

## Complications of Peripheral Intravenous Therapy

When administering intravenous (IV) fluids or medications through a peripheral IV (PIV) site, institute preventive measures, be alert for signs and symptoms of complications, and know how to intervene if complications occur.

### Infiltration

*Infiltration* refers to the leaking of IV fluid or medication into the tissue surrounding a vascular access device. This may be caused by improper placement of PIV, dislodgment of the catheter, damage to the patient vessel, or patient movement.

#### Signs and symptoms

- Swelling, discomfort, burning, and/or tightness at, near, or proximal to the insertion site
- Leakage from the insertion site
- Cool skin, redness, and/or blanching at the PIV site
- Decreased flow rate (gravity) or high-pressure/distal-occlusion alarms (infusion device)

#### Prevention

- Select an appropriate site for PIV cannulation, avoiding areas of flexion.
- Use proper venipuncture technique and follow facility policy for securing PIV catheter.
- Establish catheter patency prior to initiating any intravenous administration.
- Observe the PIV site frequently and advise the patient to report any swelling/tenderness at the site.

#### Management

- Upon first sign of infiltration, stop the infusion and remove the device.
- Check patient pulse, capillary refill time, and elevate the limb.
- A warm or cool compress may be applied, depending on the infiltrated solution.
- Perform venipuncture in a different location (proximal to the previous site, or in the contralateral arm) and restart the infusion as ordered, after changing the IV tubing (per facility protocol).
- Check the site frequently, then document findings and interventions.

### Extravasation

*Extravasation* refers to the leaking of vesicant drugs into the tissue surrounding a vascular access device. Extravasation can cause severe local tissue damage, delayed healing, infection, tissue sloughing and necrosis, disfigurement, loss of function, and may result in amputation.

#### Signs and symptoms

Signs and symptoms usually manifest immediately but may be subtle at first and progress over days to weeks.

- Discomfort, burning, pruritis, and/or tightness near PIV site
- Leakage from the PIV site
- Cool skin, redness, and/or blanching at/above the PIV site

- Blistering and/or skin sloughing surrounding PIV site
- Vesicant extravasation may lead to delayed manifestations of ulceration, eschar, and necrosis.

### Prevention

- Select an appropriate site for PIV cannulation, avoiding small and/or fragile veins, and avoiding areas of flexion.
- Avoid placing PIVs in extremities with preexisting edema or known neurological impairment.
- Establish catheter patency prior to initiating any intravenous administration.
- Be aware of vesicant medications. Examples include vancomycin, amiodarone, antineoplastic drugs (such as doxorubicin, vinblastine, and vincristine), hydroxyzine, promethazine, digoxin, and dopamine.
- Follow facility policy regarding vesicant administration via PIV. Institutional policy may require use of a central vascular access device (CVAD) for vesicant medications.
- Give vesicant drugs last, when multiple drugs are ordered, and strictly adhere to administration guidelines and techniques.

### Management

- Upon first sign of extravasation, stop the infusion, estimate the amount of extravasated solution and notify the prescriber.
- Do not immediately remove the PIV. Use it to attempt to aspirate fluid from the extravasated area and/or to administer an antidote (as with specific vasopressors).
- Administer the appropriate antidote according to facility protocol, if appropriate and as ordered.
- Elevate the extremity and perform frequent assessments of sensation, motor function, and circulation.
- Record the extravasation site, patient symptoms, estimated amount of extravasated solution, and treatment.
- Follow the manufacturer recommendations to apply either cold or warm compresses to the affected area.
- Perform venipuncture in a different location (proximal to the previous site, or in the contralateral arm) and restart the infusion as ordered, after changing IV tubing (per facility protocol).
- Continue to check the site frequently, then document findings and interventions.

### Infection

*Infection* refers to local or systemic signs of infection in patients with a PIV in place.

#### Signs and symptoms

- Pain, tenderness, redness, or discharge at or near PIV insertion site
- Fever may be present.

#### Prevention

- Perform hand hygiene, don gloves, and use standard-ANTT (aseptic non touch technique) for PIV insertion.
- Clean the site with approved skin antiseptic prior to PIV insertion, making sure to not touch the site again after it is cleaned.

- Ensure careful hand hygiene before contact with the infusion system or the patient.
- Clean injection ports with alcohol, using friction for 15 seconds, on all exposed surfaces prior to each use, including in between medication and flush syringes.
- Follow your facility-specific policy for dressing changes and changing of solutions and administration sets.

### Management

- At earliest sign of complications, stop infusion and notify prescriber.
- Remove the device.
- If catheter-related bloodstream infection (CRBSI) is suspected, culture the catheter tip as ordered. Catheter tip culture from PIVs should not be done routinely (Zingg et al., 2023).
- Administer medications as prescribed, continuing to monitor patient vital signs.

### Phlebitis

*Phlebitis* is inflammation of a vein and may be caused by chemical, mechanical, or bacterial insults to the vein lining. Chemical phlebitis is often associated with the infusion of acidic, alkaline, or high-osmolarity solutions, or excessive infusion rate. Mechanical phlebitis can result from trauma to the vein during the insert of a PIV or using an inappropriately large PIV for the vein. Bacterial phlebitis may result from poor aseptic technique on insertion and may be related to emergent placement of PIVs.

### Signs and symptoms

- Pain, tenderness, warmth, erythema
- Swelling, induration, purulent drainage
- Palpable venous cord

### Prevention

- Use proper venipuncture technique for PIV insertions.
- Choose the most appropriately sized catheter for the ordered infusion or medication, utilizing the smallest size appropriate to allow for hemodilution of the infusate.
- Use a trusted drug reference or consult with the pharmacist for instructions on drug dilution.
- Monitor administration rates and inspect the PIV site frequently.
- Change the infusion site in accordance with facility policy.

### Management

- At the first sign of redness or pain, stop the infusion.
- Apply a warm, moist compress to the PIV site, and elevate the limb.
- Assess patient condition, then document findings and interventions.
- If indicated, insert a new PIV at a different site, preferably on the opposite arm, using a larger vein or a smaller device and restart the infusion as ordered, after changing IV tubing (per facility protocol).

### Hypersensitivity

*Hypersensitivity* reactions are immediate, severe reactions that can be life-threatening. These reactions can be induced by medications and require prompt recognition and treatment.

### Signs and symptoms

- Sudden onset of fever

- Rash, urticaria
- Wheezing, bronchospasm
- Joint swelling

### Prevention

- Assess patient allergies prior to administration of medications.
- For infants younger than three months, assess the allergy history of the mother, as maternal antibodies may still be present.
- Stay with the patient for the first five to ten minutes of any new infusion to detect early signs of hypersensitivity.
- When administering a new drug to the patient, monitor patient at intervals in accordance with facility policy.

### Management

- Discontinue the infusion and notify the prescriber immediately.
- Administer medications as ordered.
- Monitor the patient's vital signs and provide emotional support.

### References:

- Buter, J., Steele K.T., Chung, K., Elzinga, K. (2023, September 27). Extravasation injury from chemotherapy and other non-antineoplastic vesicants. *UpToDate*. <https://www.uptodate.com/contents/extravasation-injury-from-chemotherapy-and-other-non-antineoplastic-vesicants>
- Nickel, B., Gorski, L., Kleidon, T., Kyes, A., DeVries, M., Keogh, S., Meyer, B., Sarver, M. J., Crickman, R., Ong, J., Clare, S., & Hagle, M. E. (2024). Infusion Therapy Standards of Practice, 9th Edition. *Journal of infusion nursing: the official publication of the Infusion Nurses Society*, 47(1S Suppl 1), S1–S285. <https://doi.org/10.1097/NAN.0000000000000532>
- Spencer, S., & Gilliam, P. (2015). Teaching patients about their short peripheral I.V. catheters. *Nursing*, 45(2), 64. <https://doi.org/10.1097/01.NURSE.0000459801.33205.6a>
- Zingg, W., Barton, A., Bitmead, J., Eggimann, P., Pujol, M., Simon, A., & Tatzel, J. (2023). Best practice in the use of peripheral venous catheters: A scoping review and expert consensus. *Infection prevention in practice*, 5(2), 100271. <https://doi.org/10.1016/j.infpip.2023.100271>