Complications of Peripheral Intravenous Therapy

Intravenous (IV) catheter insertion in a peripheral vein is one of the most common invasive procedures in pre-hospital, hospital, and outpatient settings. Safe administration of IV fluids or medications through a peripheral IV (PIV) site requires measures to prevent infiltration, extravasation, infection, and phlebitis. Routine monitoring for these complications will allow for prompt treatment.

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, and loss of function. In severe cases, it 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, pruritus, 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, as well as areas of flexion.
- Avoid placing PIVs in extremities with preexisting edema or known neurological impairment.
- Establish catheter patency before 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 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's 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.

- Avoid placing PIVs in extremities with acute issues such as injury, infection, lymphedema, lymph node dissection, fractures, impaired skin integrity, or locations of planned procedures.
- Clean the site with approved skin antiseptic before PIV insertion, making sure not to touch the site again after it has been 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 before 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's 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 insertion 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 per 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 to infused medications are immediate, severe reactions that can be life-threatening. These reactions require prompt recognition and treatment.

Signs and symptoms

- Sudden onset of fever
- Rash, urticaria
- Wheezing, bronchospasm
- Hypotension
- Facial or airway swelling

Prevention

- Assess patient allergies before 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 per facility policy.

Management

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

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