be made.

14. Establish blood return and patency before administering antineoplastic drugs.

Do not administer any agent if patency is not determined. Report inability to obtain a blood return to the practitioner.

15. If a long-term VAD is already in place (e.g., tunneled catheter, implanted port, PICC), verify that its placement is correct before use.

a. Aspirate for blood to verify IV patency before administering antineoplastic drugs.11

If blood return is not evident, do not administer any agent. Report inability to obtain a blood return to the practitioner.

b. Follow the organization’s practice for skin or catheter preparation and access.
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16. Administer pretreatment hydration IV fluids, antiemetics, antipyretics, steroids, and other medications per the practitioner’s order. Remove gloves, perform hand hygiene, and don a disposable, lint-free, chemotherapy-resistant gown; two pairs of disposable, powder-free gloves that have been tested for use with hazardous drugs; eye protection and a face mask when splashing is possible; and a National Institute for Occupational Safety and Health (NIOSH)-approved respirator when inhalation exposure is possible.

Rationale: PPE must be used for the safe administration of hazardous medications.\textsuperscript{9,12}

17. Administer antineoplastic drug agent(s) per the practitioner’s order.

a. Verify blood return before, at regular intervals during, and after administration of antineoplastic drugs.

Rationale: In many cases, lack of blood return is a sign that the VAD is not in the correct anatomic location.

\textbf{If blood return is not evident, immediately stop the administration of chemotherapy and notify the practitioner. Verification of placement with appropriate diagnostic tests must occur before continuing therapy.}\textsuperscript{3}

b. Frequently assess for infusion-related complications specific to the agent(s) administered, such as anaphylaxis, hypersensitivity, extravasation, irritation, flare reaction, and fever.

\textbf{Infusion-related events can occur at any time, but they are more common with the initial treatment and often occur within the first 5 to 30 minutes of starting the infusion but may occur hours later with some agents.}\textsuperscript{3} \textbf{However, infusion reactions may occur in later cycles with some drugs, such as carboplatin, when reactions, if they occur, may be noted at about the fifth to seventh dose.}\textsuperscript{3}

18. Upon completion of administration, flush the VAD with an appropriate solution and amount per the organization’s practice.

19. Discard supplies, remove PPE and discard in an appropriate chemotherapy waste receptacle, and perform hand hygiene.


\textbf{MONITORING AND CARE}

1. Monitor the patient for adverse and allergic reactions to the IV antineoplastic medication. Recognize and immediately treat respiratory distress and circulatory collapse, which are signs of a severe anaphylactic reaction. Follow the organization’s practice for emergency response.

2. Monitor laboratory results, including baseline CBC with differential, electrolytes, BUN, and creatinine, before medication administration and monitor further results as ordered by the practitioner, depending on the specific agent(s) given.
3. Assess the patency of the VAD by checking blood return before, at regular intervals during, and after the injection or infusion.
4. Instruct the patient to report any pain, burning, or swelling at the venipuncture site.
5. Assess, treat, and reassess pain.

EXPECTED OUTCOMES
- Patient and caregiver describe administration procedure, including names of agent(s), routes, schedule of administration, schedules for laboratory testing, and clinical examinations.
- Patient and caregiver describe potential complications and short- and long-term side effects of IV antineoplastic therapy.
- Patient and caregiver describe self-care measures to prevent or minimize side effects of therapy.
- Patient and caregiver understand the side effects that should be reported immediately to the practitioner.
- Patient understands how IV antineoplastic therapy may impact fertility and participates in options to preserve reproductive function and pregnancy prevention, dependent upon the antineoplastic being administered.
- Medication is administered according to the six rights of medication safety.
- Appropriate interventions are initiated to promptly recognize and address infusion-related complications and to minimize short- and long-term side effects as much as possible.
- All hazardous waste is disposed of properly.
- Patient and caregiver verbalize appropriate community resources.
- Patient demonstrates self-care skills.
- Patient and caregiver demonstrate care of VAD.
- Patient reports side effects in a timely manner.

UNEXPECTED OUTCOMES
- Patient and caregiver are unable to describe drug protocol, including names of agent(s), routes, schedule of administration, schedules for laboratory testing, and clinical examinations.
- Patient and caregiver are unable to describe potential complications and short- and long-term side effects of IV antineoplastic therapy.
- Patient and caregiver are unable to describe self-care measures to prevent or minimize side effects of therapy.
- Patient and caregiver are unable to list side effects that should be reported immediately to the practitioner.
- Patient is unable to state how therapy may affect fertility and the options available to preserve reproductive function or prevent pregnancy, depending on the antineoplastic being administered.
- Medication is not administered according to the six rights of medication safety.
- Inappropriate interventions are performed for management of infusion-related complications.
- Leakage or spill of agent occurs.
- Improper disposal of hazardous waste occurs.
- Patient and caregiver are unable to describe potential short-term and long-term side effects of drug(s).
- Patient and caregiver are unable to verbalize appropriate community resources.
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- Patient is unable to demonstrate self-care skills.
- Patient and caregiver are unable to demonstrate care of VAD.
- Patient does not report side effects in a timely manner.
- Patient is hospitalized because of side effects.

DOCUMENTATION
- Verification of chemotherapy with practitioners involved:
  - Name of patient to receive the therapy
  - Name of drug
  - Schedule
  - Route
  - Volume
  - Expiration date and time
  - Rate
  - Dose
- Laboratory results
- Administration date and start and stop times
- Management of infusion-related complications
- Name of individual administering antineoplastic agent(s)
- Patient’s height and weight in kilograms per the organization’s practice
- Patient’s response to medication(s), including any adverse reactions
- Venous access insertion (if not in place), type of device, patency, ability to aspirate blood return
- Education
- Unexpected outcomes and related interventions

SPECIAL CONSIDERATIONS
- Patients with a history of anaphylaxis, hypersensitivity, or infusion-related complications during administration may have similar complications with subsequent therapy.
- Older adult patients may have comorbidities that predispose them to greater severity of side effects from IV antineoplastic therapy.
- Any patient who takes medications for other comorbid conditions may experience a drug-drug interaction with antineoplastic agent(s). A thorough understanding of other drugs being taken, including over-the-counter medications and complementary and integrative health medications, is critical to ensure that underdosing or overdosing of the antineoplastic agent(s) does not occur.
- If antineoplastic therapy is to be administered during pregnancy:
  - The fetus’s gestational age should be established.
  - Multidisciplinary management should occur to optimize outcomes with involvement by an oncologist, a neonatologist, perinatologist, and an obstetrician.
  - Antineoplastic therapy agents are generally avoided during the first trimester of pregnancy, after 35 weeks’ gestational age, or within 3 weeks of anticipated delivery.

REFERENCES
Antineoplastic Drug Administration: Intravenous (Oncology) - CE


ADDITIONAL READINGS
Antineoplastic Drug Administration: Intravenous (Oncology) - CE

*In these skills, a “classic” reference is a widely cited, standard work of established excellence that significantly affects current practice and may also represent the foundational research for practice.

Elsevier Skills Levels of Evidence

- Level I - Systematic review of all relevant randomized controlled trials
- Level II - At least one well-designed randomized controlled trial
- Level III - Well-designed controlled trials without randomization
- Level IV - Well-designed case-controlled or cohort studies
- Level V - Descriptive or qualitative studies
- Level VI - Single descriptive or qualitative study
- Level VII - Authority opinion or expert committee reports

Supplies

- PPE
  - For isolation precautions: gloves and PPE, as indicated
  - For antineoplastic administration: double chemotherapy-tested gloves, eye protection, face shield, impervious chemotherapy-resistant gown with long sleeves that closes in the back, and respirator
- Agents for treatment of extravasation
- Appropriate flushing solution
- Emergency equipment (e.g., oxygen)
- Emergency medications (e.g., epinephrine)
- Hazardous medication disposal container
- Infusion pump (if drug is to be infused)
- Closed IV tubing and connectors, including appropriate filters as indicated in drug package insert
- Venipuncture kit (if initiating a peripheral IV line) or supplies for accessing VAD

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Published: January 2020
Revised: April 2020