Non-Tunneled Central Venous Catheter (NT-CVC) – Basic Care and Maintenance (Adult)

Not Applicable for Hemodialysis/Apheresis CVC. See Hospital Specific guidelines.

Site Applicability

All VCH & PHC Acute and Community

Practice Level

- RN, LPN
- RPN (SPH Only)

See site specific Practice Level/Education Requirements:

- **PHC** (see Appendix A)
- **VCH** (see Appendix B)

Policy Statement

1. The recommended optimal NT-CVC tip position is the distal (lower third) superior vena cava (SVC) or the cavo-atrial junction (CAJ) or Right Atrial Junction (RAJ).
2. The NT-CVC may be used AFTER initial tip position confirmation by a Physician/Designate.
3. A Physician order is required for NT-CVC removal.
4. Catheter tip position is documented in the patient's health record.
5. Immediately post insertion, measure the amount of catheter visible from the insertion site up to the permanent suture wing (one dot equals one cm) and document.
6. For NT-CVCs not inserted at your acute care facility, and without documentation on admission, prior to use:
   - Catheter tip confirmation is **required** by Chest X-Ray (CXR).
   - Catheter patency **must** be verified by flushing and aspiration with blood return noted without resistance or complication.
   - Site assessment **must** be done; document external measurement of catheter once tip confirmation done.
7. Review necessity of line daily and ensure prompt removal of unnecessary lines.
8. Assess the entry site daily for signs and symptoms of complication.
9. A dedicated lumen for TPN is recommended.
10. Percutaneous Sheath Introducers (i.e. trauma catheters) are allowed in Critical Care areas and VGH Burn Trauma High Acuity (BTHA) Trauma High Acuity patients only. These catheters are removed in critical care areas prior to transfer to non-critical care units.
11. Power injectable catheters are labeled by the manufacturer as power injectable, with the maximum rate of power injection in mL/sec.
12. DO NOT POWER INJECT INTO A CATHETER NOT LABELED AS POWER INJECTABLE.
13. A pump is recommended for infusions via NT-CVC. For blood products, refer to transfusion guidelines **See Blood Components / Products: Administration [D-00-12-30223].**
    - **No minimum rate is recommended for continuous infusion via pump.**
    - **For infusions not via pump (i.e. gravity) minimum rate must be 50 millilitres (mL)/hour.**
14. 10 mL is the smallest-sized syringe to be used for flushing a NT-CVC.
15. Non-toothed forceps must accompany the patient with a NT-CVC at all times. In the event of a damaged/broken NT-CVC, catheter is clamped between the area of damage/break and insertion site with forceps to prevent air embolus or hemorrhage. See Appendix C.
16. A needleless connector is required on each lumen hub of a NT-CVC.
17. A NT-CVC is clamped (with the built-in clamp on the catheter lumen) when not in use.
18. If the built-in clamp of a NT-CVC breaks, attach extension tubing with a clamp. Use non-toothed forceps on the extension leg of the NT-CVC to occlude the catheter lumen when adding/changing the extension tubing.

19. Aseptic technique is maintained throughout all NT-CVC care and maintenance procedures.

Need to Know

- Each lumen is an independent lumen.
- A NT-CVC has a clamp on the permanent extension tube.
- **Administration of phenytoin through a NT-CVC is allowed.**
- Central Venous Pressure Monitoring: CVP monitoring – verify with catheter Instructions for Use (IFU) or consult Infusion Program Clinician/IV Educator.
- FOR FLOW RATES AND PRIMING VOLUMES: refer to manufacturer and/or Infusion Program Clinician/IV Educator.
- Management of Complications - see Appendix C.

Procedure

Procedure Resource Videos

Part 1: Site Assessment
Part 2: Needleless Connector Use
A: Flushing
B: Needleless Connector Change
C: Initiating an Infusion through an Unused Lumen
D: Discontinuing a Continuous Infusion from a Capped Lumen
Part 3: Tubing Change
Part 4: Dressing Change
Part 5: Obtaining Blood Samples
Part 6: Removal
Part 7: Assisting the physician with NT-CVC insertion
Appendix C: Management of Complications for Tunneled-CVC
Appendix D: Checklists
- Dressing change for a Non-Tunneled CVC
- Obtaining blood sample from a CVC: Vacutainer method
- Obtaining blood sample from a CVC: Syringe method

Appendix E: CVC Quick Reference

Part 1: Site Assessment

Policy Statement:

1. NT-CVCs are assessed at the beginning of each shift and PRN.

Procedure:

Assessment:

1. Line placement:
   a. Measure the amount of catheter visible from the insertion site to the permanent suture wing (one dot equals one cm). Confirm it matches the documented length from insertion date.
   b. Intactness of the stabilization wing, and presence of an intact suture.
   c. Ensure all connections are secured.
   d. Unused lumens are clamped.
2. Dressing:
   a. Ensure dressing is dry, intact and dated.
3. Infection:
   a. Insertion site for redness, edema, tenderness or discharge.
   b. Assess patient for signs and symptoms of systemic infection.
4. Phlebitis:
   a. Assess vein pathway for redness, tenderness, swelling, warmth or hardness along the vein in the chest and neck area.
5. Thrombus:
   a. Assess color, warmth, sensation, movement, or edema of extremity of NT-CVC site/side and compare to opposite side.
   b. Visible collateral chest/facial veins, neck swelling and redness.

Part 2: Needleless Connector Use

Policy Statement:

1. NT-CVC lumen(s) are attached to a sterile needleless connector that is used to access the NT-CVC in order to maintain a closed system.
2. Access needleless connectors with luer-lock connection only. **Do not use a needle or cannula to access needleless connector.**
3. 10 mL is the smallest-sized syringe used for flushing NT-CVCs for routine care and maintenance.
4. Replace needleless connector:
   a. Every 7 to 8 days (with dressing change);
   b. PRN if contamination or complication noted.
5. Access lumen using aseptic technique.
6. IV direct medication can be given into a capped NT-CVC lumen through the needleless connector.
7. To decrease risk of catheter related infection, avoid accessing the line more than 4-6 times in a 24 hour period (i.e. for intermittent medications more frequently than every 6h). Obtain an order for continuous infusion.

A) Flushing

1. Flush NT-CVC with minimum 20 mL NS every 12 hours when not in use, pre and post access, after TPN, blood product infusion or blood sampling.

Equipment:

- Surface disinfectant
- Alcohol swabs, Large
- Non-sterile gloves
- Normal Saline 0.9% (NS) 10 mL in pre-filled 10 mL syringe (20 mL per lumen)

Procedure:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Put on non-sterile gloves.
5. Scrub top of needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
6. Attach NS syringe to NT-CVC lumen.
7. Flush with 1 to 2 mL NS before checking for patency. Patency is confirmed by aspirating until blood visible in mid extension tubing of catheter. If unable to aspirate blood or resistance is felt, refer to **Troubleshooting Appendix C #4 Partial Occlusion**.
8. Flush each lumen with 20 mL NS, using turbulent, stop start technique.
9. Remove syringe.
10. Clamp lumen.
11. Wipe top of needleless connector with alcohol swab to remove fluid residue.
12. Document procedure.

B) Needleless Connector Change

PHC uses sterile technique during dressing change and aseptic no touch technique for prn change without dressing change.

Equipment:

- Surface disinfectant
- Non-sterile gloves
- Alcohol swabs, Large
- Sterile needleless connector
- NS 10 mL in pre-filled 10 mL syringe (20 mL per lumen)

Procedure:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Attach 10 mL pre filled NS syringe to needleless connector using no touch technique, prime cap, leave attached in package.
5. Clamp lumen.
6. Wash hands thoroughly using waterless hand sanitizer.
7. Put on non-sterile gloves.
8. Scrub catheter and needleless connector connection with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
9. Remove old needleless connector.
   Note: if contaminants visible (dried blood/crystallization), use new alcohol wipe to scrub hub for 15 seconds, being careful to prevent alcohol solution/contaminants from entering catheter. **ALLOW TO DRY COMPLETELY**.
10. Attach new needleless connector
11. Unclamp.
12. Flush with 1 to 2 mL NS before checking patency. Patency is confirmed by aspirating until blood visible in mid catheter lumen. If unable to aspirate blood, refer to **Troubleshooting Appendix C #4 Partial Occlusion**.
13. For capped unused lumen:
    a. Flush with 20 mL of NS using turbulent, stop start technique to ensure thorough flushing of catheter.
    b. Remove syringe.
    c. Clamp lumen.

d. Wipe top of needleless connector with alcohol swab to remove fluid residue.

14. For lumens with continuous infusion:
    a. Flush with 20 mL of NS using a turbulent, stop start technique to ensure thorough flushing of catheter.
    b. Attach IV infusion set into needleless connector.
    c. Unclamp.
    d. Initiate infusion.
15. Document procedure.

C) Initiating an Infusion through an Unused Lumen

Equipment:

- Surface disinfectant
- Alcohol swabs, Large
- Non-sterile gloves
- IV solution
- IV tubing
- NS 10 mL in pre-filled 10 mL syringe (20 mL per lumen)
- Pump
- Tubing change label

Procedure:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Prime IV tubing.
5. Wash hands thoroughly using waterless hand sanitizer.
6. Put on non-sterile gloves.
7. Scrub top of needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
8. Attach 10 mL NS syringe.
9. Unclamp NT-CVC.
10. Flush with 1 to 2 mL NS before checking for patency. Patency is confirmed by aspirating until blood visible in mid catheter lumen. If unable to aspirate blood, refer to **Troubleshooting Appendix C #4 Partial Occlusion**).
11. Flush with 20 mL NS using turbulent, stop start technique.
12. Connect IV tubing to needleless connector.
13. Initiate IV infusion.
14. Secure tubing.
15. Attach change label to the IV tubing.
16. Document procedure.

D) Discontinuing an Infusion

Equipment:

- Surface disinfectant
- Non-sterile gloves
- Alcohol swabs, Large
- Sterile dead end cap
- NS 10 mL in pre-filled 10 mL syringe (20 mL per lumen)

Procedure:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.

3. Gather equipment.
4. Stop IV infusion.
5. Wash hands thoroughly using waterless hand sanitizer.
6. Put on non-sterile gloves.
7. Disconnect IV tubing from needleless connector.
8. Cap IV tubing with sterile dead-end cap, if IV tubing will be re-connected for later infusion.
9. Scrub top of needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
10. Attach 10 mL NS syringe.
11. Flush with 1 to 2 mL NS before checking for patency. Patency is confirmed by aspirating until blood visible in mid catheter lumen. If unable to aspirate blood, refer to **Troubleshooting Appendix C #4 Partial Occlusion**.
12. Flush with 20 mL NS using turbulent, stop start technique.
13. Remove syringe.
14. Clamp NT-CVC.
15. Wipe top of needleless connector with alcohol swab to remove fluid residue.
16. Document procedure.

Part 3: Tubing Change

Policy Statement:

1. Luer-Lock IV tubing is used for all NT-CVC infusions.
2. Do not transfer IV tubing from one venous access to another.
3. A pump is recommended for infusions via NT-CVC. For blood products, refer to transfusion guidelines: **See Blood Components / Products: Administration [D-00-12-30223].**
   - **No minimum rate is recommended for continuous infusion via pump**.
   - **For infusions not via pump (gravity) minimum rate must be 50 mL/hour**.
4. It is recommended to prime IV tubing immediately prior to use.

Tubing and Solution/Bag Change

	Tubing	IV Solution/Bag
Primary/Secondary Tubing Set		
Non-Medicated (Continuous) IV	every 96 hrs	when empty & with tubing change every 96 hrs
Medicated (Continuous) IV (incl. adds in primary bag)	every 96 hrs	every 24 hrs
Intermittent IV Infusion	every 24 hrs	with tubing change every 24 hrs
Blood and blood product infusion, see **VCH:** TM Blood Product Fact Sheets **PHC:** Blood/Blood-Product Administration Procedure		

TPN Tubing Set	
3:1 TPN: Lipids included • Filtered (1.2 micron) tubing	See Parenteral Nutrition Document: **VCH:** Parenteral Nutrition: Care and Management **PHC:** TPN: Total Parenteral Nutrition: Patient Care
2:1 TPN: Lipids separate • Filtered (0.2 micron) tubing Dextrose/Amino Acid • Lipid Tubing	See Parenteral Nutrition Document: **VCH:** Parenteral Nutrition: Care and Management **PHC:** TPN: Total Parenteral Nutrition: Patient Care
TPN: Dextrose/Amino Acid only	See Parenteral Nutrition Document: **VCH:** Parenteral Nutrition: Care and Management **PHC:** TPN: Total Parenteral Nutrition: Patient Care
TPN: Intermittent	See Parenteral Nutrition Document: **VCH:** Parenteral Nutrition: Care and Management **PHC:** TPN: Total Parenteral Nutrition: Patient Care

Equipment:

- Surface disinfectant
- Non-sterile gloves
- Alcohol swabs, Large
- NS 10 mL in pre-filled 10 mL syringe (20 mL per lumen)
- IV solution
- IV tubing
- Pump
- Tubing change label

Procedure:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Prime tubing.
5. Stop infusion.
6. Wash hands thoroughly using waterless hand sanitizer.
7. Put on non-sterile gloves.
8. Disconnect IV tubing from needleless connector.
9. Scrub top of needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
10. Attach NS syringe.
11. Flush with 1 to 2 mL NS before checking for patency. Patency is confirmed by aspirating until blood visible in mid catheter lumen. If unable to aspirate blood, refer to **Troubleshooting Appendix C #4 Partial Occlusion**).
12. Flush with 20 mL NS, using turbulent, stop start technique.
13. Remove syringe.
14. Wipe top of needleless connector with alcohol swab to remove fluid residue.
15. Connect new IV tubing to needleless connector.
16. Initiate IV infusion.

17. Secure tubing.
18. Attach change label to IV tubing.
19. Document procedure.

Part 4: Dressing Change

Policy Statement:

1. The NT-CVC insertion site must be assessed daily and with every dressing change (see Site Assessment).
2. All NT-CVC are sutured via the stabilization wing. **If sutures are not secure, do not proceed with dressing change, notify the physician.**
3. Post insertion care:
   a. The insertion site must be assessed within 24 hours after insertion.
   b. If site visible (e.g. transparent gel-pad dressing was used), assess need for dressing change based on drainage type and saturation of gel-pad dressing.
   c. If gauze dressing in place, dressing change must be done.
4. Transparent, semi-permeable dressing is changed every 7 to 8 days and as needed when loose, or if moisture, drainage, blood or signs or symptoms of infection are present.
5. A transparent, semi-permeable Chlorhexidine (CHG) impregnated pad dressing or CHG-impregnated sponge dressing may be used to reduce catheter related blood stream infections. Not to be used for patients with CHG intolerance.
6. Sterile adhesive gauze dressing is used if
   a. bleeding at the site
   b. patient is diaphoretic
   c. skin impairment or reaction to transparent dressing
7. Gauze dressing is changed every 48 hours and PRN when needed if loose, or if moisture, drainage, blood or signs or symptoms of infection are present.
8. Strict aseptic technique is required for dressing change procedure including dressing tray, procedure mask and sterile gloves.
9. Untinted Chlorhexidine Gluconate 2% (CHG) with 70% alcohol is used for skin cleansing.
10. CHG 2% without alcohol is to be used when skin irritation is related to an interaction between the adhesive in the dressing, and the alcohol of the prep.
11. Skin contact with CHG must:
    a. be a minimum of 30 seconds
    b. use friction in multiple directions
12. Povidone Iodine 10% is used as an alternative to CHG in cases of contact dermatitis or allergy. Do not wash off with saline as this will affect antimicrobial properties.
13. Saline is not recommended as a cleaning agent for dressing change.
14. May use sterile normal saline to cleanse site if saturated in blood; follow with skin antiseptic.
15. CHG may be inactivated if used with normal saline. Ensure skin is completely dry prior to cleaning with CHG.
16. For skin irritation, contact Infusion Program Clinician/IV Educator.

Equipment:

- Surface disinfectant
- Procedure Mask
- Non-sterile gloves
- Sterile gloves
- Dressing tray
- Sterile dressing (choose type based on work site availability and skin condition):
  - Transparent semi-permeable (large or small size)
  - Transparent semi-permeable with CHG impregnated pad (Large or Small size)
  - Transparent semi-permeable securement dressing

- Transparent semi-permeable dressing and CHG impregnated sponge dressing
- Sterile adhesive gauze dressing

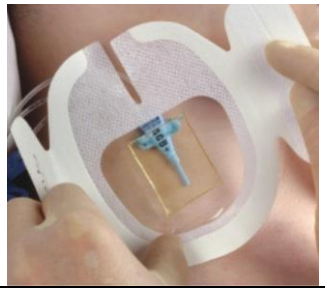
- 2 - CHG 2% with 70% alcohol – swab sticks
- 2-3 CHG 2% with 70% alcohol – large wipe
- Protective skin barrier for patients with sensitive skin
- If removing Transparent dressing with CHG-impregnated pad, include another antiseptic swab stick
- Paper tape measure (to measure external catheter length)

Procedure:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Put on mask.
5. Wash hands thoroughly using waterless hand sanitizer.
6. Set up dressing tray.
7. Put on non-sterile gloves.
8. Measure amount of catheter visible from the insertion site to the permanent suture wing (one dot equals one cm). Compare measurement to original insertion.
9. If sutures used, NT-CVC will be sutured via the stabilization wing.
10. **If sutures are not secure:**
    a) Dressing still intact
       - do not proceed with dressing change, and notify the physician for new suture
    b) Dressing removed:
       - Secure line
       - Clean as per procedure
       - Apply steri-strips and new dressing
       - Notify physician for new suture
11. **Dressing removal:** follow instructions in table below based on product used.
12. Inspect the catheter site. If there are any signs of infection, swab the site for Culture and Sensitivity (C&S) and notify the physician.
13. Remove gloves.
14. Wash hands thoroughly using waterless hand sanitizer.
15. Put on sterile gloves.
16. **Clean catheter and insertion site**:
    a) Use first CHG wipe to clean catheter insertion site.
    b) Anchor NT-CVC at the catheter site with sterile forceps.
    c) Wrap second CHG wipe around catheter. Clean the catheter moving in one direction away from the insertion site up to and including the permanent suture wing.
    d) Clean all of the catheter lumen that will be under the dressing.
17. Clean the catheter site, sutures and skin with CHG 2% with 70% alcohol swab stick.
    a) Clean using friction in multiple directions for 15 seconds.
    b) Repeat with second swab stick. Skin contact with cleanser must be for a minimum of 15 seconds per swab stick.
    c) Ensure entire area that will be covered by dressing (approximately 10 x 10 cm) is cleansed.

    Allow skin to dry completely to prevent skin irritation (minimum 3 minutes); increased dry time may be indicated for populations prone to skin irritation.
18. If required, apply skin prep, allow to dry completely.
19. Dressing application: follow instructions in table below based on product used.
20. Measure external length of catheter:
    a) any movement must be documented
    b) depending on tip location at insertion, CXR may be required.
21. Label dressing with date and external length.

22. Remove gloves, mask, and wash hands thoroughly.
23. Document procedure.

Type of Dressing	Removal	Application
Securement Dressiing (e.g. Tegaderm IV Advanced™) 	1. Remove tape strips applied to top of dressing. Allows for removal of dressing towards insertion site. 2. Separate soft cloth border tabs where they meet under the catheter lumens. 3. Slowly peel dressing back over itself while stabilizing catheter. 4. Remove entire dressing, peeling "low & slow" to reduce medical adhesive skin injuries.	1. Position notched edge of dressing over built-in catheter wing and slightly over lap soft cloth border tabs. Do not stretch dressing over skin. Skin will blister as dressing pulls back. 2. Press transparent portion of dressing into place. 3. While slowly peeling off paper frame, smooth dressing edges with fingertips. Smooth dressing from centre toward edges, using firm pressure. 4. Remove sterile tape strip from paper frame. Optional - fold edge over itself, making a small tab for easier removal. 5. Place wide strip underneath catheter lumen(s), with notch facing towards the insertion site. 6. Apply documentation label over top of dressing where catheter lumen(s) exits dressing. Include date of dressing change & current external length. 7. Apply firm pressure to entire dressing to ensure optimal adhesion. Pressure-sensitive adhesive conforms to skin and builds strength, securing catheter. 8. Ensure: • catheter site is visible near centre of dressing • entire catheter including suture wing is secured under dressing • catheter not twisted or kinked.
Securement Dressing with Chlorhexidine (CHG) (e.g. Tegaderm CHG™) **MUST USE MOISTURE TO REMOVE** 	1. Remove over/under tape strips if present; loosen edges of dressing. 2. Secure catheter at insertion site with finger on top of dressing. 3. Pull dressing laterally (parallel to skin) to ease removal. 4. Once CHG gel pad exposed, use swab stick to apply moisture between CHG pad and skin. DO NOT REMOVE WITHOUT MOISTURE.	1. Ensure NT-CVC site is secured under CHG gel pad. 2. Ensure: • catheter site is visible near centre of dressing • entire catheter including suture wing is secured under dressing • catheter not twisted or kinked. 3. Smooth and press edges of dressing to adhere. Do not stretch dressing over skin – skin will blister as dressing pulls back.

Type of Dressing	Removal	Application
Tegaderm IV Advanced™ with Securacath™ in place (Do not remove Securacath™ with dressing change, only change dressing.)	The Securacath™ device is NOT removed with routine dressing changes. 1. Remove tape strips applied to top of dressing. Allows for removal of dressing towards insertion site 2. Separate soft cloth border tabs where they meets under the catheter lumen(s). 3. Slowly peel dressing back over itself while stabilizing catheter/Securacath™ device. 4. Remove entire dressing, peeling "low & slow" to reduce medical adhesive skin injuries. 5. Clean NT-CVC site – the Securacath™ device can be 'lifted' off the skin for complete skin cleaning to insertion site and surrounding area 	The Securacath™ device is NOT replaced with routine dressing changes. 1. After skin is dry from skin cleaning, place Securacath™ device on skin without tension (let it 'fall into place' on skin) 2. Position notched edge of dressing over built-in catheter wing and slightly over lap soft cloth border tabs. Do not stretch dressing over skin. Skin will blister as dressing pulls back. 3. Press transparent portion of dressing into place. 4. While slowly peeling off paper frame, smooth dressing edges with fingertips. Smooth dressing from centre toward edges, using firm pressure. 5. Remove sterile tape strip from paper frame. Optional – fold edge over itself, making a small tab for easier removal. 6. Place wide strip underneath catheter legs, with notch facing towards the insertion site. 7. Apply documentation label over top of dressing where catheter lumen(s) exits dressing. Include date of dressing change and current external length. 8. Apply firm pressure to entire dressing to ensure optimal adhesion. 9. Ensure: • catheter site is visible near centre of dressing • entire catheter including suture wing is secured under dressing • catheter/Securacath™ not twisted or kinked.

Part 5: Obtaining Blood Sample

- Obtaining Blood Samples from a Central Venous Catheter: Vacutainer Method Checklist
- Obtaining Blood Samples from a Central Venous Catheter: Syringe Method Checklist

Specific labelling procedures for drawing Group and Screen, see
VCH: Patient Identification, Specimen Collection and Labeling for Transfusion Medicine Investigation

Policy Statement:

1. Blood should not be drawn from a lumen used to infuse cyclosporine, tacrolimus or dextran.
2. If TPN is infused via a single lumen NT-CVC, blood work is drawn peripherally if adequate peripheral access. Prior to using TPN lumen for blood work, consult Infusion Program Clinician/IV Educator.
3. Blood sampling can be done from all types of NT-CVC – single, dual and triple lumens.
4. It is recommended that blood sampling be done through the needleless connector to ensure a closed-system.
5. For blood cultures: changing the needleless connector is recommended prior to obtaining blood sample.
6. Use the proximal lumen for blood samples.
   a) If multi-lumen, stop infusions on other lumens and clamp during blood draw.
   b) If other lumens (multi-lumen) are capped, flush **all** lumens after blood sampling.
7. A discard sample is taken prior to obtaining blood work. See:
   VCH: Guidelines for Collecting Blood Samples through Vascular Access Device (VAD)
8. Flush with a **minimum** of 20 mL NS post blood draw or until needleless connector is clear (no blood visible in needleless connector).
9. Blood sampling may be done using:
   a. Vacutainer method (preferred).
   b. Syringe method (using blood transfer device).

Equipment:

- Surface disinfectant
- Non-sterile gloves
- 4-5 alcohol swabs, Large
- Luer-lock Access Device, Holder with Pre-Attached Multiple Sample Adapter (vacutainer holder)
- Lab blood tubes
- Blood culture bottles *if required – also new needleless connector (to be changed prior to blood sampling)
- Biohazard Sharps container
- Sterile dead end cap if reconnecting existing IV tubing
- 3-7 NS 10 mL in pre-filled 10 mL syringe (20 mL per capped lumen)
- Additional supplies required to flush all capped lumens after blood sampling

If using syringe method, you will need:

- Eye protection / mask with eye shield
- Luer-lock syringes – as many as required to withdraw blood samples
- Blood transfer device for transferring blood from syringe into collection tubes

If obtaining coagulation tests, you will need:

- ***Vacutainer method:*** a 5 mL non-additive tube (refer to site below for non-additive tube color)
- ***Syringe method:*** an additional 10 mL syringe

For order of blood tube collection, see:
VCH: Blood collection through a VASCULAR ACCESS DEVICE (CVC & ARTERIAL) Reference Guide
PHC: Phlebotomy & CVAD Quick Reference

Procedure:

1. Clean work surface with surface disinfectant and let dry.

2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Turn off IV infusion if present. For multi lumen, ensure all IV infusions are turned off prior to blood sampling.
5. Clamp all lumens excluding the lumen you are drawing blood from.
6. Wash hands thoroughly for 30 seconds using waterless hand sanitizer.
7. Put on non-sterile gloves.
8. Disconnect IV tubing from needleless connector and cap IV tubing with sterile dead-end cap to maintain sterility of IV tubing end.
9. Scrub top of needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
10. Attach 10 mL pre-filled NS syringe and flush catheter with a minimum of 5 mL NS.
11. Slowly aspirate discard sample (follow discard instructions below).

Discard Instructions, see:
VCH: Guidelines for Collecting Blood Samples through Vascular Access Device (VAD)

Troubleshooting:

If blood flow slows or stops:

a. Check lumens for any kinks.
b. Have patient cough, do Valsalva's maneuver, turn head to opposite side, raise arms or change position.
c. Change blood collection tube.
d. Use syringe to withdraw blood through the needleless connector.
e. Change needleless connector.
f. Flush lumen with 5 mL NS solution and if resistance to flush is felt, stop and contact Infusion Program Clinician/IV Educator.

12. Remove discard syringe.
13. Attach either Luer-lock Access Device, Holder with Pre-Attached Multiple Sample Adapter (vacutainer holder) or a 10 mL syringe and withdraw sample. See Vacutainer and Syringe method below.

Vacutainer Method:

1. Insert blood tubes into barrel of device and push down to allow blood to flow into the tube. Continue until all tubes have been collected (if blood flow slows or stops see troubleshooting guide above) For order of blood tube collection see:
   VCH: Blood collection through a VASCULAR ACCESS DEVICE (CVC & ARTERIAL) Reference Guide
   PHC: Phlebotomy & CVAD Quick Reference

2. Remove the Luer-lock Access Device, Holder with Pre-Attached Multiple Sample Adapter (vacutainer holder) and discard in the sharps container.

3. Scrub needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
4. Attach NS syringes and flush immediately using turbulent, stop start technique. Flush with a minimum of 20 mL NS or until no blood visible in needleless connector.
5. Remove syringe.
6. Wipe top of needleless connector with an alcohol swab to remove fluid residue.
7. Clamp lumen if not reconnecting IV tubing.
8. If **reconnecting IV** tubing:
    i. Connect IV tubing and resume IV infusions.
9. Unclamp all other lumens as necessary and reinitiate any stopped IV infusions.
10. Flush all capped lumens after blood sampling.
11. Label collected specimens, and send to the Lab as per lab guidelines. Refer to:
    VCH: Label Samples [D-00-12-30098]
    Invert tubes as per:
    VCH: Blood collection through a VASCULAR ACCESS DEVICE (CVC & ARTERIAL) Reference Guide
    PHC: Phlebotomy & CVAD Quick Reference
12. Remove gloves and wash hands thoroughly for 30 seconds.
13. Document procedure.

Note: if unable to draw blood using the vacutainer method, use the syringe method.

Syringe Method:

1. Attach empty syringe and withdraw the required amount of blood for your sample volumes, if blood flow slows or stops see troubleshooting guide above**.**
2. If coagulation tests are required, draw an additional syringe of blood after step 1.
3. Disconnect the syringe and attach to transfer device with a twist to lock it on (if applicable you will transfer coagulation syringe first).
4. Before transferring blood samples, scrub needleless connector with an alcohol swab using friction for 15 seconds. **ALLOW TO DRY COMPLETELY**.
5. Attach NS syringes and flush immediately using turbulent, stop start technique. Flush with a minimum of 20 mL NS or until no blood visible in needleless connector.
6. Remove syringe.
7. Wipe top of needleless connector with an alcohol swab to remove fluid residue.
8. Clamp lumen if not reconnecting IV tubing.
9. **If reconnecting IV tubing:**
    i. Connect IV tubing and resume IV infusions.
10. Wear eye protection when transferring blood from syringe to lab tubes.

11. With the syringe held vertically and the tip pointing down, insert blood-sampling vacuum tube into the barrel of device to collect blood sample. Allow vacuum to fill the tube (e.g. do not apply pressure to syringe plunger). Continue until all sample tubes have been collected into appropriate lab tubes.
12. For order of blood tube collection see:
    VCH: Blood collection through a VASCULAR ACCESS DEVICE (CVC & ARTERIAL) Reference Guide
    PHC: Phlebotomy & CVAD Quick Reference
13. Dispose of needleless blood transfer assembly and syringe as one unit into the sharps container. Do not disassemble.
14. Unclamp all other lumens as necessary and reinitiate any stopped IV infusions.
15. Flush and all capped lumens after blood sampling.
16. Label collected specimens, and send to the Lab as per lab guidelines, refer to:
17. **VCH:** Label Samples [D-00-12-30098]
18. Invert tubes as per:
    VCH: Blood collection through a VASCULAR ACCESS DEVICE (CVC & ARTERIAL) Reference Guide
    PHC: Phlebotomy & CVAD Quick Reference
19. Remove gloves and wash hands thoroughly for 30 seconds.
20. Document procedure.

Part 6: Removal

Policy Statement:

1. An RN who has completed the Practice Level requirements may remove a NT-CVC.
2. Large-bore catheters (8.5 French or larger), Percutaneous Sheath Introducers such as trauma catheters, and Cordis catheters are only removed by Critical Care RNs and VGH Burn Trauma High Acuity (BTHA) RNs.
3. Review necessity of NT-CVC daily and ensure prompt removal of unnecessary lines.
4. If a complication or thrombus is identified and diagnosed by ultrasound or venogram, consult Infusion Program Clinician/IV Educator and physician (removal by physician may be indicated).
5. For patients on anticoagulant therapy or with coagulation abnormality, review relevant lab results (i.e. platelets, INR) prior to removal. If anticoagulation concerns, or at high risk for bleeding, contact Physician for removal direction

Equipment:

- Sterile dressing tray
- Sterile gloves
- Non-sterile gloves
- 10 x 12 cm transparent dressing
- Petroleum ointment or petroleum gauze
- 3 CHG 2% in 70% alcohol swab sticks
- 2 CHG 2% in 70% alcohol - Large swab/wipe
- Procedure Mask
- Eye Protection
- Sterile suture scissors (x 2 if culturing NT-CVC tip)
- if sending tip for culture, C&S container

Procedure:

1. Clean work surface with disinfectant and let dry.
2. Wash hands thoroughly for 30 seconds.
3. Gather equipment.
4. Place patient in a supine position
   Note: If patient dehydrated, place in Trendelenberg position (10 to 30 degree head down tilt)
   Rationale: A dehydrated patient will have a low CVP which allows air to be aspirated into their circulation more easily.

5. Put on mask and eye protection.
6. Wash hands thoroughly for 30 seconds using waterless hand sanitizer.
7. Set up dressing tray
8. Put on non-sterile gloves
9. **Dressing removal:** follow instructions in types of dressing table based on product used.
10. Inspect the catheter site. If there are any signs of infection, swab the site for C&S and notify the physician.
11. Remove gloves
12. Wash hands thoroughly for 30 seconds using waterless hand sanitizer.
13. Put on sterile gloves.
14. Clean as per dressing change procedure.
15. Prepare petroleum gauze dressing:
    - If using petroleum ointment, put 1-2 cm on gauze
    - If using petroleum impregnated gauze, put on top of dry gauze dressing
16. Remove sutures using sterile scissors.
17. Have the patient perform the Valsalva's maneuver if the patient's condition allows. If the patient is mechanically ventilated, remove during expiration, at the end of inspiration. If Valsalva's maneuver is contraindicated, remove the catheter while the patient exhales.
18. Hold folded 10 x 10 cm gauze in non-dominant hand above NT-CVC insertion site while removing the catheter with the dominant hand in one straight motion. Immediately occlude site with folded 10 x 10 cm gauze. Avoid wiping catheter on gauze during removal to prevent site contamination.
19. Apply manual pressure to the site until hemostasis achieved; additional time will be required for patients who are anticoagulated, or have a coagulation abnormality.
20. After removal, inspect distal tip of NT-CVC noting condition and length to ensure complete removal.
21. Repeat step #17.
22. Remove folded gauze and apply prepared petroleum gauze dressing to old CVC insertion site.
23. Apply sterile transparent dressing over prepared petroleum gauze dressing.
24. Do vital signs post removal every 15 minutes times 2 then every 30 minutes times 1 and document.
25. Instruct patient to remain in bed supine or flat if possible for a minimum of 15 minutes post removal. This position maintains a positive intra-thoracic pressure and allows time for tissue tract to seal.
26. Post removal observe patient for bleeding, air embolus, and or other removal complications for 60 minutes. Refer to Appendix C: Management of complications.
27. Document procedure.
28. Remove dressing 24 hours post NT-CVC removal. If site is not epithelialized, apply new dressing and assess every 24 hours until skin is epithelialized.

Part 7: Assisting the physician with NT-CVC insertion

Resources: See CVC Insertion E-learning Module in LearningHub.
Recommendation: Review e-learning insertion module prior to assisting the physician.

Policy Statement:

1. At any point before and during the placement of the line, the observer and /or the assistant should feel empowered to halt the procedure if there is a break in sterile technique or patient safety is at risk.
2. The recommended optimal NT-CVC tip position is the distal (lower third) superior vena cava (SVC) or the cavo-atrial junction (CAJ/Right Atrial Junction (RAJ).
3. Tip placement must be confirmed by CXR. A nurse must confirm x-ray results with the inserter or Radiologist prior to use.
4. Tip position is documented in the patient's health record.

The NT-CVC insertion procedure is done using **maximal barrier precautions** including:

- Proper hand hygiene.
- Use of non-tinted or tinted Chlorhexidine Gluconate (CHG) 2% with alcohol 70%.
- Large sterile drape

- Sterile gown and gloves
- Head cover and protective eyewear
- Procedure Mask

Indication	Contraindication
• Resuscitation • Short term IV therapy • Infusion of IV fluids • Medication administration • TPN • Blood products • Chemotherapy • Blood sampling	• Coagulopathy, a relative contraindication but one requiring extreme care during insertion (INR > 2, platelets < 50,000). • Infection over target vein • Thrombosis over target vein • Scarring over target vein • Erythema or open wound over targeted site

Equipment:

- Surface disinfectant
- Mask for inserter and assistant(s)
- Head cover for inserter and assistant(s)
- Non-sterile gloves
- Sterile gloves
- Sterile gown
- CVC kit: Choose catheter size that will accommodate client size and required therapy
- Ultrasound
- Ultrasound probe cover
- Sterile ultrasound transmission gel
- Needleless connector – 1 per lumen
- Transparent dressing with/without CHG-impregnated pad or CHG-impregnated sponge dressing
- 3 - CHG 2% with alcohol 70% non tinted or tinted Maxi swab sticks
- 2-6 10 mL pre-filled syringes with NS – 20 mL per lumen
- Clipper with disposable blade

Procedure:

Pre-insertion:

1. Clean work surface with surface disinfectant and let dry.
2. Wash hands for 30 seconds.
3. Gather equipment.
4. Provide the inserter with head cover, mask, sterile gown, and sterile gloves.
5. For **internal jugular and subclavian** placement, place client in **Trendelenberg (15°) position.** For **femoral** insertion, place client in **supine position**.
6. Remove pillow and place a protective pad under the patient's head and shoulders or pelvic/lower hips.
7. Remove hair over targeted insertion area with clippers, if necessary.
8. Assist inserter as needed.
9. Provide support to client.

Post-insertion:

10. Ensure each lumen is patent: aspirate blood from each lumen and flush each lumen with 20 mL NS
11. Ensure needleless connectors are attached to each lumen.
12. Ensure built-in clamp on catheter lumen is clamped if not in use.
13. Ensure appropriate dressing applied post insertion; follow dressing change procedure.

Patient/Client/Resident Education

CVC information

Documentation

Document on site-specific documentation tools as per policy.

Related Documents

- Arrow. Arrow CVC poster plus insertion procedure. Retrieved on June 20, 2008 from www.arrowintl.com
- VCH Online e-learning CVC Care and Maintenance Module
- VCH Online e-learning CVC Insertion Module

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March 05, 2019 *(Changed point #6 in Vacutainer Method Checklist.)*

Appendix A: PHC Practice Level/Education Requirements

RN (RPN at SPH Only): with additional education

- Successful completion of a Central Venous Catheter (CVC) Care & Maintenance Learning Module.
- Attendance of IV Specific Orientation session and CVC Care and Maintenance instruction lab as required by work site.
- Demonstrate competency through a site specific formal process *(may include observation by experienced RN/Educator/Clinical Resource Nurse).*
    - Specialized education is not required to perform a site assessment, change intravenous (IV) infusion bags or administer medication into a continuous IV infusion.

Additional specialized education is required for PICC:

- Insertion
- Tip confirmation prior to initial access
- Exchange
- Repair
- Occlusion Management
- PICC adjustment
- PICC removal

LPN requirements: (Practice limited to Acute sites only)

- Successful completion of a CVC Care & Maintenance Learning Module.
- Attendance of Orientation session on IV therapy as required by work site.
- A LPN who has completed the site specific relevant orientation may:
    - Report/consult with RN for suspected complications and problem solving (shared provision of care).
    - Assess PICC insertion site for complications and dressing status.

Back to Top

Appendix B: VCH Practice Level/Education Requirements

RN: with additional education

ALL:

- Successful completion of the CVC Care & Maintenance E-Learning Module.
- Demonstrates competency through a formal process – (see Performance Checklists – pgs 29-31).

Acute:

- Attendance of Hospital Wide Orientation session on Parenteral Therapy.
- Attendance of CVC Care and Maintenance Instruction Lab.

Community:

- Attendance of IV Specific Orientation session as required by work site.

An RN who has completed the requirements may perform the following skills:

- Site assessment
- Flushing
- Tubing change
- Needleless connector change
- Dressing change
- Obtaining a blood sample
- Removal

An RN who is new at performing the above skills, or who has identified a need for review, must be observed by an experienced RN, Educator, or Clinical Resource Nurse.

An RN who ***has not*** completed the requirements may:

- Perform a site assessment
- Change intravenous (IV) infusion bags
- Administer medication into a continuous intravenous infusion

An RN requires specialized training for:

- Occlusion Management

LPN requirements: (Practice limited to Acute sites only)

- Successful completion of Section A of the CVC Care & Maintenance E-Learning Module.
- Attendance of Hospital Wide Orientation session on Parenteral Therapy.
- An LPN who has completed the site specific relevant orientation may:
  - Report/consult with RN for suspected complications and problem solving (shared RN/LPN provision of care).
  - Assess NT-CVC insertion site for complications and dressing status.

Back to Top

Appendix C: Management of Complications for Non-Tunneled CVC

Complications	Signs & Symptoms	Management	Prevention
1. Air Embolism: Air is drawn through the catheter into the patient's vascular system. Air embolism can occur during insertion and/or removal of CVC.	• Light-headedness • Restlessness/anxiety • Chest pain • A sense of impending doom • Nausea • Tachycardia • Hypotension • Dyspnea, tachypnea • Cyanosis changes in mental state, confusion, seizures • Unresponsiveness • Rales or wheezing in the presence of pulmonary edema	• Clamp the open/cracked lumen/catheter close to the insertion site and apply an occlusive dressing to a dislodged, cracked or disconnected lumen. • Place patient on Left side (this permits the air bubble to rise to upper part of the Right Atrium). • Call a code • Vital signs every 5 minutes • Administer oxygen	• Use luer-lock connections and secure well • Clamp catheter/lumen when changing administration set/cap. • Provide patient education re: catheter displacement and disconnection. • During insertion ensure that blood is aspirated from each lumen and each lumen is flushed with 20mL NS. • Position patient in Trendelenberg (if patient condition allows) for NT-CVC insertion and supine using Valsalva's maneuver for removal.
2. Arrhythmias: Tip of catheter is placed within the R atrium; leads to cardiac muscle irritability and arrhythmias	• Irregular pulse • Chest Pain • Palpitations	• Obtain CXR to confirm tip position • If in Right Atrium contact the Physician who inserted NT-CVC	• Confirm catheter tip placement prior to use
3. Infection: Could be local or systemic	*Local:* • Purulent drainage, erythema • Swelling • Tenderness at site *Systemic:* • Fever/chills • Increased WBC • Malaise • Hypotensive & shock (severe infection)	*Local:* • Contact physician. • Swab insertion site for C&S prior to starting antibiotics. *Systemic:* • Contact physician • Catheter removal may be necessary if treatment is unsuccessful. • Obtain peripheral blood cultures as well as blood cultures from the central line. • Send catheter tip for C&S if line is removed.	• Assess site every shift and PRN. • Aseptic technique to be used at all times during care & maintenance. • Monitor vital signs and temperature. • Monitor lab results. • Assess daily clinical need for line removal.

Complications	Signs & Symptoms	Management	Prevention
4. Partial Occlusion: Able to infuse, but unable to withdraw blood. *Contributing factors:* • Failure to flush/lock according to catheter flushing procedure resulting in lumen obstruction. • Catheter opening may draw up against vein wall with aspiration. • Blood clot, fibrin sheath, or particulate matter obstructing catheter, when blood is being aspirated. • Sutures may be too tight. • Kinked catheter outside or inside the body. • Malposition of catheter tip.	• Sluggish flow of IV fluids. • Difficulty flushing. • Inability to aspirate blood.	• Check lumen for any kinks. • Have patient cough, do Valsalva's maneuver, turn head to opposite side, raise arms or change position. • Flush with 10 mL NS solution in a 10 mL syringe using a gentle push-pause technique. If resistance to flush is felt, stop. • If no resistance to flush is felt, pull back gently on the syringe plunger 2 to 3 mL pause and proceed with aspiration. • Attempt to aspirate with a smaller syringe (3 to 5 mL) which exerts less negative pressure when withdrawing blood. • Change needleless connector. • Notify the physician; obtain order for Thrombolytic Therapy. • Notify Infusion Program Clinician/IV Educator to instill Thrombolytic Therapy. • If able to flush and aspirate blood, flush the lumen with 20 mL NS and continue with therapy. • Document the type of occlusion, intervention, patient response, and physician intervention.	• Routine turbulent flushing with 20 mL NS after intermittent medications, blood product transfusions or following obtaining blood sample. • Follow guidelines for routine NT-CVC flush and lock. • Check for lumen patency prior to accessing. • Do not leave partial occlusion unresolved, as it will turn into total occlusion.
5. Total Occlusion: Inability to withdraw blood or infuse. *Contributing factors:* • Blood, drug precipitate or lipid deposits completely obstructs the lumen. • May be kinked, coiled or damaged. • Sutures used during catheter placement may have tightened and restricted flow.	• Unable to flush or aspirate blood.	• Do not force flush. • Assess catheter and tubing for kinks in line or tight sutures. • Move the patient's arm, shoulder and head to see if a position change affects the ability to infuse. • If occlusion not fibrin/blood related (i.e. drug precipitate, lipid deposits), notify Infusion Program Clinician/IV Educator to identify source of occlusion and treat with appropriate agent. • Discuss Radiologic studies, e.g. CXR, Venogram • Report and document occlusion, interventions and response.	• Routine turbulent flushing with 20 mL NS after intermittent medications, blood product transfusions or following obtaining blood sample. • Follow guidelines for routine NT-CVC flush and lock. • Check for lumen patency prior to accessing • Check for sutures that are tight and restricting flow around the catheter and notify the physician.

Complications	Signs & Symptoms	Management	Prevention

6. "Stuck" needleless connector cap	• Unable to remove cap from catheter lumen
	• Two potential causes:
	  ○ Over-tightening of cap when accessing (see photos in 'prevention')
	  ○ Fluid has crystallized between cap and catheter lumen
		• Reassess routinely
		• Change cap after collecting blood sample if flushing does not clear cap
		• If "stuck" cap, try using a latex Penrose drain for grip to remove
		• May try alcohol swab between cap and lumen hub to dissolve crystallized solution
		• Notify Infusion Program Clinician/IV Educator
		• Forceps may crack or break NT-CVC, and are only to be used after Infusion Program Clinician/IV Educator notified.
			• After priming new cap, tip excess fluid out of end of cap prior to attaching to catheter lumen
			• When attaching new cap, finger tighten only
			AND
			• With any luer-access (syringe or IV tubing), **hold at base of cap.**
			 
			• When "turning on" to cap, continue to **hold cap at base**
			 

7. Venous Thrombosis: A clot between the catheter and the vein. *Contributing factors:* • Improper flushing of catheter lumen(s) causing fibrin sheath/clot formation in catheter or at tip of catheter in vein. • Predisposing patient history related to blood clotting (i.e. cancer) • Incorrect tip position (i.e. in Upper SVC or Brachiocephalic, or Subclavian vein	• Edema/cyanosis of arm with CVC line • Pain • Swelling of neck, face, shoulder, arm or chest. • External jugular vein distention. • Change in ability to infuse or withdraw.	• Do not remove the NT-CVC. • Contact Infusion Program Clinician/IV Educator, and Physician. • After informing the above clinicians/physician observe the client hourly & PRN • Follow up with diagnostic studies (Ultrasound and/or venogram) • Anticoagulation therapy as directed by Physician. • Do not remove the line. Removal is the responsibility of the Physician. (NT-CVC may be left in place during anticoagulation treatment).	• Assess for signs & symptoms of venous thrombosis every shift and PRN. • Check for lumen patency prior to accessing. • Use turbulent flush (stop start) technique. • Use needleless connector.
8. Superior Vena Cava Syndrome: Occlusion of the SVC by a thrombus. SVC syndrome results in increased venous pressure, which results in central nervous system disturbances. SVC syndrome can lead to cerebral and vocal cord edema and death.	• Progressive edema of upper extremity, neck and face. • Dilatation of the superficial veins of the chest, neck, and arms. • Collateral veins of chest, neck. • Peri-orbital edema (swollen eyes) • Tachycardia • Hypotension	• Notify physician and Respiratory Therapist STAT. • Position patient comfortably. • Apply oxygen. • Obtain peripheral venous access. • Vital signs every 5 minutes and PRN.	• Assess every shift and PRN for signs of increased swelling of face, chest and eyes. • Assess for signs & symptoms of venous thrombosis every shift. • Check for lumen patency prior to accessing.

Complications	Signs & Symptoms	Management	Prevention
9. Extravasation Soft tissue damage due to leaking of vesicant or irritating drug from a vein into the surrounding tissue. *Contributing Factors:* • Catheter dislodgement. • Catheter broken internally • Presence of a fibrin sheath.	• Edema • Erythema • Pain or burning during or after infusion in area of vascular access device. • Unable to obtain blood return with aspiration	• Stop infusion • Notify physician STAT • Warm or cold treatment as per ordered medication protocol. • Attempt to aspirate the drug or solution from the catheter • Follow Extravasation Protocol. • Document observation, assessment and treatment.	• Check site each shift and PRN. • Check for lumen patency prior to accessing. • When administering vesicants, check for blood return with aspiration prior to drug administration. • Review CXR to confirm correct tip position. • Have antidotes available when administering vesicant drugs.
10. Catheter Dislodgement Line is partially or totally dislodged. *May cause:* • Hemorrhage or • Air Embolus - Air can be drawn up through dislodged, cracked, or disconnected CVC or IV tubing into the patient's vascular system causing an Air Embolus.	*Partial Dislodgement:* • Swelling in the chest wall during infusion. • Leaking at catheter site. • Pain or discomfort with infusion. • External portion of catheter may have increased in length • Obvious bleeding from disconnected tubing. *Complete Dislodgement:* • Hemorrhage • Air Embolus • Hypotension, tachycardia, pallor, altered level of consciousness • Catheter has completely dislodged out of the insertion site.	*Partial dislodgement:* • Stabilize catheter • Stop IV • Position patient supine • Notify Infusion Program Clinician/IV Educator and Physician. • Monitor vital signs • Obtain CXR *Complete Dislodgement:* Asymptomatic: • Position patient on left side • Apply pressure to insertion site for 5 minutes • Apply occlusive dressing to exit site • Monitor for S&S of air embolism and hemorrhage • Notify physician Symptomatic: • Position on left side • Initiate resuscitation measures • Acute: call a Code • Community: call 911 • Continue to apply pressure until bleeding stops • Apply occlusive dressing to exit site	• Ensure sutures and/or securement devices are intact. • Record catheter length at the beginning of each shift and PRN. Compare measurement to original measurement. • Secure NT-CVC to skin/ clothing to prevent pulling • Avoid pulling on NT-CVC when transferring/ positioning patient.

Complications	Signs & Symptoms	Management	Prevention
11. Catheter damage tear or leak *Contributing factors:* • Contact with a sharp object • Rupture from attempt to irrigate an occluded catheter with a syringe smaller than 10 mL	• IV fluid or blood leaking out of NT-CVC. • Signs & symptoms of Air Embolism • External portion of catheter may have increased in length	• Clamp catheter close to insertion site with non-toothed forceps. • Prevent air emboli. • If the lumen or catheter is broken, obtain an order to remove the NT-CVC. • Notify Infusion Program Clinician/IV Educator and Physician.	• 10 mL syringe is the smallest size syringe used to flush a CVC. • Secure catheter to skin/ clothing to prevent pulling • Avoid pulling on NT-CVC when transferring/ positioning patient • No sharp objects near NT-CVC • Compare measurement to original insertion documented measurement. • Ensure line is not twisted or kinked before flushing.
12. Blood noted in Catheter *Contributing factors:* • Placement of the catheter in the right atrium or ventricle. Contractions of the heart muscle can force blood into the catheter. • Increased pressure in the SVC due to excessive coughing, vomiting. • Loosened cap. • Tear or hole in the extension tubing. • Fractured catheter. • Flush/lock protocols not followed.	• Blood seen in catheter lumen • Signs & symptoms of Air embolism	• If catheter is fractured, clamp NT-CVC close to the insertion site with non-toothed forceps. • Attempt to aspirate blood from the catheter, if blood aspirated, flush with 20 mL NS. If unable to aspirate blood, follow total occlusion management protocol (above). • Consider CXR to confirm tip placement • Ensure needleless connector is used and secure • Clamp lumen when not in use • Notify Infusion Program Clinician/IV Educator and Physician.	• NT-CVC correct tip confirmation prior to use • Ensure needleless connector tubing connections are secure. • 10 mL syringe is the smallest size syringe used to flush a NT-CVC. • Secure catheter to skin/ clothing to prevent pulling • Avoid pulling on NT-CVC when transferring/ positioning patient. • No sharp objects near NT-CVC. • Use needleless connector.
13. Air noted in catheter lumen *Contributing factors:* • Hole in catheter. • NT-CVC/IV tubing/cap not primed. • Loose connections – IV tubing or cap. • Faulty catheter. • Broken catheter or lumen.	• Air seen in catheter lumen • Signs & symptoms of Air embolism	• Treat for Air Embolism • Attempt to aspirate air if possible. • Check the catheter for leakage by flushing with NS after aspirating.	• Prime all IV tubing prior to connecting. • Check for loose connections – IV tubing or cap and tighten as needed. • Ensure needleless connector tubing connections are secure. • No sharp objects near NT-CVC. • Avoid pulling on NT-CVC when transferring/positioning patient.

Complications	Signs & Symptoms	Management	Prevention
14. Fluid leakage from NT-CVC insertion site. *Contributing factors:* • Catheter may have become encapsulated by a fibrin sheath, which prevents infused fluid from entering the venous system. • Central vein thrombosis or tumour growth occluding the vein can cause infused fluid to flow back along the outside of the catheter to the skin exit site. • Edema. • Catheter punctured by sharp object prior to placement • Catheter ruptured from attempt to irrigate an occluded catheter with a small syringe	• Fluid visibly leaking from CVC insertion site • External portion of catheter may have increased in length.	• Infuse 10 mL NS and assess for signs of fluid extravasation/ infiltration under the skin. • Notify Infusion Program Clinician/IV Educator/ Physician • Venogram may be required • NT-CVC will be removed if leak is caused by hole or tear in catheter. • If leak is due to seeping edema, fold 2x2 gauze, create pressure point over the insertion site and cover with occlusive dressing. • Change pressure dressing in 24 hours and PRN.	• No sharp objects near CVC. • 10 mL syringe is the smallest size syringe used to flush a CVC. • Avoid pulling on CVC when transferring/ positioning patient
15. Attempt to power inject through non power related device	• NT-CVC will rupture • Possible contrast medium infiltration • Pain swelling along NT-CVC vein pathway	• Stop the infusion STAT • Clamp lumen/NT-CVC with non-toothed forceps STAT • Notify physician STAT • Notify the Infusion Program Clinician/IV Educator STAT • Apply cool compress	• **Do not power inject into a NT-CVC not labeled as power injectable.**

Appendix D: Checklists

Skills Performance Checklist
Removal of a Non-Tunneled Central Venous Catheter

Name: _____ Unit: _____

Assessor: _____ Date: _____

RN requirements:

- Successful completion of the CVC Care & Maintenance E-Learning Module
- Attendance of CVC Care and Maintenance Instruction Lab
- Demonstrates competency through a formal process
- Large-bore catheters 14 g and larger as well as percutaneous sheaths may only be removed by Critical Care RNs.

Available resources: BD-00-12-40045: Non-Tunneled Central Venous Catheter (NT-CVC)

TASK	YES	NO	RELATED QUESTIONS
1. Inform the patient of the procedure. Position patient and arrange equipment.			• What consideration is made if patient is anticoagulated? • Which CVC lines are Nurses not qualified to remove? • Discuss patient position during removal.
2. Clean work surface with surface disinfectant and let dry.			
3. Gather equipment. Position patient.			
4. Wash hands thoroughly for 30 seconds. Set up dressing tray.			
5. Apply non-sterile gloves.			
6. Remove old dressing. Assess catheter site and surrounding skin.			• List actions taken if a NT-CVC infection is suspected.
7. Remove gloves, wash hands. Apply sterile gloves.			
8. Clean the insertion site, sutures and skin with CHG 2% with alcohol 70% swab stick. Allow skin to dry completely.			
9. Prepare petroleum gauze dressing.			
10. Remove suture(s). Discard scissors.			
11. Have the patient perform the Valsalva's maneuver if the patient's condition allows. If the patient is mechanically ventilated, wait for the end of inspiration. If Valsalva's maneuver is contraindicated, remove the catheter while the patient exhales.			• Why should the patient inhale, hold their breath and bear down? • What would you do if the patient was unable to perform the Valsalva's maneuver or if it was contraindicated?
12. Hold folded 10 x 10 cm gauze in non-dominant hand above NT-CVC insertion site while removing the catheter with the dominant hand in one straight motion. Immediately occlude site with folded 10 x 10 cm gauze.			• What would you do if you met resistance while pulling out the catheter?

TASK	YES	NO	RELATED QUESTIONS
13. Apply pressure to the site for minimum of 5 minutes or until no further bleeding, especially if the patient is anticoagulated or has a coagulation abnormality.			• How would you control bleeding from the site
14. After removal, inspect distal tip of NT-CVC noting condition and length to ensure complete removal			
15. Repeat step #11.			
16. Remove folded gauze and apply prepared petroleum gauze dressing.			
17. Apply sterile transparent dressing over prepared petroleum gauze dressing.			
18. Instruct patient to remain flat and supine for 15 minutes if not contraindicated.			• How often are vital signs performed after removal of NT-CVC?
19. Document procedure.			
20. Assess dressing 24 hours post NT-CVC removal. Apply new sterile adhesive dressing every 24 hours until skin is epithelialized.			

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Skills Performance Checklist –
Answer Key Removal of a Non-Tunneled Central Venous Catheter

QUESTIONS	ANSWERS
What consideration is made if patient is anticoagulated?	• If patient is being anticoagulated, discuss with physician whether IV infusion of anticoagulant needs to be stopped **prior to removal**. Recommended it be stopped 60-120 mins before removal.
Which CVC lines are Nurses not qualified to remove?	• Large-bore catheters (14g or larger), Percutaneous Sheath Introducers such as trauma catheters, and Cordis catheters are only removed by Critical Care RNs and VGH Burns Trauma High Acuity (BTHA) RNs. • Tunneled catheters • Hemodialysis/Apheresis CVC are removed by ICU RNs only.
Discuss patient position during removal.	• Place patient in a supine position. ○ **Note:** If patient dehydrated, place in Trendelenberg position (10-30 degree head down tilt) ○ **Rationale:** A dehydrated patient will have a low CVP which allows air to be aspirated into their circulation more easily.
List actions taken if a NT-CVC infection is suspected.	• If NT-CVC infection suspected, consult physician for blood culture collection via NT-CVC and peripheral site. • Tip may be sent for C&S. At least 5 cm of NT-CVC line to be sent. • Swab may be sent from insertion site if drainage present.
Why should the patient inhale, hold their breath and bear down?	• To prevent an air embolism due to negative pressure present in the central vein.
What would you do if the patient was unable to perform Valsalva's maneuver or if it was contraindicated.	• If Valsalva's maneuver is contraindicated, remove the catheter while the patient exhales. • If the patient is mechanically ventilated, remove during expiration, at the end of inspiration.
What would you do if you met resistance while pulling out the catheter?	• Stop. • Do not withdraw the catheter. • Apply an occlusive dressing and inform physician immediately.
How would you control bleeding from the site?	• Check blood results **prior to removal**. • Apply direct pressure at insertion site until bleeding stops. • Contact physician.
How often are vital signs performed after removal of NT-CVC?	• Do vital signs post removal every15 x2 then every 30 x1 and document. • Instruct patient to remain in bed supine or flat if possible for a minimum of 15 minutes post removal. • This position maintains a positive intra-thoracic pressure and allows time for the tissue tract to seal.

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NT-CVC Procedure Resource Videos

1. **Set up**
    a. Cleaning work surface area
    b. Washing hands
    c. Clean hands with Gel
    d. Preparing and setup of dressing tray

2. **IV Infusion Access**
    a. Initiating IV Infusion
    b. Discontinuing IV Infusion

3. **Needleless Connector Change**
    a. No Touch Technique Needleless connector change

4. **Flushing**
    a. Flushing of Non-Valved CVC

5. **Dressing Change**
    a. Application of IV Advanced dressing – NT-CVC
    b. Removal of IV Advanced dressing – NT-CVC
    c. NT-CVC Dressing Change – CHG Dressing

6. **Removal**
    a. Removal of NT-CVC

7. **Blood Draw**
    a. NT-CVC – Blood Draw