Risk Management - Infusion Complications

Infusion complications can be local or systemic. Local complications are those that result from mechanical problems associated with the venous access device, the medication, or delivery of the solution, which may result in trauma or damage to the tunica intima of the vein. Some local complications may turn into systemic complications.

Systemic complications are those that occur in the circulatory system and have the potential of affecting the entire body.

Local Complications

<table>
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<tr>
<th>Complication</th>
<th>Possible Cause</th>
<th>Signs/Symptoms</th>
<th>Interventions</th>
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<tbody>
<tr>
<td><strong>Mechanical Issues: Can’t infuse IV</strong></td>
<td>• IV catheter is kinked/bent&lt;br&gt;• Extension set is clamped&lt;br&gt;• Administration set is kinked&lt;br&gt;• Administration set taped badly&lt;br&gt;• Catheter tip is against the wall of the vein&lt;br&gt;• Catheter moving in the vein&lt;br&gt;• Lose tape/dressing&lt;br&gt;• Empty bag, inadequate gravity flow – inappropriate bag height&lt;br&gt;• Infusing cold fluid&lt;br&gt;• Something constricting flow (ID bracelet, jewelry, clothing)</td>
<td>• Solution not flowing smoothly&lt;br&gt;• Only flows “positionally”</td>
<td>• Assess site&lt;br&gt;• Flush per policy&lt;br&gt;• Assess solution container&lt;br&gt;• Assess administration set and re-tape if needed&lt;br&gt;• Assess drsg device&lt;br&gt;• Remove constrictive jewelry, etc.&lt;br&gt;• Change needlessly connector</td>
<td>Secure catheter well with dressing/securement device and monitor frequently&lt;br&gt;Monitor flow rate&lt;br&gt;Allow refrigerated solutions to come to room temperature prior to infusing&lt;br&gt;Loosen clothing, jewelry, etc. on site with IV&lt;br&gt;Positional IV catheters should be replaced</td>
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<td><strong>Infiltration:</strong> The inadvertent administration of a solution or medication into subcutaneous tissue surrounding the IV catheter</td>
<td>• Catheter tip slips partially or totally out of the vein, causing fluid to seep into tissue&lt;br&gt;• Vessel integrity breaks down</td>
<td>• Coolness, swelling, stretched, and firm skin&lt;br&gt;• Blanching&lt;br&gt;• Puffiness around insertion site&lt;br&gt;• Unable to obtain blood back return when aspirating</td>
<td>• Stop infusion&lt;br&gt;• Remove catheter&lt;br&gt;• Rate area using infiltration scale (appendix 3 pg. 48)&lt;br&gt;• Elevate extremity&lt;br&gt;• Obtain order for warm compress</td>
<td>• Monitor site&lt;br&gt;• Ensure dressing secure&lt;br&gt;• Avoid areas of flexion for insertion&lt;br&gt;• Secure catheter and keep secure especially in moving patient&lt;br&gt;• Educate patient to report S&amp;S</td>
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| **Extravasation:** Infiltration of a vesicant drug that causes tissue damage and even necrosis | Type of medication, concentration of the medication, and the volume of the medication extravasated **Note: Extravasation treatment orders MUST be obtained BEFORE the administration of any vesicant medications** | • See infiltration  
• Pain at infusion site  
• Progressive skin breakdown. Sloughing of the tissue – necrosis may not occur for 1-4 weeks after the initial incident | • Stop infusion  
• Aspirate the residual drug from the catheter  
• DO NOT remove the catheter as you may need to infuse an antidote  
• Consult pharmacist ASAP  
• Notify practitioner  
• Treat per order  
• Complete incident report | • It is NEVER OK to infuse a vesicant through a peripheral line, even once  
• Administer vesicants through a central line  
• Monitor site frequently |
| **Phlebitis:** Inflammation of intima of the vein | • Mechanical – Irritation of vein wall due to catheter abrasion; poor insertion technique; poor site selection  
• Bacterial – Prolonged or extended catheter dwell time; infrequent dressing changes; poor insertion technique  
• Chemical – Medication/solutions infusing | • Pain and tenderness along course of vein (unlike infiltrate where just at site)  
• Red rash with red line at top of vein  
• Vein hard when palpated  
• Gets worse with infusion | • Observe skin and insertion site for warmth, edema, induration  
• Remove peripheral IV (keep tip in case practitioner orders culture)  
• Obtain order for warm compress  
• Rate affected area using INS phlebitis scale (appendix 3 p 48)  
• If midline or PICC, probably mechanical; elevate arm, obtain order for warm compress 4 x day for 20 min. If no improvement in 72 hours, obtain order for removal | • Avoid insertion in areas of flexion  
• Insert appropriate sized catheter for vein and site selection (22 g LTC)  
• Avoid multiple venipuncture attempts  
• Ensure catheter and dressing are well secured  
• If peripheral IV, rotate site per policy  
• Use appropriate vascular access device for the therapy ordered |
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| Venous Thrombosis: The formation of a clot in a vein | • Multiple venipuncture attempts  
• Catheter too large for the vein, which limits the adequate blood flow  
• Hypercoagulable state  
Note: Catheter-related venous thrombosis is a serious and potentially life threatening complication which must be treated promptly | • Redness, local tenderness  
• Patients may complain of neck, jaw, or shoulder pain which may progress to parasthesia of the distal extremity followed by ipsilateral (same side of body) swelling of the extremity or upper body | • For midline or CVAD, notify practitioner – they may order a Doppler study or venogram to diagnose  
• Follow practitioner orders | • Avoid small vessel use  
• Select appropriate size and type of catheter  
• Assessment of IV catheter and extremity per policy |
| Thrombophlebitis: A thrombus is present in the vein, as well as inflammation | See phlebitis and thrombosis | Tortuous veins may form with redness, tenderness and warmth | • See phlebitis and thrombosis  
• Cold compresses applied initially, then warm compresses 4 times daily per practitioner order  
• Elevate extremity  
• Instruct patient not to rub or massage area | See phlebitis and thrombosis |

Note: Catheters with known or suspected thrombus or thrombophlebitis should NOT be removed in the LTC setting due to the risk of an embolism and septicemia.
### Hematoma
A collection of blood outside of a blood vessel

**Possible Cause**
- Multiple insertion attempts in same vein
- Unskilled professional attempting IV insertion
- Patient on anticoagulation therapy

**Signs/Symptoms**
- Hard, bruised, painful area

**Interventions**
- Remove catheter and apply pressure
- Obtain order for cold compress
- Re-evaluate 2 x shift for continued bleeding

**Prevention**
- Don’t use same vein (below or above initial insertion site) for multiple insertions
- If patient on anticoagulation therapy, be cautious

### Ecchymotic Spread
When blood leaks from a broken capillary into surrounding tissue under the skin

**Possible Cause**
- Use of contaminated equipment
- Poor hand hygiene
- Poor site preparation
- Dressing loose
- Patient manipulating dressing

**Signs/Symptoms**
- Redness, swelling, drainage, tenderness at site
- Increased temperature at site
- May occur after catheter removed

**Interventions**
- Notify practitioner
- Remove peripheral catheter (save tip in case practitioner orders culture)
- DO NOT remove a functional CVAD until infection confirmed

**Prevention**
- Good hand hygiene
- Aseptic or sterile technique
- Do not use contaminated or expired equipment
- SCRUB THE HUB
- Educate patient not to touch the site

### Site infection
The presence of bacteria at a vascular access device or catheter insertion site

**Possible Cause**
- Blood clot in catheter
- Fibrin sheath/biofilm
- Catheter tip malposition
- Accumulation of particulate inside the catheter

**Signs/Symptoms**
- Partial – able to flush catheter but negative blood return
- Complete – unable to flush and unable to obtain blood return

**Interventions**
- Reposition VAD or extremity and try again
- NEVER forcibly flush catheter
- Discontinue short peripheral IV and change site
- Contact practitioner r/t midline and CVAD

**Prevention**
- Verify solution/drug compatibility prior to infusion
- Flush catheter per protocol
- Use proper flush techniques to prevent blood back up in catheter

**Note:** Do not leave a CVAD with an occlusion untreated. Do not leave an occluded CVAD lumen just because other lumens may be patent.
## Systemic Complications

<table>
<thead>
<tr>
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<th>Interventions</th>
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<td><strong>Septicemia:</strong></td>
<td>Bacteria entering the bloodstream in several ways:</td>
<td>• Chills, fever, general malaise</td>
<td>• Evaluate for any potential source of infection (e.g., catheter site, UTI, URI)</td>
<td>• Hand hygiene</td>
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<td></td>
<td>• Inappropriate cleansing of needleless connectors</td>
<td>• Increased pulse</td>
<td>• Monitor vital signs</td>
<td>• Aseptic or sterile technique</td>
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<td></td>
<td>• Exposed insertion sites by non-intact dressings</td>
<td>• Rash and discoloration of the skin resulting from bleeding underneath</td>
<td>• Notify practitioner and follow orders (e.g., remove solution or catheter and culture)</td>
<td>• Do not use contaminated or expired equipment</td>
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<tr>
<td></td>
<td>• Poor aseptic technique</td>
<td>• Decreased urine output</td>
<td>• If patient continues to worsen or goes into shock, call 911 and notify practitioner</td>
<td>• SCRUB THE HUB</td>
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<td></td>
<td>• Multiple accesses</td>
<td>• Confusion or mental status change</td>
<td></td>
<td>• Educate patient not to touch the site</td>
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<td></td>
<td>• Contaminated supplies</td>
<td></td>
<td></td>
<td>• Follow equipment change procedures</td>
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<tr>
<td></td>
<td>• Poor hand hygiene</td>
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<tr>
<td><strong>Embolism-air:</strong></td>
<td>• The IV catheter is broken, or needleless connector is off end of hub and patient breaths in air</td>
<td>• Chest pain, dyspnea, low back or shoulder pain</td>
<td>• Immediately place patient on left side in Trendelenburg position</td>
<td>• Make sure all connections are secure</td>
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<tr>
<td></td>
<td>• Not priming/removing air from IV administration sets/supplies prior to infusions</td>
<td>• Cyanosis</td>
<td>• Stop all sources of air</td>
<td>• Prime all infusion supplies (admin sets, extension sets, needless connectors, non-coring needles)</td>
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<td></td>
<td></td>
<td>• Weak, rapid pulse, low BP</td>
<td>• Call 911</td>
<td>• Keep catheters clamped when not in use</td>
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<tr>
<td></td>
<td></td>
<td>• Unconscious</td>
<td>• Notify practitioner</td>
<td>• Instruct patient/family members on prevention</td>
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<td></td>
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<td>• Give oxygen</td>
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Note: Due to risk of pulmonary embolism (see below), always check your solutions to ensure they are clear.
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<td><strong>Embolism-pulmonary:</strong></td>
<td>• The inadvertent infusion of a solution containing particulate matter</td>
<td>• Chest pain, dyspnea, apprehension,</td>
<td>• Place patient in semi-Fowler’s position</td>
<td>• Never forcefully irrigate a catheter</td>
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<td></td>
<td>• Forcefully flushing an IV catheter</td>
<td>hemoptysis, diaphoresis</td>
<td>• Monitor V.S.</td>
<td>• Examine solutions for particulate matter</td>
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<td></td>
<td>• Tachycardia</td>
<td>• Call 911</td>
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<tr>
<td></td>
<td></td>
<td>• Cyanosis</td>
<td>• Notify practitioner</td>
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<td></td>
<td></td>
<td>• Low grade fever</td>
<td>• Administer oxygen</td>
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<td>Broken catheter-Catheter</td>
<td>• Use of sharp objects on or near catheter</td>
<td>• Upon removal of a catheter, a piece</td>
<td>• Immediately place a tourniquet above the area of venipuncture if peripheral,</td>
<td></td>
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<td>Embolus:</td>
<td>• Faulty product</td>
<td>appears to be missing (e.g., measurement</td>
<td>PICC or midline; make sure it is not too tight by checking for pulse.</td>
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<td>• Re-insertion of stylet into catheter</td>
<td>different)</td>
<td>• Bedrest with minimal arm movement</td>
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<td>• Patient or healthcare worker breaks or damages the catheter</td>
<td>• Catheter is broken off</td>
<td>• Stay with patient and have someone call 911</td>
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<tr>
<td></td>
<td></td>
<td>• Cyanosis</td>
<td>• Notify practitioner</td>
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<td></td>
<td>• Hypotension</td>
<td>• Monitor VS</td>
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<td>• Bradycardia</td>
<td>• If PICC: Clamp open end of catheter; cover open end of catheter with</td>
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<td></td>
<td>• Fainting or loss of consciousness</td>
<td>sterile gauze</td>
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<tr>
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<td>• Upon removal of a catheter, a piece appears to be missing (e.g., measurement</td>
<td>• Cyanosis</td>
<td>• Avoid use of sharp objects around catheter (including scissors)</td>
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<td></td>
<td>different)</td>
<td>• Hypotension</td>
<td>• Inspect catheters for defects prior to insertion</td>
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<tr>
<td></td>
<td></td>
<td>• Bradycardia</td>
<td>• Change dressing carefully (never yank)</td>
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<tr>
<td></td>
<td></td>
<td>• Fainting or loss of consciousness</td>
<td>• Never reinsert stylet once removed</td>
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<td></td>
<td>• Never forcefully flush catheter</td>
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<td>• Assess and monitor resident for risk of tampering</td>
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<td>• Use caution when assisting patient in transferring; mobility, all ADLs</td>
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<td>• Keep catheter secured at all times</td>
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| Pulmonary Edema:      | • Precipitated by infusion overload         | • Early signs: restlessness, slow increase in heart rate, headache, SOB, cough and/or flushing  
|                       | • History of CHF                           | • Signs of progression: hypertension, severe dyspnea with gurgling respirations, and coughing frothy fluid  
|                       |                                             | • Late signs: above plus increased weight, puffy eyelids, engorged neck veins, pitting edema  
|                       |                                             | • Hypotension                                                                  | • Slow or stop infusion                           | • Assess patient carefully for Hx of cardiac and fluid volume problems prior to beginning therapy  
|                       |                                             |                                                                                | • Place in high-Fowler’s position                    | • Monitor patient closely during infusion  
|                       |                                             |                                                                                | • Monitor VS                                     | • Maintain ordered infusion rates  
|                       |                                             |                                                                                | • Notify practitioner – administer diuretic and oxygen as ordered  
| Speed Shock:         | • Refers to the rapidity with which a medication is administered  
|                       | • Infusing a medication into the body too fast for the patient’s condition (i.e., kidney disease)  
|                       |                                             | • Dizziness, facial flushing, headache (red man syndrome)  
|                       |                                             | • May progress to chest tightness, hypotension, irregular pulse and anaphylactic shock  
|                       |                                             | • Hypotension                                                                  | • Stop infusion immediately                      | • Nurse MUST infuse medication at ordered administration rate  
|                       |                                             |                                                                                | • Maintain IV catheter                            | • Utilize flow-control device or electronic fluid device to administer fluids  
|                       |                                             |                                                                                | • Treat for shock if necessary                    | • Monitor closely  
|                       |                                             |                                                                                | • Notify practitioner and treat as ordered         | • Keep regulators out of reach of patients if using gravity flow  

Note: Allergic reactions can occur even if no history of allergy exists. If administering a first dose of medication to a patient with a previous Hx of allergy in a similar drug class, be sure to have an order for anaphylactic protocol and have treatment kit nearby. Stay by the patient for the first 15 minutes of the infusion.
Images of Complications

Extravasation

Infection

Infiltration

Phlebitis