**Policy:**

Fluids given via central venous catheters will be done in a safe manner.

This policy is to provide care and troubleshooting guidelines for central venous catheters.

**Table of Contents:**

Definitions

General Considerations

Central Line Insertion Procedure

Accessing the Central Line

Converting to a Heparin Lock

Flushing Procedures

Site Care/Dressing Change

Central Line Removal

Troubleshooting

Central Venous Catheter Reference Guide

**Definitions:**

1. Single lumen: For central venous access for short-term use.
2. Double lumen: Proximal 18G white port is used primarily for general access and a distal 18G red or brown port is used for blood draws for short-term use.
3. Multi-lumen: Proximal 18G white port is used primarily for general access; middle 18G blue port is used for general access or TPN; distal 16G brown port is used for central venous pressure (CVP) monitoring, blood drawing and general access for short-term use.
4. D. Groshong: Permanent central venous access device with a special neutral valve. There are no clamps due to the special valve. Acetone will degrade the catheter material. A dacron cuff adheres to subcutaneous tissue within two weeks of insertion.
5. Hickman: A permanent central venous device that has a clear tip and requires a heparin flush. A dacron cuff adheres to subcutaneous tissue within two weeks of insertion.
6. Implanted vascular access devices (IVAD): A permanent device that has a chamber with a silicone port placed subcutaneously for access. The port is accessed with a non-coring Huber needle. Once accessed, the IVAD is like most other central lines. Some brand names are Port-a-Cath, Mediport, PAS-port, Infusaport, etc.
7. Peripherally inserted central catheters (PICC): Can be single or dual lumen, inserted into central circulation.
8. Short-term: Less than four (4) weeks in duration.
9. Permanent: More than four (4) weeks in duration.
10. Ipsilateral: Appearing or affecting the same side of the body.

**General Considerations:**

1. Types of central venous catheter (CVC) include single, dual, and multi-lumen. It is important for the nurse to know where the tip of the catheter is located, since TPN can be given only when the tip is in the superior vena cava (SVC).
2. Drug incompatibility must be monitored even though the CVC route represents a larger venous system.
3. Any time a CVC is open to the air, there is a risk of air embolism. Minimize the risk by placing the patient supine, head of bed flat or in Trendelenburg position if there are not contraindications. Instruct the patient in breathing techniques and practice with them before starting procedures. If the slide clamp is in the “off” position, the above is not necessary.
4. Notify the physician when the temporary line has been in 7 days. Document in the progress record.

**Procedure:**

## Central Line Insertion

A. Equipment/supplies:

1. Central Venous Catheter kit (physician’s choice)
2. Betadine solution
3. Sterile gloves
4. Masks, gloves, goggles and gowns
5. Appropriate IV fluid and tubing
6. (12cc) syringe for each lumen
7. Normal saline
8. Heparin 10u/cc for heparinized central lines (for flush volumes refer to Central Venous Catheter Quick Reference Guide).

B. Actions/rationale:

1. Prime the IV tubing and label if needed.
2. Prepare the heparin flush solution if IV infusion will not be used for each lumen.
3. Position the patient flat or in slight Trendelenburg.
4. Clip the hair at the insertion site, if necessary.
5. Masks, gloves, gowns and goggles will be worn by all nursing personnel during insertion and will be offered to the provider.
6. Central venous catheters should be inserted with aseptic technique and sterile equipment including gloves and drapes.
7. Assess the patient during insertion. Instruct the patient to remain immobile during catheter insertion.
8. Assist the provider as directed with the insertion.
9. If the provider did not pre-fill the lines with IV fluid, draw blood back through all the ports of the catheter to remove air, flush with saline.
10. Anytime a CVC is open to the air; there is a risk of an air embolism. Take precautions when attaching the tubings. Utilize the slide clamps in the "off" position and attach IV tubing to ports only during patient exhalation.
11. Heparinized lines not being used with the appropriate heparin as on quick reference chart.
12. Secure the catheter to the patient's skin to prevent accidental withdrawal.
13. Apply a sterile dressing, label with date, time and initials.
14. 14. Prevent clotting of the catheter lumen by maintaining continuous IV infusion or routine heparin flush.

C. Aftercare/charting:

1. Auscultate the lung fields for symmetric breath sounds.
2. When the catheter is inserted, a post-insertion chest x-ray to verify catheter position is needed. Run ordered IV fluids at TKO until the placement is verified.
3. Provider order to use central venous catheter is needed before initiating any IV therapy on a newly placed line.
4. Document the insertion of the catheter, catheter type and size, and patient's tolerance of the procedure in the progress notes and the catheter type, size, insertion date, and dressing application on the assessment flow sheet.
5. Document IV fluid(s) and rate.
6. The patient should receive appropriate education and instruction regarding the procedure and his/her responsibilities.

## Accessing the Line

A. Bolus injection:

1. Bolus injections: These can be given directly via a syringe and needle inserted directly into the injection caps or via a syringe and needled into the sideport of a running IV infusion. Direct administration via a syringe attached to the extension tubing (port to port) is discouraged because of the risk of an air embolism when the system is open to the air.
2. Follow the S.A.S.H. formula (or S.A.S. for the Groshong) in giving meds: Saline flush, **A**spiration check and administration, **S**aline flush and **H**eparin.

B. Continuous infusions - port to port (tubing changes):

1. Wash your hands, prepare and prime the IV tubing and IV fluid.
2. Clean the injection cap and the connection between the cap and the extension tubing with alcohol and allow to dry.
3. Assure patency with a 5cc normal saline (NS) aspiration flush.
4. Clamp the tubing with the slide clamp.
5. Put on non-sterile gloves.
6. Disconnect the injection cap from the extension tubing of the established line. Remove the sterile cap from the new IV tubing and connect the IV tubing to the extension.

Open the slide clamp and regulate the flow rate.

C. Charting:

 1. Document on the progress note as needed.

 2. Document patient education.

 3. Document site and site condition.

 4. Document the rate and IV fluid type.

**Conversion to Heparin Lock: (cap change)**

A. Equipment/supplies:

1. Non-sterile gloves
2. Clave cap
3. Heparinized saline, 10 units per cc
4. 2-10cc syringes with needles
5. Normal saline
6. Alcohol swabs

B. Actions/rationale:

1. Gather supplies.
2. Wash hands.
3. Use the slide clamp to close the lumen(s).
4. Draw up the appropriate amounts of solution for the catheter. See Central Venous Catheter Quick Reference Guide at end of policy.
5. Clean the junction between the catheter and cap using friction with alcohol and allow to dry.
6. Put on the non-sterile gloves.
7. Remove the old tubing or cap and apply the new sterile cap.
8. Proceed with flush procedure.

## Flushing Procedure

A. Routine flush:

1. Clean the clave cap with an alcohol swab.
2. Flush line with 5cc saline being careful not to inject air.
3. Flush with the appropriate volume and concentration of heparinized saline solution using positive injection pressure technique when removing the syringe.
4. Positive injection pressure: closing the slide clamp while injecting the final 1cc of heparinized solution.

B. Intermittent medication administration:

1. With a 10cc syringe filled with 5cc of NS, gently aspirate to check for blood return.
2. Flush with 5cc NS using sterile technique before medication administration.
3. Administer medication.
4. Flush with an additional 5cc NS.
5. Flush with the appropriate flush protocol on the Central Venous Catheter Reference Guide, using positive pressure injection technique.

C. Frequency of flushing: See Central Venous Catheter Quick Reference Guide at end of policy.

**Site Care/Dressing Changes**

KEY POINT: All central line dressings are to be sterile procedures while the patient is in the hospital. If a sterile dressing change is not performed, a progress note must be written in the medical record.

A. Equipment/supplies:

 1. Central venous catheter dressing tray

 2. Appropriate dressing

B. Actions/rationale:

1. Assemble materials.
2. Prepare the patient.
3. Wash hands.
4. Secure the lines if applicable.
5. Explain to patient what will happen and his/her responsibilities.
6. Inspect the catheter insertion site, palpate for swelling or tenderness.
7. Remove the old dressing with non-sterile gloves, and discard both.
8. Wash hands again.
9. Put on mask, then sterile gloves.
10. Cleanse the site with three (3) alcohol swabsticks, using friction. Clean site and catheter in a circular motion from insertion site out. Repeat, using three (3) betadine swabsticks. Allow to dry completely before proceeding.
11. KEYPOINT: If patient is allergic to iodine, use alcohol to clean site.
12. DO NOT USE ACETONE IN SITE PREPARATION.
13. Tincture of benzoin and/or skin protectant may be applied around the periphery to improve adherence of the dressing.
14. Cover the entire site with an occlusive dressing. The dressing MUST be occlusive at least 1 ½ - 2 inches from the insertion site in all directions. Overlap or pinch the dressing to ensure occlusiveness around tubing. DO NOT USE TAPE on or under transparent dressing. Sterile steri-strips may be used under a transparent dressing.
15. Secure the catheter and extension tubing to the skin with tape.
16. Date, time, and initial the dressing. Document site care on the CBE.

 17. KEY POINTS:

1. The insertion site should be observed daily for evidence of infection.
2. Remove the steri-strips or suture(s) once healing occurs. Observe daily for evidence of infection.
3. Leave the initial occlusive pressure dressing on the exit site for 48 hours after surgery. If soiled or no longer occlusive, CHANGE! Then change every 7 days or as needed if dressing is no longer occlusive, is loose, damp or soiled.

 d. Observe the site every shift.

## Discontinuing subclavian catheter

1. RNs DO NOT REMOVE GROSHONG OR HICKMAN CATHETERS.

For all other subclavian catheters:

B. Equipment/supplies:

1. Non sterile gloves

 2. Tape

 3. 4 x 4 sponge (sterile)

 4. Betadine swabs

 5. Suture removal set

 6. Sterile specimen container (if signs of infection)

C. Actions/rationale:

1. There must be a provider’s order to remove and/or culture catheter tips.
2. Wash hands.
3. Disconnect all IV tubings from the central line catheter.
4. Place the patient in slight Trendelenburg or flat. Placing the patient in proper position assists in avoiding complications upon removal of the catheter.
5. Remove the dressing using non-sterile gloves. Discard both.
6. Note any purulent drainage, redness, or swelling. If purulence is noted, obtain culture.
7. Wash hands again and put on the non-sterile gloves.
8. Prep the site with a betadine swab.
9. Remove the suture with a suture removal kit. If removing a cut-down catheter, avoid removing any skin sutures.
10. Practice the breathing technique with the patient. Instruct the patient to inhale/exhale two times, and then on the third breath, blow out the air and bear down until the nurse instructs them to continue normal breathing.
11. Grasp the catheter at the insertion site; pull the catheter with a steady force as the patient exhales. This manages intrathoracic pressure, reducing the possibility of air embolus. Do not force a catheter out! If necessary, apply a small amount of tension to the catheter near the insertion site, tape in place. Apply a warm compress to the site, reassess and attempt removal in one hour.
12. Using the 4x4, apply hand pressure to site for five minutes or longer, as needed to control bleeding. Inspect the insertion site. Secure the 4 x 4 gauze with tape. Keep the dressing dry for 24 hours. Apply a new dressing as needed after 24 hours.
13. Inspect the tip of catheter. If the catheter is ragged or damaged, notify the doctor. If the catheter appears to have been severed, measure its length from the hub to the end.
14. After removing the central venous catheter, observe for complications (i.e., swelling, bleeding, pain, difficulty breathing).
15. Document (on the dressing) initials, the date, and time the central catheter was DC’d.
16. Document the date and time.
17. Document the condition of the catheter ("line DC'd intact"), condition of the catheter insertion site, and any problems with catheter removal including any cultures, if done, in the progress note.
18. Document the patient’s tolerance, patient instruction, and the patient’s condition after removal.
19. If the patient is discharged, they must stay in the hospital for at least one hour post catheter removal to enable staff to assess for complications post removal.
20. Instruct the patient/family to report bleeding, redness, swelling, drainage, or increased discomfort to their nurse or provider.

## TROUBLESHOOTING

1. Blocked Catheter: unable to flush the catheter or port using normal pressure. The catheter may be occluded, against the vessel wall or valve, or has migrated from original placement.
2. Assess for edema, signs and symptoms of venous distension or superior vena cava syndrome on the affected side.
3. Assess central venous catheter for kinks, closed slide clamps, or sutures too tight at the insertion site.
4. Assess the flow by repositioning the patient's upper body and arm. Have the patient roll, change positions, raise arms and/or cough to rule out posture-related block or a kink in the catheter. Attempt a normal saline flush. If the catheter is in the jugular vein, place the patient in semi-Fowler’s or Fowler’s position when IV fluids are infusing.
5. Verify occlusion by attaching a 10cc syringe and attempt to withdraw blood.
6. If successful, aspirate the line of all the clots, then irrigate with 20cc of NS, followed by heparin (if not a Groshong).
7. If unsuccessful, attempt to clear the catheter by using an alternating irrigation/aspiration technique with a 10cc syringe filled with 5cc NS. DO NOT force the solution into the catheter.
8. If still unsuccessful, call the physician.
9. Document in the progress note, and note the success or failure of the procedure.

B. Air embolism: signs/symptoms - short of breath; chest pain following injection; wheezing; fainting; cyanosis; tachycardia; dyspnea; tachypnea; disorientation; paresis or cardiac arrest.

1. Slide clamp the catheter immediately proximal to any breaks or leaks.
2. Position the patient on their left side, with their head lower than their heart (Trendelenburg) and their chin tucked into their chest.
3. Call the provider.
4. If cardiac arrest occurs, begin CPR.

C. Local skins irritations/rashes: signs/symptoms - itching; redness; blisters; edema; pain.

1. Notify the provider, especially if it is near the insertion site. Evaluate for signs of a localized infection.
2. Assess the patient for possible allergies.
3. Change the disinfectant to Hibiclens.
4. If the rash follows the borders of the dressing, try a different type of dressing and/or tape.
5. Phlebitis: signs/symptoms - discomfort at insertion site or along catheter pathway or under arm; increased warmth; inability to move affected arm due to discomfort; fever; edema to ipsilateral face, neck, arm; redness; induration.
6. Notify the provider.
7. Apply moist heat (one-hour on/one hour off) for 24-72 hours.
8. If moist heat makes it worse, rotate with ice or just use ice.
9. Elevate the affected extremity.
10. Monitor the temperature, condition of the arm, and general condition of the patient.
11. Observe for signs of local or systemic infection.
12. Encourage the patient to use pain medications.

F. Thrombosis: signs/symptoms - redness; edema at catheter site; possible difficulty with catheter irrigation or occlusion; pain in the neck or chest area; ipsilateral swelling of the arm, neck or face; tachycardia, fever.

1. Notify the provider.
2. If cardiac arrest occurs, start CPR.

G. Sepsis: signs/symptoms - fever over 101 degree F; chills; diaphoresis; malaise; glucose intolerance; muscle aches; weakness; tachycardia; hypotension; oliguria; mental status changes.

1. Call the provider.
2. Culture the blood and the insertion site.
3. Start antibiotics.
4. Discontinue the central venous catheter depending on the symptoms and results of the cultures.
5. Monitor the patient for signs of shock.
6. Damage to the catheter: leakage from the catheter tubing or cap; unexplained wet dressing; unexplained wet, sticky or irritated areas on the skin or tubing; swelling; discomfort; or burning along the catheter path.
7. Immediately slide clamp the tubing as close to the chest as possible. (Fold and tape the tubing if necessary).
8. Check all the connection points and tighten if necessary.
9. If the tubing is damaged or contaminated - change the tubing per this procedure, section - Continuous Infusions: Port to Port - Tubing Change.
10. If the injection cap falls off or leaks, slide clamp the catheter and change the cap.
11. If the leak is from the insertion site, apply a new dressing and call the physician.
12. If the adapter at the end of the catheter is damaged, or there is a break in the integrity of the catheter – slide clamp the catheter. A repair kit is available for the Groshong catheters.

I. Notify the provider for any of the following:

1. Extended length of catheter from the insertion site.
2. Inability to infuse solutions.
3. Leaking at the site.
4. Pain with infusion.
5. An unexplained wet dressing.
6. Flushes easily but no blood return.
7. Flushes with difficulty.

# <<*Name of your Hospital*>>

# CENTRAL VENOUS CATHETER REFERENCE GUIDE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type of Catheter | **Injec-tion Cap Change** | **Site Care Dressing Change** | Blood Draws | **Flushing Procedure** | **RN Removal of Lines** | Special Notes |
| Single and multi-lumen Sub-clavian and Internal Jugular Catheters | Every 72 hours | Every 7 days unless soiled, loose, damp or not occlusive | 1. Turn off all running IVs.2. Flush w/5cc NS (20cc if on TPN)3. Waste 3-5cc blood4. Obtain sample5. Flush w/20cc NS, push-pause method6. Resume IVF or flush w/5cc of 10u/cc Heparin solution | Every 8 hrs. or after each use.1. 5cc NS push 2. 5cc of 10u/cc Heparin solution  | Yes | 1. Proximal lumen is 18G, white port for general use.2. Middle lumen is 18G, blue for TPN3. Distal lumen 16G, brown for blood4. If being flushed > 4 times/day, connect patient to TKO IVF |
| Groshong Catheter Single or Dual Lumen | Every 72 hours | Every 7 days unless soiled, loose, damp or not occlusive | 1. Turn off all running IVs.2. Flush w/5cc NS (20cc if on TPN)3. Waste 5-10cc blood4. Obtain sample5. Flush w/20cc NS, push-pause method6. Resume IVF  | Every 7 days if not in use or flush after each use1. Flush w/5cc NS push  | No | No Acetone!Do not clamp catheter.Never use a syringe smaller than 10cc. |
| PICC | Every 72 hours | Every 7 days unless soiled, loose, damp or not occlusive | 1. Turn off all running IVs.2. Flush w/3cc-5cc NS 3. Waste 3-5cc blood4. Obtain sample5. Flush w/10cc NS6. Resume IVF or flush w/1cc of 100u/cc Heparin solution | Every 8 hrs. w/1cc of 100u/cc heparin solution if not in use1. Flush w/5cc NS 2. Flush w/1cc of 100u/cc heparin solution after each use | Yes | 1. Measure upper arm 3” above antecubital daily and record2. Measure catheter and hub length daily and record |
| Implanted Port | Every 72 hours | Every 7 days unless soiled, loose, damp or not occlusive | 1. Turn off all running IVs.2. Flush w/5cc NS (20cc if on TPN)3. Waste 5-10cc blood4. Obtain sample5. Flush w/20cc NS6. Resume IVF or flush w/5cc of 10u/cc heparin solution | Every 24 hrs. when accessed but not in use flush w/5cc of 10u/cc heparin solution or flush after each use1. Flush w/5cc NS 2. Flush w/5cc of 10u/cc heparin solution 3. For long term intermittent use, flush w/5cc of 100u/cc heparin solution every 4 weeks | No | 1. Must use Huber or non-coring needle2. Needle must be changed every 7 days |
| Hickman Catheter | Every 72 hours | Every 7 days unless soiled, loose, damp or not occlusive | 1. Turn off all running IVs.2. Flush w/5cc NS (20cc if on TPN)3. Waste 5-10cc blood4. Obtain sample5. Flush w/20cc NS6. Resume IVF or flush w/5cc of 10u/cc heparin solution | Every 24 hrs. when not in use flush or after each use flush w/5cc of 10u/cc heparin solution 1. Flush w/5cc NS 2. Flush w/5cc of 10u/cc heparin solution  | No | If being flushed > 4 times/day, connect patient to TKO IVF |