Nursing Management of Venous Access Devices: Complications and Troubleshooting

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The Three Biggies.....

- Phlebitis
- Extravasation
- Infiltration

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Phlebitis – in Peripheral IVs

- Definition: inflammation of a vein. May be mechanical, chemical, or bacterial
- Phlebitis has long been recognized as a risk for infection.
- For adults, lower extremity insertion sites are associated with a higher risk for infection than are upper extremity sites.
- Intravenous Nursing Society (INS) phlebitis scale:
  - Grade 0 no symptoms
  - Grade 1 erythema at insertion site with or without pain
  - Grade 2 pain at insertion site; with erythema and/or edema
  - Grade 3 pain at insertion site; with erythema and/or edema; streak formation; palpable venous cord
  - Grade 4 pain at insertion site; with erythema and/or edema; streak formation; venous cord > 1” in length; and purulent drainage
Prevention and Treatment of Phlebitis

○ Prevention:
  • “When in doubt, take it out”
  • Dilution of infusate
  • Decrease rate of infusion
  • “Piggy-back” with mainline/carrying IV
  • Warm compress to promote vasodilation and hemodilution
  • Device securement / stabilization

○ Treatment
  • Removal of catheter
  • Application of warm compresses at insertion site
  • Documentation of phlebitis and the subsequent treatment
Infiltration

Definition: inadvertent administration of non-vesicant medication or solution into the surrounding tissue (INS, 2016)

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INS Infiltration Scale

- **Grade 0** - no symptoms
- **Grade 1** - skin blanched, edema < 1” in any direction, cool to touch, with or without pain
- **Grade 2** - skin blanched, edema 1-6” in any direction, cool to touch, with or without pain
- **Grade 3** - skin blanched and translucent, gross edema > 6” in any direction, cool to touch, mild to moderate pain, possible numbness
- **Grade 4** - skin blanched and translucent, skin tight and leaking, discolored, bruised and swollen, gross edema > 6” in any direction, deep pitting tissue edema, circulatory impairment, moderate to severe pain, infiltration of ANY amount of blood product, irritant, or vesicant.
Treatment of Infiltration

- Discontinue infusion
- Elevate extremity
- Warm compresses, NOT HOT, for normal or high pH/alkaline solution (ex: D5W)
- Cold compresses for low pH/acidic solutions (ex: vanco)
- Caution with infiltrated solution; ex.- morphine PCA resumption with subcutaneous morphine infiltrate; “double-dosing”
- Documentation of infiltrate and subsequent treatment
Extravasation

- Inadvertent administration of vesicant medication or solution into the surrounding tissue (INS, 2016)

- Definition of a vesicant drug – any IV drug that can cause blistering, severe tissue injury or tissue necrosis when extravasated

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Extravasation

- Extravasation should always be grade 4 on the infiltration scale. This includes any amount of vesicant, blood product, or irritant.
- Incidence is similar for peripheral and central line administration.
- Risk factors, such as fragile vessels, location of peripheral iv (e.g. areas of flexion), or catheter integrity are things to consider.
- Antidotes may be used; refer to clinical resources for guidance, and obtain order if indicated [Link to new Extravasation policy].
- Many non-chemotherapy agents have vesicant properties (e.g. Dopamine, Epinephrine, Gentamycin, Mannitol).
- Extravasation is still possible, even in the presence of a positive blood return.
Signs and Symptoms of Extravasation

- Early warning signs of possible extravasation
  - Swelling
  - Stinging, burning or pain at IV site
  - IV flow that stops or slows
  - Leaking around the port needle
  - Lack of blood return
  - Erythema, inflammation or blanching

- Other symptoms/damage resulting from extravasation:
  - Induration
  - Vesicle Formation
  - Necrotic tissue damage can progress for 6 months
  - Sloughing
  - Tendon, nerve, joint damage
  - Blistering at insertion site
  - Ulceration is usually seen 2-3 days to weeks following extravasation
Treatment of Extravasation

- **IMMEDIATELY STOP INFUSION**
- Remove tubing from IV, leave catheter or needle in place, attach syringe to IV catheter
- Attempt to aspirate residual drug
- Elevate extremity
- Notify Responding Clinician ASAP
- Apply cold/heat as indicated (refer to policy for guidance on topical treatment). In general:
  - Most drugs except Vinca alkaloids, etoposide, and catecholamines...apply COLD for 15-20 minutes (minimum of QID) for 48 hrs
  - For vinca alkaloids, etoposide and catecholamines...apply HEAT for 15-20 minutes (minimum of QID) for 48 hours
- Refer to MGH Nursing Policies and Procedures in Ellucid or CALL PHARMACY for specific antidote
Extravasation Management

- DOCUMENTATION
  - Medical record ("Hypersense/Extrav" Flowsheet in EPIC, serial progress notes)
  - Safety report (Line/Tube > Extravasation)

- POST EXTRAVASATION CARE:
  - Document and consider photographing site
  - Instruct patient about cold/heat application
  - Patient and family education: symptoms to report immediately, care of site, follow-up appointment if needed
  - Anticipate consult to plastic surgery or dermatology PRN
  - Ongoing evaluation & follow-up (serial photographs as needed)
Port Extravasation
After Surgical Debridement
Other Potential Complications of Central VADs

- Central Line Infection
  - Line sepsis
  - Port pocket infection
- Catheter occlusion
  - Fibrin sheath
  - Thrombosis
  - Thromboembolism
- Catheter rupture/Fracture
- Device rotation
- Air embolism
- Bleeding
- Cardiac arrhythmias
- Port erosion through the skin
- Catheter migration
- Intolerance reaction to VAD
Central Line Infection

- Insertion site: Reportable signs and symptoms
  - Any redness (erythema)
  - Leaking, bloody, or purulent drainage
  - Tissue inflammation or induration
  - Tenderness to palpation
- Do NOT access a port with above signs and symptoms
Troubleshooting Occlusions

- **Complete catheter occlusion**
  - Internal catheter or venous thrombus
  - Drug precipitate

- **Withdrawal occlusion**
  - Fibrin sheath causes catheter to act like a one-way valve
  - Pinch-off syndrome

- **Does CVAD flush freely and have a positive blood return? If not:**
  - Ask patient if there is normally a blood return
  - Check for kinks in external catheter or tubing
  - Check clamps
  - Change needleless connector or implanted port needle
  - Reposition patient (on side, Trendelenburg, etc...), ask patient to cough, raise hands above head, take deep breath, lean forward...just about anything!
  - Consider need for anti-thrombolytic agent (e.g. t-PA Alteplase)
Troubleshooting Occlusions

- Obtain order for t-PA instillation to lumen(s) if flow is sluggish or blood return is absent. Chest xray (within 24 hours) will be required before t-PA is instilled into a PICC
- If t-PA unsuccessful after second instillation, notify provider, consider CXR to verify catheter integrity and tip location, and/or IR referral for dye study
- Prevention of occlusion is key!
  - Push-pause or pulsatile flush technique
  - Increased saline flush volume after blood draws
  - Flush immediately after infusions or blood draws are completed
Tissue Plasminogen Activator: t-PA (Alteplase)

- Refer to MGH Medication Manual (see “Alteplase”)
- Provider order and EMAR documentation required; separate t-PA order needed for each lumen
- IV nurses instill t-PA into PICCs; t-PA instillation to all other CVADs is responsibility of unit RN
- For inpatient PICCs, a CxR must have been done within 24 hrs before t-PA can be instilled. For outpatient PICCs needing t-PA, a CxR is at the discretion of the provider.
- Dosage (per lumen):
  - for patients weighing > 30kg (66lbs): 2mg/2ml
    - for patients weighing < 30kg (66 lbs): 110% of internal lumen volume of catheter (up to 2mg)
  - Diluent: 2.2ml sterile water without preservative in a 10ml syringe
  - Do NOT clamp catheter while t-PA is instilled
  - Minimum dwell time of 30 minutes; 60 minutes is often required
  - Four hour t-PA dwelling times may be required for significant fibrin sheaths causing withdrawal occlusions
Fibrin Sheath


Catheter thrombosis in subclavian vein
Retrieved from www.IV-therapy.net 10/6/09
Pinch-off Syndrome

- Compression of the catheter between the first rib and the clavicle
- Can lead to intermittent compression or catheter fracture

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Pinch-off Syndrome

- **Signs of Pinch-off:**
  - Withdrawal occlusion
  - Resistance to infusion of fluids
  - Patient position changes are required to infuse/withdraw from port (e.g. raise arm, Trendelenburg)

- Follow diligently secondary to risk of catheter fracture/shearing
Miscellaneous Information

Related to peripheral and central IV access
Filters

- Air-eliminating: 0.2 micron
- TPN: 1.2 micron (exception: pedi uses a 0.2 micron filter)
- Blood products: 170 micron filter on blood tubing set
- Mannitol: 1.2 micron
Patent Foramen Ovale (PFO) Filters

- PFO: opening between right and left atria
- Air-eliminating filter 0.2 micron
- Some medications should NOT be filtered (e.g. Amphotericin)
- NOT for use with blood transfusions
- Check priming volume
- Should be changed every 96 hours
PLEASE NOTE…

- For more information on troubleshooting CVADs, refer to the following resources:

- All information provided is subject to review and revision. Please continue to refer to MGH Policies and Procedures in Trove as your primary resource.
References

- Original power point, 2011: Bartholomay, Dreher, Theresa Evans, Susan Finn, Deb Guthrie, Hannah Lyons, Janet Mulligan, Carol Tyksienski
- MGH Ellucid
- MGH Medication Manual