Occluded Central Venous Access Device

This is the policy for an Occluded Central Venous Access Device. For the care and maintenance of a specific central venous access device, refer to the specific CVAD policy

SKILL LEVEL:
RN's are responsible for assessing and maintaining their competency for the indication, reconstitution and administration of Cathflo ® and management of occluded central venous catheters and identifying their inability to perform the skills by requesting assistance and/or further instruction and/or further educational sessions.

POLICY:
Upon instruction, qualified RNs are accountable for the performance of the skill of managing an Occluded Central Venous Access Device (CVAD) as regulated by the procedures outlined by the Pembroke Regional Hospital.

NOTE: The information presented in this policy is directed specifically at the management of thrombotic **occlusions** in CVADs**.**

Central Venous Access Devices include:
- A non-tunneled central venous catheter (CVC)
- Tunneled central venous catheter (Hickman)
- Peripherally inserted central venous catheter (PICC)
- Implanted vascular access device (IVAD)

Strict adherence to asepsis and the 4 moments of hand hygiene are to be practiced at all times during the procedure.

Alteplase (Cathflo®) (rt-PA or t-PA): An enzyme (serine protease) that binds to fibrin in a thrombus and converts the entrapped plasminogen to plasmin, thereby dissolving the clot. Alteplase (Cathflo®) is the product used at Pembroke Regional Hospital. (Please review drug information in the IV Drug Manual and the product monograph).

Mechanism of Action: Alteplase is a fibrinolytic agent, which binds directly to fibrin in a thrombus and starts the conversion of plasminogen to plasmin, thereby initiating local fibrinolysis.

Adverse Effects of Alteplase: (Roche 2003)
- Bleeding – rare
- Sepsis - less than 0.5%
- GI bleeding – less than 0.5%

GUIDELINES:
Catheter occlusions are a common complication of CVADs. Alteration of catheter patency or *functionality* occurs for many reasons and may include kinking, malposition, fibrin sheaths, lipid deposition, device breakage, and drug precipitates. The most common reason for occlusions is fibrin sheaths or clots. Early identification and prompt intervention is critical. The longer the catheter remains occluded the lower the success rate of catheter clearance.

Proper flushing and locking techniques are required to minimize occlusion occurrences. Refer to the appropriate CVAD Policy for flushing and locking procedure.

Complications of Occlusions:
- Interruption of therapy
- Infiltration or extravasation

- Infection - There is a direct association between catheter related thrombus and catheter related infections. Fibrin and thrombus provide a focus for microbial adherence and growth.
- Increased health care costs (increased length of stay, development of complications)

Brisk blood return is the only indicator of a properly functioning CVAD.

Preventing Occlusions:
1. The primary approach to managing a CVAD occlusion is through **prevention**. Early identification and intervention is key. Do not wait until the line is completely occluded. The longer a catheter remains occluded, the lower the success rate of restoring patency to the CVAD and increased risk of additional complications.

Best practice principles to prevent occlusions are:
- Assess for blood return at the prescribed intervals
- Following proper care and maintenance procedures when caring for the CVAD, including flushing between incompatible medications with compatible solutions. For example, an medication only compatible in D5W must be flushed well with D5W before flushing and locking with normal saline (PosiFlush syringes®) and or heparin
- Use of a needleless neutral displacement connector (Micro Clave Clear ®) at all times on the hub of a CVAD. A neutral displacement connector minimizes the negative displacement of blood into the catheter tip lumen.
- Flush with PosiFlush® syringes at prescribed intervals; before and after blood withdrawal, administration blood products, for routine maintenance, IV medications and IV solutions
- Use of the turbulent flush technique when flushing and locking a CVAD, never using an infusion device (intravenous pump) to flush/lock the CVAD
- Refer to the appropriate CVAD Policy for device specific flushing and locking procedure

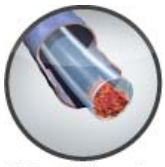
2. In the absence of any visual precipitate, the sudden development of an occlusion is suggestive of a fibrin deposit and should be managed as such.

Types of Occlusions:

Thrombotic – When placed into a vein, all catheters begin to accumulate fibrin. This is a natural process and begins within minutes of insertion. It can begin at either the insertion site of the tip of the catheter or at the tip.


Fibrin tail

Fibrin adheres to the end of the catheter. This tail acts as a one-way valve, allowing fluid to be infused but not aspirated

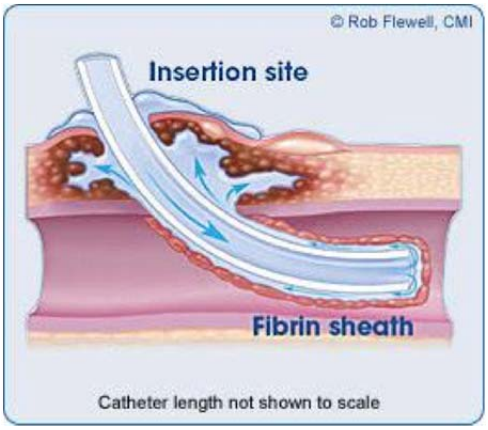

Intraluminal thrombus

Fibrin accumulates in the lumen causing sluggish flow and complete obstruction is possible

Mural thrombus

Thrombus forms when the catheter tip irritates the vessel wall to the point of injury. Fibrin from the injured area binds to fibrin that has formed on the catheter surface, causing the catheter to anchor to the wall and cause obstruction of the catheter tip.

Fibrin Sheath:



Sheaths develops when fibrin adheres to surface of catheter forming a sock-like adhesive sleeve around the distal end of the catheter. The sheath blocks the infusion of solutions. This may cause retrograde flow back up the length of the catheter internally and /or back along the sheath. The sheath may be 2 cm long or cover the entire catheter. Retrograde flow of infusate can cause tissue infiltration and/or extravasation.

Fibrin sheath

Chemical-caused by chemical/mineral precipitates and/or waxy lipid residue. This occurs when incompatible medications/solutions are given without proper and adequate flushing between administrations.

Mechanical- occlusions are related to internal or external problems with the catheter or infusion system. Examples of external problems are clogged filters, malfunctioning needleless connector, and malposition or blocked non-coring needle, closed clamp, kinked tubing. Example of internal problems: pinch off syndrome and/or kinking or malposition of the CVAD

This policy outlines assessment and interventions related to <u>thrombotic occlusions</u>.

Pathophysiology of Clot Formation:
A clot develops when thrombin converts fibrinogen to fibrin, a collagen. Fibrin is what forms the clot. Normally when this happen, activated plasminogen forms plasmin, an enzyme that dissolves the clot and keeps fibrinogen from forming more fibrin. This is called fibrinolysis. The natural process of fibrinolysis may not occur inside a central venous access device (CVAD), so when a clot or fibrin sheath occludes the catheter, a thrombolytic agent must be instilled into the catheter to restore patency.

Classification of Occlusions:

Partial - the ability to flush fluid and aspirate but resistance is felt **–this is the opportune time to intervene.**
Withdrawal occlusion – the ability to flush, but unable to aspirate blood

Complete occlusion – the inability to flush or aspirate

Alert: Because of the strong causal relationship between catheter related thrombus and catheter associated bloodstream infection and blood aspirated following successful use of Cathflo must be discarded.

Alert: Vigorous attempts to get blood return must NEVER be done due to the risk of damage to the catheter or vessel wall. No syringe with a barrel size less then a 10 mL syringe should be used to flush a CVAD as the pressure may cause damage to the catheter or vessel wall.

3. Prior to instillation of any agent, thoroughly assess the CVAD to determine the potential cause of occlusion (mechanical, chemical, or thrombotic).

4. Assess the problem (history, signs and symptoms).
   - Review line and medication history

5. Exclude external causes of catheter obstruction:
   - Check entire tubing and delivery system for kinks or malfunctions
   - Be certain dressing is not kinking/occluding catheter
   - Check to see if line is clamped
   - For an implanted infusion port, ensure non coring needle is in proper position
   - To check for blood return, place patient in semi-fowler's position, **with their affected arm fully extended 90 degrees from their body. Have patient perform the Valsalva manoeuvre (unless contraindicated) and simultaneously attempt to aspirate blood.** The catheter can be flushed with 10 mls of saline (PosiFlush® syringe) "wake up" the catheter. The patient may also deep breathe and cough, and perform shoulder rolls. The rationale for this is that the line may be resting against the vessel wall; this is especially likely with a left sided insertion. These manoeuvres may change tip-resting position in the vessel.
     - Refer to the appropriate CVAD Policy for flushing procedure

Signs and Symptoms of Catheter Occlusion:

- Inability to infuse/flush/aspirate
- Resistance when flushing/aspirating
- Frequent infusion pump (occlusion) alarms
- Catheter migration – is the external length unchanged from insertion? CXR is required; discuss with MRP
- Pinch off syndrome – occurs with CVADs inserted into the subclavian vein, internal catheter is between clavicle and first rib. Presents as intermittent occlusions related to postural changes, must be assessed radiographically. CXR is required; discuss with MRP. Once pinch off syndrome is confirmed, arrangement for removal and replacement of the device must be made. There is a very high risk of catheter fracture with this syndrome. A referral to a tertiary care centre (ex. The Ottawa Hospital Vascular Access Clinic or the TOH Emergency) is necessary; we do not perform this intervention at our facility.
- Ear popping or whooshing sound or water sound in ears – symptom of possible tip migration to the jugular vein. CXR required: discuss with MRP.
- Burning or stinging pain with infusion – can occur with development of a fibrin "sock" on catheter; infusate is deposited in a sub-optimal or incorrect area resulting in irritation or injury to tissues
- Leakage of infusate at exit site – rational as above
- Skin temperature changes and skin discoloration (esp. hands/arms) urgent U/S required: discuss with MRP.
- Edema, chest vein or neck vein distention – at the catheter site, hands, arms, face and shoulder; an urgent U/S is required to rule out upper extremity VTE. Discuss with MRP. Upper extremity VTE may involve the subclavian, axillary, or brachial veins and may include extension to the brachiocephalic vein, superior vena cava, or the internal jugular vein. The physician may refer to the CHEST Medicine 2012 Guidelines for management of a CVAD related upper extremity venous thrombosis. (See references and appendix 1 for further details)

6. Based on type of infusion and line history, determine which is more likely:
   - Fibrin sheath or thrombus formation
   - Chemical/drug precipitation (examples of causative agents are: phosphorous, calcium salts, TPN or phenytoin)
   - Build up of waxy lipid residue from recent lipid infusion

7. Once occlusion is suspected, determine occlusion by:
    - Removing the needleless connector from the catheter, attaching a new 10 mL PosiFlush® NS syringe directly to the hub of the catheter. Gently attempt to aspirate blood from the catheter (a few mls may be wasted to facilitate aspiration, if unable to flush catheter as in a total occlusion)
        - The connection between the needless connector and the catheter hub is scrubbed with a chlorhexidine 2% and alcohol 70% swab before disconnecting
        - The catheter hub is then scrubbed with a chlorhexidine 2% and alcohol 70% swab before attaching flush syringe
        - This is a clean, aseptic procedure. Universal precautions and standard hand hygiene measures are to be utilized.
    - If no blood-return: gently flush small amounts of normal saline PosiFlush ® syringe. If still no blood return:
        - Apply a new primed, sterile needless connector at completion of assessment.
    - If blood return present and brisk, flush with a second 10 mL NS PosiFlush® syringe and apply new primed, sterile needless connector.

For an **implanted vascular access device**, re-access the system with a new sterile set up including a 19-gauge non-coring Huber needle (Gripper Plus ®). If blood return now present, flush and lock as per the policy on Implanted Vascular Access Devices and Doctor's pre-printed order/continue therapy as ordered.

8. Once a central line is determined to be partially or totally occluded, inform the most responsible physician. Ask that the pre printed orders for Alteplase (Cathflo) Instillation for Partial and Complete Occlusion in a Central Venous Access Device (CVAD) be ordered. If the MRP is not present, a telephone order should be taken so that there is no delay in instituting treatment. (See policy on Telephone Orders)
    - During regular Pharmacy hours fax to pharmacy and call to request ASAP delivery
    - After hours Cathflo ® is kept in the Emergency Department medication fridge. Bring a copy of the order to Emergency, leave in their pharmacy bucket and take only one vial back to your unit.
    - If intravenous medication or therapy is required while a CVAD is not functioning properly, **a peripheral IV should be established (on the contra-lateral side) to prevent interruptions in therapy.** If patient is a difficult IV start consider calling the most expert Nurse for the first attempt or consider paging the On-Call Anesthetist, if present, in house.

9. In the case of multi-lumen CVADS, do not leave an occluded lumen untreated because another lumen is functional.
    - Ideally all lumens should be treated even if only one lumen is blocked.

10. The instillation of a drug/solution to dissolve the occlusion and salvage the catheter in many cases is preferred over catheter replacement as it reduces interruption of therapy, reduces the risk of trauma and complications for the patient associated with removing a dysfunctional line and replacing it.

11. Assess for known hypersensitivity to Alteplase (Cathflo®) or any of its components (L-arginine, phosphoric acid and polysorbate 80). Alteplase (Cathflo®) is **contraindicated** in this situation.

12. Exercise **caution** in the following patient situations:
    - Platelet count less than 50 x 109 /L
    - Any underlying bleeding tendency or conditions associated with potential bleeding
    - Pharmacokinetics: plasma half-life is less than 5 minutes
    - Use of Alteplase (Cathflo®) in pregnant women has not been studied
        - It should be used ONLY if the potential benefit justifies the potential risk to the fetus
        - It is not known whether Alteplase (Cathflo®) is excreted in breast milk, therefore caution should be exercised in nursing women
    - Known or suspected catheter infections

    - Instillation of Cathflo® in the presence of a catheter infection may release localized infection into systemic circulation causing sepsis
- Active internal bleeding
- Any of the following within 48 hours:
    - Coronary artery bypass surgery
    - Obstetrical delivery
    - Organ biopsy

13. Do not use excessive pressure or force treating the catheter.

14. The standard single dose of Alteplase (Cathflo®) for adults is 2 mg. 4 mg of Cathflo® is the maximum dose in 24 hours

15. **ALERT**: If more than one lumen is to be treated - divide Cathflo dose (in mls) by the number of lumens to be treated (see Section A, step 8) and treat all lumens simultaneously. Ideally all lumens should be treated even if the occlusion is in one lumen. Stop all infusions if possible, in multi-lumen CVADS for optimal thrombolysis during the dwell time. The instillation of a thrombolytic agent into a patent lumen of a multi-lumen catheter where the other lumen(s) are occluded is an unresolved issue, therefore if you are unable to cease intravenous therapy or establish a peripheral site; it is acceptable to continue infusion therapy in the functioning lumen.

16. Consider the appropriate method for instilling the Alteplase (Cathflo®):
    - Standard instillation method for partially occluded CVAD (for partial/withdrawal occlusion-Section A)
    - Single syringe attached directly to the occluded CVAD lumen hub (for complete occlusion-Section B)

SECTION A: Partial and Withdrawal Occlusions

EQUIPMENT:

- Alteplase (Cathflo®) (1mg/mL) 2mL (reconstitute according to Product Monograph)
- 3 2% Chlorhexidine with 70 % Isopropyl alcohol swab(s)
- Needleless Connector (s)
- 1 blunt needle(s)
- 1 Sterile syringe tip cover(s)
- 1 10 mL Sterile Water for reconstitution
- 1 10 mL syringe(s)
- 2 10 mL preservative free 0.9 % Normal Saline PosiFlush® prefilled syringe(s)
- 1 pair non-sterile gloves
- 1 procedure mask
- 1 Medication Label(s)

NOTE: Double/triple supplies if treating a double or triple lumen CVAD.

GUIDELINES:

If intravenous medication or therapy is required while a CVAD is not functioning properly, **a peripheral IV should be established (on the contra-lateral side to prevent development of a blood clot in arm with PICC) to prevent interruptions in therapy.** If patient is a difficult IV start consider calling the most expert Nurse for the first attempt or consider paging the On-Call Anesthetist, if present, in house.

ALERT: If more than one lumen is to be treated, divide Cathflo dose (in mls) by the number of lumens to be treated and treat all lumens simultaneously. Ideally all lumens should be treated even if the occlusion is only in one lumen. Stop all infusions if possible, in multi-lumen CVADS for optimal thrombolysis during the dwell time. Instillation of a thrombolytic agent into a patent lumen of a multi-lumen catheter where the other lumen(s) are occluded is an unresolved issue, therefore if you are unable to cease intravenous therapy or establish a peripheral site; it is acceptable to continue infusion therapy in the functioning lumen.

1. Ensure physician's order for Alteplase (Cathflo®), see step 8 above.

2. Ensure epinephrine, diphenhydramine and hydrocortisone is readily available (allergic reactions are possible but rare).

3. Verify the patient identification (see "Patient Identification" Policy).

4. Explain the procedure to patient and obtain consent (see "Consent to Treatment" Policy).

5. Perform hand hygiene (see "Hand Hygiene" Policy).

6. Assemble the equipment (double/triple supplies if other lumen(s) are also being treated).

7. Reconstitute the Alteplase (Cathflo®) just prior to use.
   - Final concentration will be 1mg/mL
     - Gently inject 2.2 mL sterile water for injection into the Alteplase (Cathflo®) vial
     - Slight foaming is not unusual; let vial stand undisturbed to allow large bubbles to dissipate
     - Mix by gently swirling vial until contents are completely dissolved, **DO NOT SHAKE**
     - Reconstituted solution is stable for 8 hours if stored at 2-30°C.

8. Withdraw Alteplase (Cathflo®) from the reconstituted vial into 10 mL syringe.
   - <u>If treating 2 or more lumens</u>, divide the single vial between the number of lumens to be treated, using one 10 mL syringe per dose/lumen.
     - For <u>2 lumens</u> the dose is 1mg in 1mL using a 10 mL sterile syringe for each lumen
     - For <u>3 lumens</u> the dose is 0.7 mg in 0.7 mL using a 10 mL sterile syringe for each lumen (the 0.7 mark is found between the 0.6 and 0.8 mark on the 10 ml syringe)
   - Remove blunt fill needle(s), dispose of properly and apply sterile syringe tip cap
   - Label the syringe(s) appropriately using the orange medication labels

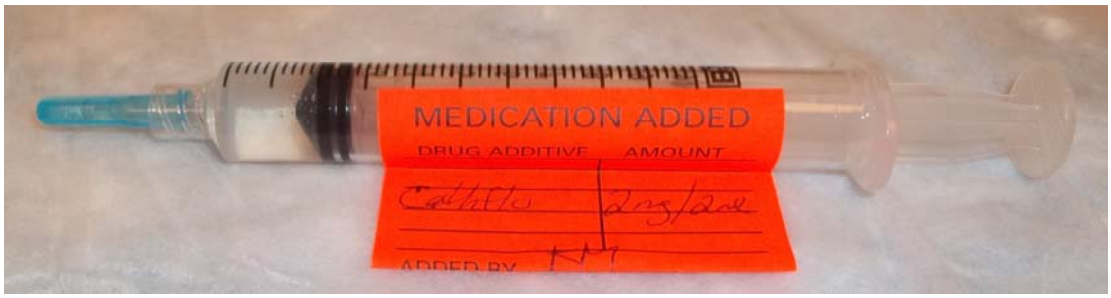


Fig 1.

9. Perform hand hygiene, mask and glove, following aseptic technique practices. (See "Hand Hygiene Policy").

10. Scrub the needleless connector and catheter connection with a 2% Chlorhexidine with 70 % Isopropyl Alcohol swab using the juicing technique for at least 15 seconds.
    - Allow to air dry completely
    - **Do not put the line down once it is cleaned**

11. Ensure the catheter clamp is closed (if clamp present), remove the needleless connector, scrub the hub with a 2% chlorhexidine with 70% Isopropyl Alcohol swab(s) using the juicing technique for at least 15 seconds.
    - Allow to air dry completely
    - **Do not put the line down once it is cleaned**

12. Administer Cathflo as follows:
    - Attach the syringe containing the Alteplase (Cathflo®) directly to catheter hub
        - If treating 2 or more lumens, divide the single vial between the number of lumens to be treated, using one 10 mL syringe per lumen.
        - For **2 lumens the dose is 1mg in 1mL** using a 10 mL sterile syringe
        - For **3 lumens the dose is 0.7 mg in 0.7 mL** using a 10 mL sterile syringe. 0.7 is found between the 0.6 and 0.8 mark on the 10 ml syringe
    - Unclamp the catheter (if clamp present)
    - **Slowly** instill the Alteplase (Cathflo®) into the catheter lumen.
    - Clamp the catheter (if clamp present)
    - Leave the empty Alteplase (Cathflo®) syringe attached to the lumen(s) during dwell time if the patient is assessed as cognitively capable of understanding and following instructions.
        - If there are concerns regarding patient cognition or safety, remove the syringe and attach a new sterile and primed needless connector to the CVAD hub. – DO NOT FLUSH.
        - **NOTE: Label the lumen(s) that have Alteplase (Cathflo®) dwelling** with a completed orange medication label, if removing the syringe; remove label from syringe and place on lumen.
        - Use of the appropriate size of Surgifix elastic tubular netting, cut to adequate length,applied to upper arm to secure the syringe and external PICC lumen while allowing easy access to syringe. (See Fig. 6)
    - Allow the Alteplase (Cathflo®) to dwell for a minimum of 30 minutes before attempting to aspirate the medication

13 Repeat steps 10 though 12 for each lumen.

14. After 30 minutes of dwell time, unclamp (if clamp present) the lumen(s) and attempt to aspirate blood.
    - Aspirate only enough that any blood that comes back does not enter the syringe
    - Assess each lumen sequentially.

15. If able to aspirate blood:
    - Withdraw Alteplase (Cathflo®) and 5 -10 mls of blood
    - Clamp catheter (if clamp present) and discard the blood filled syringe
    - Scrub the hub with Chlorhexidine 2% and 70% alcohol
    - Place a new sterile primed needleless connector on the lumen
    - Unclamp the catheter (if clamp present) and gently flush with a minimum of 20 mL normal saline (PosiFlush® syringes) using the turbulent flushing technique
    - Reconnect to the intravenous tubing or lock the catheter with saline and/or heparin according to device protocol. (See policies for care and maintenance of Peripherally Inserted Central Catheter (PICC), Percutaneous Non-Tunneled Central Venous Catheter (CVC), Implanted Vascular Access Device, and Tunneled External Central Venous Catheter (Hickman®)" Policies)

16. If blood return is still absent, let the syringe passively close and allow the Alteplase (Cathflo®) to dwell an additional 90 minutes and reattempt to aspirate the Cathflo from the CVAD
    - Longer dwell time permits longer contact time between the thrombolytic and the fibrin in the catheter or around the catheter tip.

NOTE: The first dose of Alteplase (Cathflo®) should have a maximum dwell time of 2 hours.

17. If unable to aspirate the blood after initial 2 hours: **Do not flush**:
    - Instil second dose of Cathflo, as instructed in steps 1-16, directly on top of the first dose
    - Clamp the lumen (if clamp present). Discard Cathflo ® syringe. Scrub hub with a chlorhexidine 2 % and alcohol 70 % swab, then place a sterile primed needless connector on catheter hub,
    - **Do not flush catheter.** This will allow the Cathflo ® to continue working.
    - **Label the lumen(s) that have Alteplase (Cathflo®) dwelling** with a completed orange medication label – remove label from syringe and place on lumen.

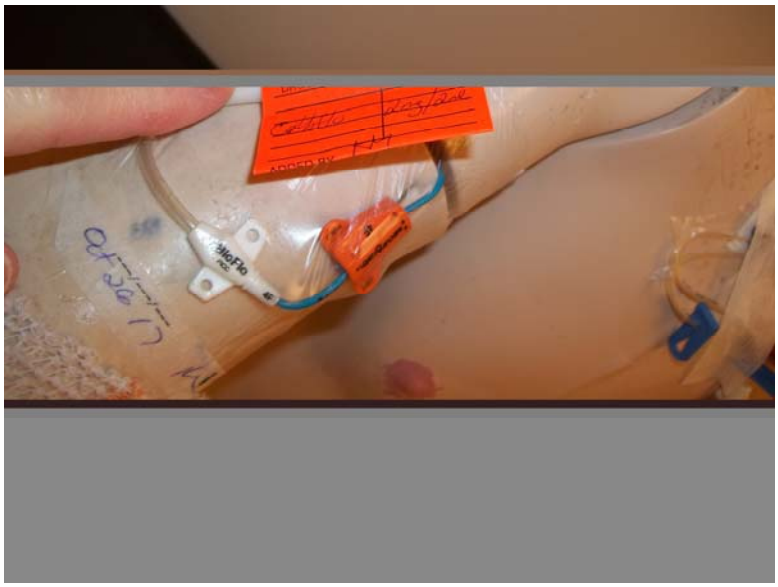


Fig. 2
Clearly label CVAD when Cathflo is left in lumen to prevent inadvertent access.

17. If after the second 2-hour dwell time there is still no blood return, call the MRP and discuss allowing Cathflo® to dwell overnight, or 24 hours before reassessing.
    - Letting the thrombolytic dwell for extended time periods (24-72 hours) permits the fibrin to remain in contact with the Cathflo®. An order can be made by the physician for Cathflo to dwell overnight and be reassessed the next day (24 hours). Salvaging a catheter is preferable to replacing it. Prolonged dwell times are sometimes required and are frequently successful.
    - If intravenous medication or therapy is required while the CVAD is being treated with a prolonged dwell of the thrombolytic, **a peripheral IV should be established (ideally on the contra-lateral side to prevent development of a blood clot in the arm with PICC) to prevent interruptions in therapy.** If patient is a difficult IV start consider calling the most expert Nurse for the first attempt or consider paging the On-Call Anesthetist, if present, in house.

ALERT: No more than 4 mg in a 24-hour period may be given.

18. If a prolonged dwell time does not restore functionality to the CVAD, consult the authorized prescriber regarding obtaining an x-ray to confirm proper CVAD line and tip position and/or possible replacement of the catheter.
    - Do not flush the catheter! Not flushing the catheter allows the Cathflo to remain in the lumen where it will continue to work.
    - Using the pre printed PICC Insertion order form, request PICC insertion, outlining a history on the blank area at the bottom of the order sheet.
    - The PICC should not be removed, but left idle, if it is still required.
    - Prior to inserting a new PICC, the PICC nurses will check the functionality of the PICC, in the event that the Cathflo® was able to clear the fibrin clot during the prolonged dwell time.

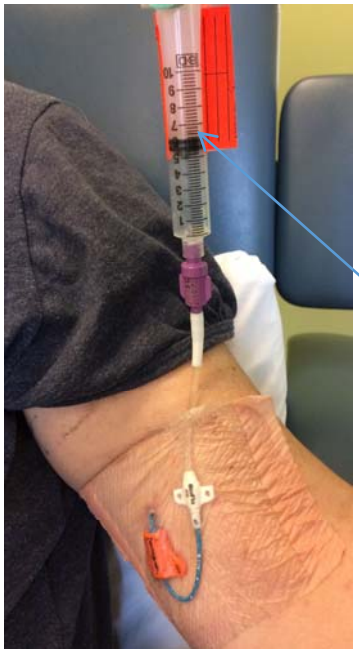
19. Document the following in the on the Medication Administration Record (MAR):
    - Date and time of administration
    - Dose of Alteplase (Cathflo®) given

20. Document in nurse's notes: assessment findings, related interventions and response to interventions.

Section B: Total Occlusions Using the Single Syringe Method

The single syringe method is used when the CVAD is unable to be flushed and/or aspirated. The single syringe method creates negative pressure inside the catheter and draws Alteplase (Cathflo®) into the occluded lumen. This is done by pulling back on the plunger and creating a vacuum. (Fig 3) The plunger is then allowed to slowly close; this allows the thrombolytic to be "pulled" back into the lumen toward the clot causing the occlusion. The Cathflo® will then act to lyse the clot. It is important to ensure that the syringe remains in an upright position. Upright is with the plunger in the top position and the Luer lock connection in the dependent position. (Fig 4) This will prevent air entry from the syringe and thus into the vasculature. In the case of total occlusions a minimum dwell time of 24 hours is often required to restore functionality. Do not use excessive pressure or force treating the catheter; this will result in catheter fracture/rupture.

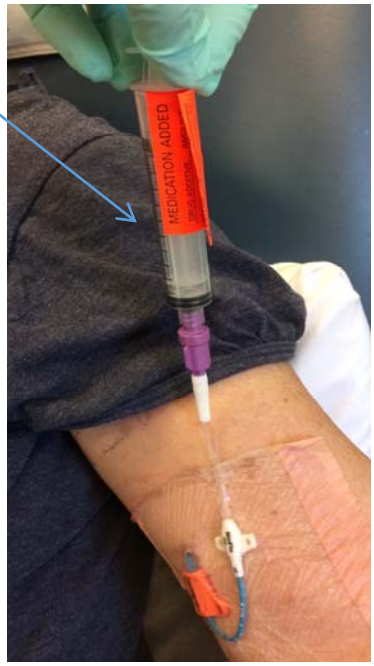
Fig. 3



Gently aspirate to the 6 ml mark or beyond, if able.

The correct method of holding syringe while aspirating to create negative pressure; treating a complete occlusion.

Fig. 4



GUIDELINES:
The standard single dose of Alteplase (Cathflo®) for adults is 2 mg. 4 mgs of Cathflo® is the maximum dose in 24 hours

ALERT: If more than one lumen is to be treated, divide Cathflo dose (in mls) by the number of lumens to be treated and treat all lumens simultaneously. Ideally all lumens should be treated even if the occlusion is only in one lumen. Stop all infusions if possible, in multi-lumen CVADS for optimal thrombolysis during the dwell time. Instillation of a thrombolytic agent into a patent lumen of a multi-lumen catheter where the other lumen(s) are occluded is an unresolved issue, therefore if you are unable to cease intravenous therapy or establish a peripheral site; it is acceptable to continue infusion therapy in the functioning lumen.

If intravenous medication or therapy is required while a CVAD is not functioning properly, **a peripheral IV should be established (on the contra-lateral side to prevent development of a blood clot in arm with PICC) to prevent interruptions in therapy.** If patient is a difficult IV start consider calling the most expert Nurse for the first attempt or consider paging the On-Call Anesthetist, if present, in house.

EQUIPMENT:

- Alteplase (Cathflo®) (1mg/mL) 2mL vial (reconstitute according to Product Monograph)
- 3 2% Chlorhexidine with 70 % Isopropyl alcohol swab(s)
- Needleless Connector (s)
- 1 blunt needle (s)
- 1 sterile syringe tip cover (s)
- 1 10 mL Sterile Water for reconstitution
- 1 10 mL syringe
- 10 mL preservative free 0.9 % Normal Saline PosiFlush® prefilled syringe(s), as many as required.
- 1 pair non-sterile gloves
- 1 procedure mask
- 1 Medication Label(s)

NOTE: Double/triple supplies when other lumen(s) are also occluded.

PROCEDURE:

1. Obtain the preprinted doctor's order for the Alteplase (Cathflo®).
2. Make sure epinephrine, diphenhydramine, and hydrocortisone are readily available (allergic reactions are possible but rare).
3. Verify the patient identification (see above See "Patient Identification" Policy).
4. Explain the procedure to patient and obtain consent (see "Consent to Treatment" Policy)
5. Perform hand hygiene (See "Hand Hygiene" Policy).
6. Assemble the equipment (double/triple supplies if other lumen(s) are also being treated).
7. Reconstitute the Alteplase (Cathflo®) immediately before use.

NOTE: Reconstituted solution is stable for 8 hours if stored at 2-30°C. Final concentration will be 1mg/mL.

8. Gently inject 2.2 mL sterile water for injection into the Alteplase (Cathflo®) vial.
    - Slight foaming is not unusual; let vial stand undisturbed to allow large bubbles to dissipate

9. Mix by gently swirling vial until contents are completely dissolved, **DO NOT SHAKE**.

10. Withdraw Alteplase (Cathflo®) 2mg (2 mL) from the reconstituted vial into a 10 mL syringe.
    - If treating 2 or more lumens, divide the single vial between the number of lumens to be treated, using one 10 mL syringe per lumen.
    - For 2 lumens the dose is 1mg in 1mL using a 10 mL sterile syringe
    - For 3 lumens the dose is 0.7 mg in 0.7 mL using a 10 mL sterile syringe. 0.7 is found between the 0.6 and 0.8 mark on the 10 ml syringe
    - Label syringe(s) appropriately using the orange medication label(s).

11. Perform hand hygiene, mask and glove, following aseptic technique practices. (See "Hand Hygiene" Policy).

12. Scrub the needleless connector and catheter connection with a 2% Chlorhexidine with 70 % Isopropyl Alcohol swab using the juicing technique for at least 15 seconds.
    - Allow to air dry completely
    - **Do not put the line down once it is cleaned**

13. Ensure the catheter clamp is closed (if clamp present), remove the needleless connector, scrub the hub with 2% chlorhexidine with 70% Isopropyl Alcohol swab(s)
    - Allow to dry completely
    - **Do not put the line down once it is cleaned**

14. Attach the syringe containing the Cathflo® directly to catheter hub

15. Gently pull back on the plunger of the Cathflo syringe, then slowly allow it to return to the neutral position, control must be exercised as not to allow the plunger to snap back into position. This should be repeated every few minutes for the first 15 minutes and then every 15 minutes for the remainder of the 2-hour period of the first dose.
    - Leave syringe attached to catheter, clamp line (if present) between aspiration attempts.
    - Use of appropriate size of Surgifix elastic tubular netting, cut to adequate length is applied to upper arm to secure the syringe and external PICC lumen while allowing easy access to work syringe. (Fig 6)
    - It can be challenging and time consuming to instil the dose in this manner, and the full dose may not get into the catheter. This is why a dwell period of 24 hours or longer may be required to restore function.
    - Excessive pressure is to be avoided when aspirating, excessive pressure may cause catheter rupture or fracture or damage to the vessel wall.
    - Keep fresh **packaged** supplies for flushing and capping needless connector(s) on hand in case blood return is established while performing an aspiration attempt during the administration process. See step 17.

16. Repeat steps 12-15 for each lumen.

Fig. 6

Ideally, to prevent over manipulation of the catheter hub, when treating a total occlusion the syringe is left attached to the catheter and a stockinet sleeve is applied to support the syringe and prevent use of tape.

17. If able to aspirate blood at any point in the 2-hour window:
    - Withdraw 10 mL of blood/Alteplase (Cathflo®)
    - Clamp the catheter (if clamp present) and discard the blood filled syringe
    - Scrub the hub with Chlorhexidine 2% and alcohol 70%
    - Place a new primed sterile needleless connector to the hub
    - Unclamp the catheter (if clamp present) and gently flush with a minimum of 20 mL preservative free 0.9 % Normal Saline (PosiFlush ®) using turbulent technique
    - Reconnect to the intravenous tubing or lock the catheter with saline and/or according to device (See policies for the care and maintenance of: Peripherally Inserted Central Catheter (PICC), Percutaneous Non-Tunneled Central Venous Catheter (CVC), Implanted Vascular Access Device, and Tunneled External Central Venous Catheter (Hickman®)" Policies)

18. If unable to aspirate the blood after the second 2 hours: administer second dose of Cathflo® as instructed in steps 8-16.
    - **Do not flush** between Cathflo® doses
    - Instil dose directly on top of the first dose

19. If after the second two-hour dwell period, there is no blood return, **do not flush catheter.** Clamp the lumen (if clamp present) and consult the authorized prescriber regarding obtaining an x-ray and/or possible replacement of the catheter. Allow the Cathflo® to dwell overnight and reassess in 24 hours. The order is to be obtained from the MRP. Salvaging a catheter is preferable to replacing it. Prolonged dwell times are often required and successful Not flushing the catheter allows the Cathflo to remain in the lumen where it will continue to work. Contact Medical Day Care, Ext 6610 for further direction. Ensure CVAD is labeled, and Kardex is updated to ensure nursing staff does not use the affected CVAD lumen until function is restored or CVAD is replaced.
    - If required, and not already performed, initiate peripheral venous access so that the patient's therapy may not be interrupted. **(Ideally on the contra-lateral side to prevent development of a blood clot in the arm with PICC)** If patient is a difficult IV start consider calling the most expert Nurse for the first attempt or consider paging the On-Call Anesthetist, if present, in house.

20. Arrange for replacement of CVAD via appropriate referral.
    - If PICC, send referral and completed pre printed order for insertion to Medical Daycare (fax number on order form)
    - If CVC, (ICU/ER) MRP to consult specialist to replace
    - If implanted or tunnelled central venous catheter, consult the Vascular Access Program at the Ottawa Hospital 613-798-5555, ext. 17692, Civic Campus fax 613-761-4286, General Campus Fax 613-739-6957
    - Cathflo should be left to dwell in the device while awaiting replacement. It is possible for functionality to be restored after many days. Device should always be rechecked for blood return prior to leaving for removal appointment. If left dwelling ensure catheter is labelled and notation is made in Nursing Kardex

22. Document the following in the on the Medication Administration Record (MAR):
    - Date and time of administration
    - Dose of Alteplase (Cathflo®) given

23. Document in nurse's notes: assessment findings, related interventions and response to interventions.

REFERENCES:

CHEST 20112; 141(2)(Suppl):e419S-e494S Antithrombotic Therapy For VTE Disease, Guidelines 9.3.1, 9.3.2., 9.3.3., 9.3.4.

http://www.improvepicc.com/uploads/5/6/5/0/56503399/4_management.pdf

Capital Health – Learning Module for Care of an Occluded Central Venous Access Device

Capital Health. (2011). Care of the Occluded Central Venous Access Devices.

Canadian Vascular Access Association. (2013). Occlusion Management Guideline for Central Venous Access -Devices(CVADs). Journal of the Canadian Vascular Association 7(1). Dundas: Andrew John Publishing

Care and Maintenance to Reduce Vascular Access Complications. Nursing Best Practice Guidelines, Registered Nurses Association of Ontario. (2008). Retrieved from http://www.rnao.org/Storage/11/570_BPG_Reduce_Vascular_Access_Complications.pdf

Cathflo®, Alteplase (Cathflo), recombinant", Product Monograph. Hoffman-La Roche Ltd, e-CPS [Internet]. Ottawa (ON): Canadian Pharmacists Association; c2007 [updated 2003 Sept 6]. Cathflo [product monograph]. Available from: http://www.e-cps.ca.

McGill University Health Centre. Instillation of Alteplase (Cathflo) through a Central Venous Access Device in Adult Patients. Medication Administration Policy (2009).

Moureau, Nancy L., Dawson, Robert B. “2011 guide to Patient Safety: Vascular access Needleless connector know-how” in Nursing Management Vol. 41, No. 12 (2010), pp. 40-41.

Nakazawa, Nadine. “Infectious and Thrombotic Complications of Central Venous Catheters”, Seminars in Oncology Nursing. Vol. 26, No. 2, (2010): pp 121-131.
Ng, R. et al, “Alteplase (Cathflo) for Treatment of Occluded Peripherally Inserted Central Catheters: Safety and Efficacy in 240 patients” J Vasc Interv Radiol, Vol.15 (1 pt 1), (2004), pp. 45-49.

Schulmeister, Lisa. “Management of Non-Infectious Central Venous Access Device Complications”. Seminars in Oncology Nursing. Vol. 26, No. 2 (2010): pp 132-141.

The Ottawa Hospital. (2011). Central Venous Access Device (CVAD): Restoring Patency for Thrombotic Occlusion.

Appendix 1

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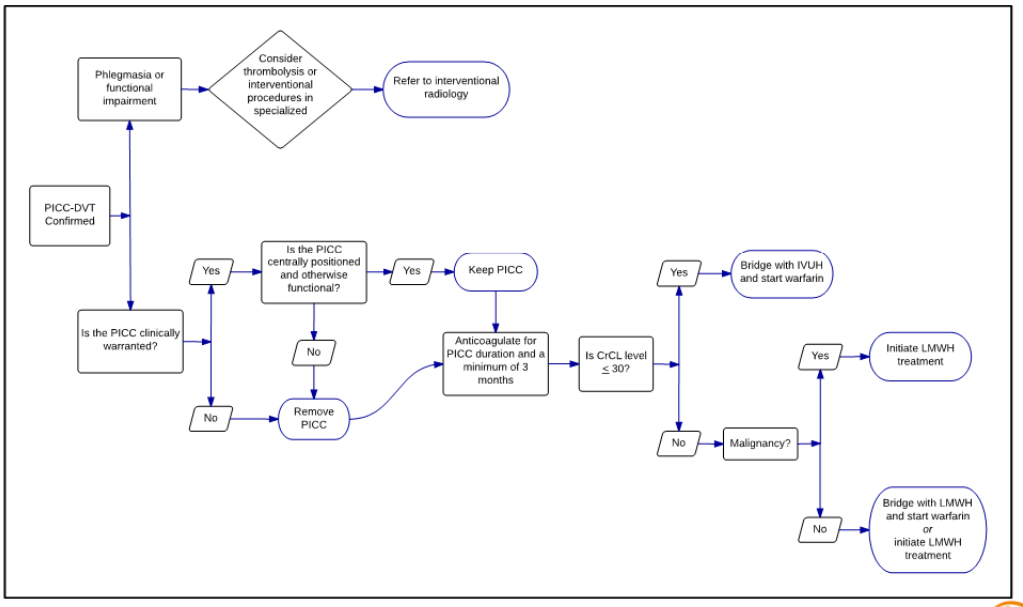
Evidence-Based Algorithm for Management of PICC-Associated DVT



Improve PICC