Capital Health

INTERDISCIPLINARY CLINICAL MANUAL

Policy & Procedure

TITLE:	Care of an Occluded Central Venous Access Devices	**NUMBER:**	CC 80-022
Date Issued:	June 2011	Page	1 of 14
Applies To:	All Holders of Interdisciplinary Clinical Manual		

THIS IS A POST-ENTRY LEVEL COMPETENCY FOR *REGISTERED NURSES* THAT REQUIRES ASSESSMENT OF COMPETENCY PRIOR TO PERFORMING.

TABLE OF CONTENTS

POLICY

1. Nursing care of an occluded central venous access device (CVAD) is a Post-Entry Level Competency (PELC) for a Registered Nurse (RN) which requires the RN to:
   1.1. be deemed competent in the PELC of caring for CVADs.
   1.2. read this policy, the learning module and complete the self test.
   1.3. review the Capital Health IV drug monograph and the CPS product monograph for alteplase (Cathflo®).
   1.4. maintain a record of competence and conduct a yearly self-assessment of competency level.

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

DEFINITIONS

Alteplase (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. Cathflo® is the alteplase product used at CDHA.

Central Venous Access Devices (CVADs): CVADs include:

- Implanted Infusion Ports,
- External Tunnelled (Hickman),
- Peripherally Inserted (PICC)
- Non-tunnelled (multilumen) Central Venous Access Catheters

Dwell Time: Amount of time solution is required to 'dwell' in the lumen(s) of the CVAD (maximum dwell time for each dose of alteplase = 2 hours).

Juicing Technique: Using an alcohol or chlorhexidine swab to vigorously scrub the threads and septum of a needleless connector with a twisting clockwise-counterclockwise motion several times (as if you were juicing an orange). Scrubbing the connector with friction for at least 15 seconds.

Patent Catheter: No resistance to flushing and unimpeded blood return on aspiration.

Pinch-off syndrome: The anatomic mechanical compression of a catheter as it passes between the clavicle and first rib. This complication results in intermittent occlusion that is temporarily relieved by specific position changes such as raising the arm or rolling the shoulder on the CVAD side. This syndrome can lead to fracture of the catheter and embolism. **A line that is being pinched must be removed.** A new line inserted lateral to the midclavicular line may be considered.

Partial Occlusion: Able to infuse fluid but blood return is sluggish or absent on aspiration. OPTIMAL TIME FOR INTERVENTION.

Total Occlusion: No solution can be infused and no blood can be aspirated

GUIDING PRINCIPLES AND VALUES

(return to ToC)

1. It is not uncommon for central venous access devices (CVAD) to become occluded by a fibrin sheath, thrombus, chemical/mineral precipitates or waxy lipid residue. 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.
2. The primary approach to managing a CVAD occlusion is through ***prevention***. Some best practice principles to prevent an occlusion are:
   2.1. Assess for blood return at the beginning of each shift and/or just before use
   2.2. Proper care and maintenance procedures for the CVAD
   2.3. Mandatory positive pressure flushing every time the line is used such as before and after blood withdrawal or administration of any medication / blood product.
   2.4. Use of a syringe for positive pressure flushing to maintain patency. Using an infusion devise only to flush a CVAD is unacceptable and contributes to the creation of an occlusion.
3. The most common reasons for occlusions are fibrin sheaths or clots. 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.

PROCEDURE

(return to ToC)

Equipment

- Alcohol swabs
- Positive pressure adaptor (CLC 2000™ adaptor)
- 10 mL syringe with alteplase (Cathflo® 1mg/mL) 2mL (reconstitute according to product monograph)
- 3 x 10 mL normal saline syringes

- 1 pair non-sterile gloves
- Mask
- Label

In addition – for Total Occlusions

- Three-way stopcock
- Empty 10mL syringe

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

(return to ToC)

General

1. Do not use excessive pressure or force. NEVER use a syringe smaller than 10 mL.
2. Prior to instillation of any agent, thoroughly assessed the CVAD to determine the potential causes of occlusion (mechanical, chemical or thrombotic).
3. Obtain a written order prior to instilling any agent into an occluded catheter. Ensure that the order specifies:
   - 3.1. the concentration and volume of drug/solution to be instilled,

   Note: The standard dose of alteplase (Cathflo®) for adults is 2 mg (2mL). For children or adults weighing less than 30 kg, a dose of 110% of internal lumen volume is recommended not to exceed 2 mg (2mL).
   - 3.2. the frequency and dosing interval,
   - 3.3. if more than one lumen is to be treated. (If more than one lumen is occluded, treat simultaneously.)
4. Consider the appropriate method for instilling the alteplase:
   - 4.1. a *standard instillation* method for partially occluded CVADs.
   - 4.2. the *stopcock* method for total occlusions.

Assessment

1. Assess the problem (history, signs and symptoms). Review line and medication history.
2. Exclude external causes of catheter obstruction:
   - 2.1. Check entire tubing and delivery system for kinks or malfunctions. Be certain dressing is not occluding catheter. Check to see if line is clamped. For an implanted infusion port, ensure needle is in proper position.
   - 2.2. Check for blood return with patient sitting and leaning forward or lying on right or left side, have patient deep breathe and cough (Rationale: line may be resting against a vessel wall).
   - 2.3. Assess for catheter migration, pinch off syndrome, neck vein distention, ear popping, back pain, burning or stinging with infusion. If any of these symptoms are present, obtain an order for x-ray confirmation of the catheter placement.
3. Based on type of infusion and line history, determine which is more likely:
   - 3.1. Fibrin sheath or thrombus formation

3.2. Chemical/drug precipitation (examples of causative agents are: etoposide, phosphorous, calcium salts, TPN or phenytoin)

3.3. Build up of waxy lipid residue from recent lipid infusion.

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

4. Determine occlusion by:

4.1. Removing the positive pressure adaptor from the catheter and gently attempting to aspirate blood from catheter with a 10 mL syringe containing 0.9% normal saline.

4.2. If no blood return, alternate gently drawing back while infusing small amounts of saline.

4.3. For an implanted infusion port, re-access system with another non-coring needle.

Note: Vigorous attempts to get blood return and/or use of a syringe smaller than 10mLs can damage the catheter or vessel wall and should NEVER be done.

5. Once a central line is determined to be partially or totally occluded, notify the authorized prescriber.

6. **Instillation of Alteplase: (Suspected Thrombus or Fibrin Sheath Formation)**

6.1. Assess for known hyper-sensitivity to Alteplase or any of its components (L-arginine, phosphoric acid and polysorbate 80). (Cathflo® is **contraindicated** in these patients).

6.2. Exercise **caution** in the following patient situations:

6.2.1. Platelet count less than 50 x 10^9 /L. (Rationale: patients with thrombocytopenia were excluded from pivotal trials).

6.2.2. Any underlying bleeding tendency or conditions associated with potential bleeding (Rationale: patients with known conditions associated with bleeding events were excluded from pivotal trials).

6.2.3. Use of 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 Cathflo® is excreted in breast milk, therefore caution should be exercised in nursing women.

6.2.4. Known or suspected catheter infections. Instillation of Cathflo® in the presence of a catheter infection may release localized infection into systemic circulation causing sepsis.

6.2.5. Active internal bleeding.

6.2.6. Any of the following within 48 hours: coronary artery bypass surgery, obstetrical delivery, organ biopsy, or puncture of a non-compressible vessel.

Partial Occlusion

(return to ToC)

(Use for partial occlusions, i.e.when able to flush, but not able to aspirate blood from CVAD.)

Refer to Appendix A - **Partial Occlusion Decision Tree**

1. Obtain physician's order for alteplase.
2. Ensure epinephrine, diphenhydramine and hydrocortisone are available on the unit (allergic reactions are possible but rare).
3. Measure and record baseline vitals.
4. Explain procedure to patient.
5. Assemble equipment (double/triple supplies if other lumen(s) are also occluded).
6. Reconstitute 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.

6.1. Inject 2.2 mL sterile water for injection into the Cathflo® vial. Slight foaming is not unusual; let vial stand undisturbed to allow large bubbles to dissipate.

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

7. Withdraw alteplase 2mg (2 mL) from the reconstituted vial into a 10 mL syringe. Label the syringe.
8. Wash hands, mask and glove and follow aseptic technique.
9. Scrub connection site with an alcohol swab using the juicing technique for at least 15 seconds. Allow to dry completely.
10. Ensure the catheter clamp is closed, remove positive pressure adaptor and attach a 10 mL normal saline syringe to catheter directly.
11. Open catheter clamp, again attempt to aspirate blood from catheter to check for patency. If blood return is spontaneous, flush line with 20 mLs normal saline using turbulent technique, and carry out procedures as required.
12. If blood return is not spontaneous, initiate standard alteplase procedure as follows:

    12.1. Flush lumen(s) by flushing with 20 mLs of normal saline (*rationale:* alteplase is incompatible with other drugs).

    12.2. Remove saline syringe and attach syringe containing alteplase.

    12.3. Unclamp catheter and slowly instill alteplase.

    12.4. Reclamp catheter and allow the alteplase to dwell for a minimum of 30 minutes before attempting aspiration. Repeat procedure if more than one lumen is involved.

13. **Label the lumen(s) that have alteplase dwelling**.

    13.1. Either leave the empty alteplase syringe attached to lumen(s) during dwell time or replace with a CLC 2000™ adaptor.

14. After 30 minutes of dwell time, unclamp lumen and attempt to aspirate blood.
15. If blood return is still absent, allow alteplase to dwell an additional 30 minutes and reattempt aspiration.

    Note: One dose of alteplase may have a maximum dwell time of 2 hours (blood return may be reassessed every 30 minutes x 4 with one instillation).

16. If able to aspirate blood:
    16.1. Withdraw 10 mL of blood/alteplase
    16.2. Clamp catheter and discard blood filled syringe
    16.3. Place a new positive pressure adaptor (CLC 2000™) to lumen.
    16.4. Unclamp catheter and gently flush with 20 mLs normal saline solution, using turbulent technique.
    16.5. Reconnect to IV tubing or lock the catheter with saline or heparin as appropriate.
17. If unable to aspirate blood after 2 hours:
    17.1. Attempt to remove the alteplase
    17.2. Flush the line with 20mL normal saline solution using turbulent technique.
    17.3. Repeat procedure if ordered **(no more than two doses in a 24 hour period).**
18. If the second attempt is unsuccessful, clamp lumen and consult authorized prescriber regarding fluoroscopy and/or possible replacement of catheter.
19. Document the following In the progress notes, on the Medication Administration Record (MAR) and the Kardex:
    19.1. Date and time of procedure
    19.2. Dose of alteplase given
    19.3. Dwell time
    19.4. Response to alteplase

(return to ToC)

Total Occlusions USING STOPCOCK

(Use when the CVAD cannot be instilled directly with fluid. Negative pressure is created to instill alteplase into the occluded line with the assistance of the stopcock device.)

Refer to Appendix B – Total Occlusion Decision Tree

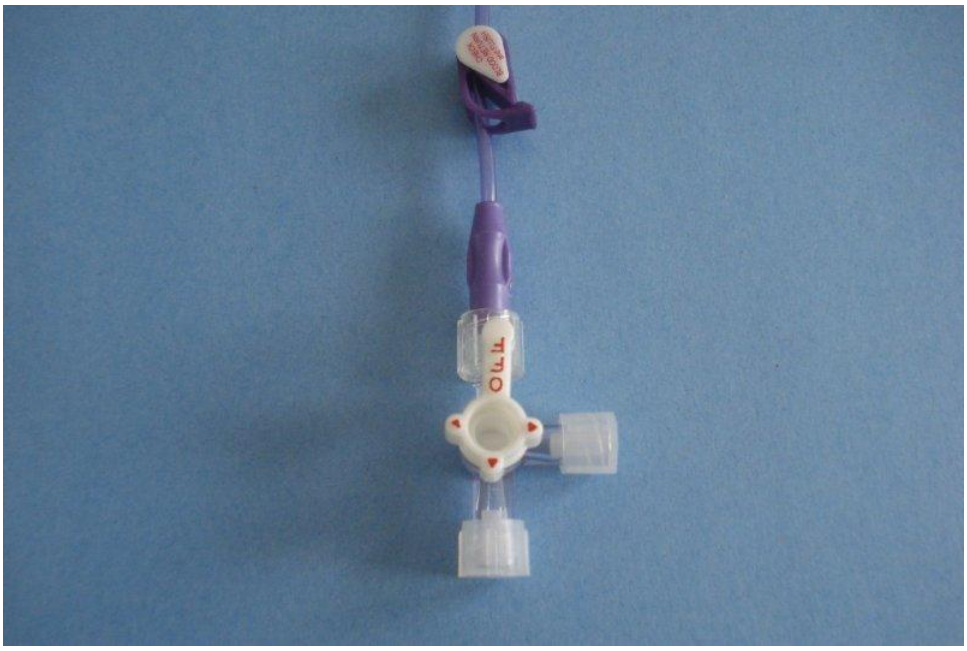
1. Obtain physician's order for alteplase.
2. Ensure epinephrine, diphenhydramine and hydrocortisone are available on the unit (allergic reactions are possible but rare).
3. Measure and record baseline vitals.
4. Explain procedure to patient
5. Assemble equipment (double/triple supplies if other lumen(s) are also occluded).
6. Reconstitute 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.
7. Inject 2.2 mL sterile water for injection into the Cathflo® vial. Slight foaming is not unusual; let vial stand undisturbed to allow large bubbles to dissipate.

8. Mix by gently swirling vial until contents are completely dissolved. **DO NOT SHAKE**.
9. Withdraw alteplase 2mg (2 mL) from the reconstituted vial into a 10 mL syringe. Label syringe.
10. Wash hands, mask and glove and follow aseptic technique.
11. Scrub connection site with an alcohol swab using the juicing technique for at least 15 seconds. Allow to dry completely.
12. Ensure catheter clamp is closed, remove positive pressure adaptor and attach a 10mL normal saline syringe to connection site.
13. Open catheter clamp, and reattempt to aspirate blood from catheter to check for patency. If blood return is spontaneous, flush line with 20mL normal saline using turbulent technique, and carry out procedures as required.
14. If blood return is not spontaneous, use the following stopcock method to create negative pressure and instill the alteplase.

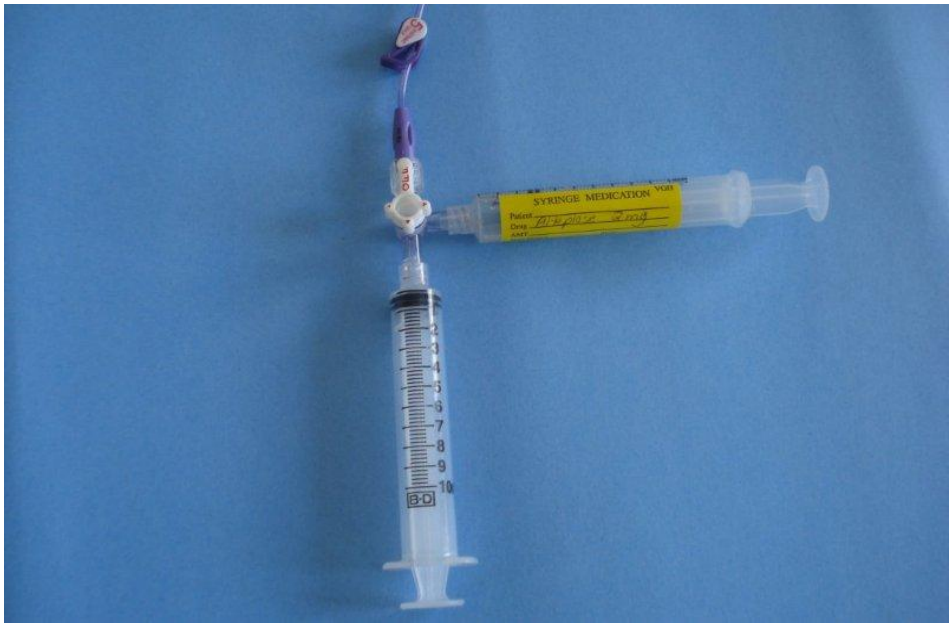
Stopcock Technique

15. Ensure catheter clamp is closed. Remove the normal saline syringe and attach the three-way stopcock directly to the catheter with the key pointed “off” towards the catheter.



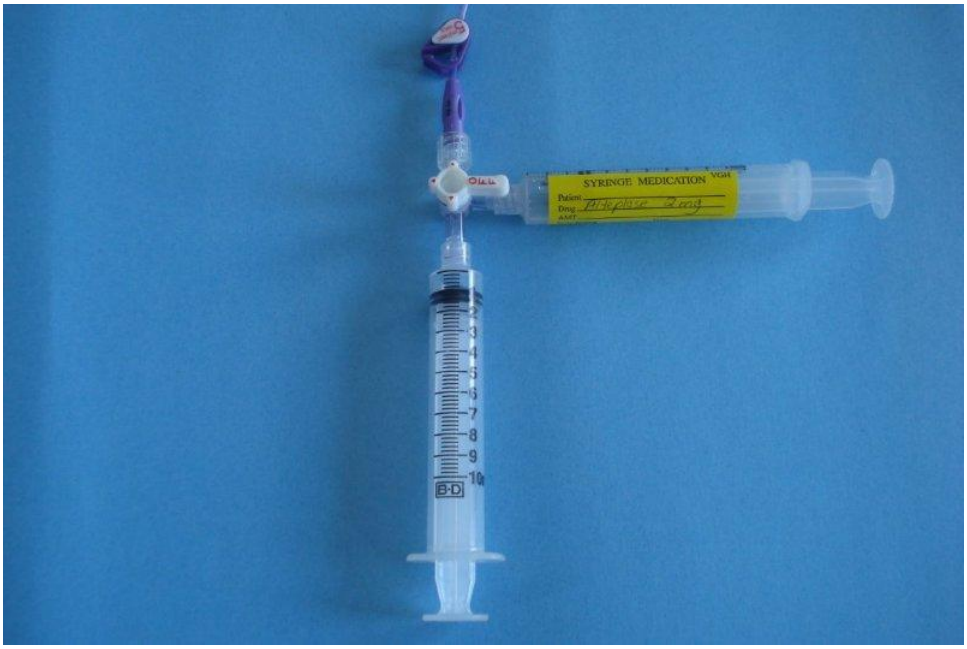
16. Attach an empty 10mL syringe at the 6 o’clock position.
17. Attach the 10mL syringe containing 2mg (2mL) of alteplase to the other port at the 3 o’clock position.

(return to ToC)



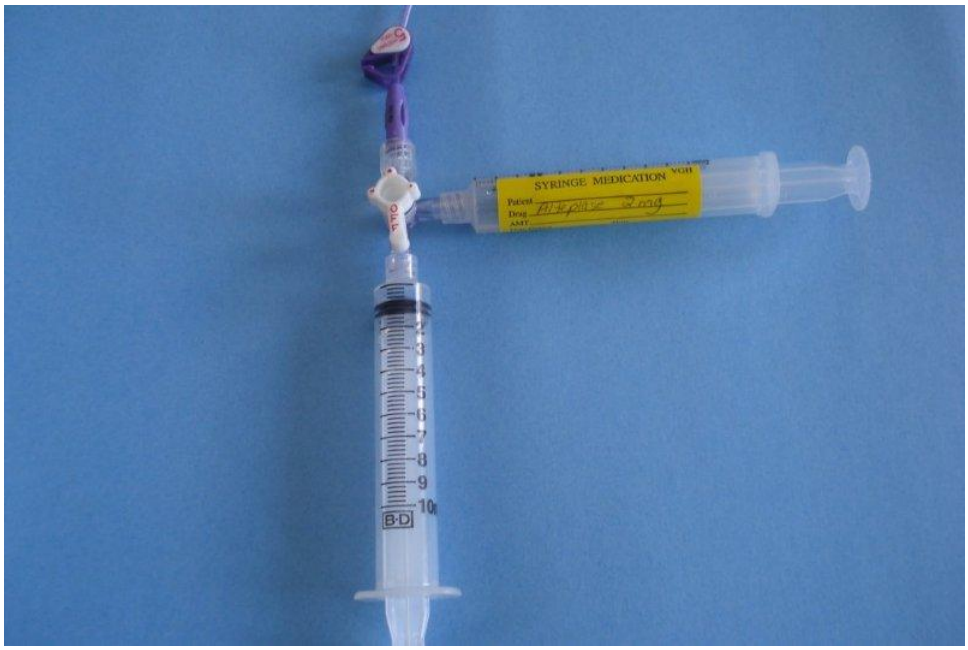
18. Point the turn key “off” towards the alteplase syringe to open the three-way stopcock to the empty syringe.
19. Unclamp the catheter. Gently aspirate the empty syringe as far as possible, thus creating a negative pressure in the lumen.

(return to ToC)



20. While maintaining the negative pressure on the syringe, point the turn key “off” towards the empty syringe to open the stopcock and allow the release of alteplase into the catheter.

Note: As the negative pressure resolves the required amount of alteplase necessary to reach the clot occlusion will be pulled into the central venous catheter. The entire dose of alteplase may not be drawn into the catheter



21. Once some of the alteplase is drawn into the catheter, point the turn key “off” towards the alteplase syringe.
22. Clamp the catheter.
23. **Label the lumen(s) that have Alteplase dwelling**.
    23.1. Either leave the alteplase syringe attached to lumen(s) during dwell time or replace with a CLC 2000™ adaptor.
24. Repeat procedure if more than one lumen is involved.
25. Allow the alteplase to dwell for a minimum of 30 minutes before attempting aspiration.
26. After 30 minutes of dwell time, with the turn key ‘off’ towards the alteplase syringe at the 3 o’clock position, unclamp catheter and attempt to aspirate alteplase / blood using the empty 10mL syringe at the 6 o’clock position.
27. If blood return is unsuccessful, allow alteplase to dwell an additional 30 minutes then reattempt aspiration.

    Note: One dose of alteplase may have a maximum dwell time of 2 hours (blood return may be assessed every 30 minutes x 4 with one instillation).

28. If blood return is successful:
    28.1. Withdraw 10 mL of blood/alteplase
    28.2. Clamp catheter and discard blood filled syringe
    28.3. Place a new positive pressure adaptor (CLC 2000™) to lumen.

28.4. Unclamp catheter and gently flush with 20 mLs normal saline solution, using turbulent technique.

28.5. Reconnect to IV tubing or lock the catheter with saline or heparin as appropriate.

29. If unable to aspirate blood after 2 hours:

29.1. Attempt to remove the alteplase

29.2. If possible, flush the line with 20mL normal saline solution using turbulent technique.

29.3. Repeat procedure if ordered **(no more than two doses in a 24 hour period).**

30. If second attempt is unsuccessful, clamp lumen and consult authorized prescriber regarding fluoroscopy and/or possible replacement of catheter.

31. Document in the progress notes, on the Medication Administration Record (MAR) and in the Kardex:

31.1. Date and time of procedure

31.2. Dose of alteplase given

31.3. Dwell time

31.4. Response to alteplase

REFERENCES

(return to ToC)

Alberta Health Services Cancer Care Provincial Nursing Procedure, November 2009. Policy C-11: Central Venous Access Device : Management of Occlusion.

Andris, D.A. and Krzywda, E.A., "Central Venous Catheter Occlusion: Successful Management Strategies", MEDSURG Nursing, Vol. 8, No. 4 (1999), pp. 229.

BC Cancer Agency, May 2004. C-080: Central Venous Catheters, Care and Maintenance of Open-Ended Right Atrial Catheters (e.g. Hickman-Broviac), retrieved from **http://www.bccancer.bc.ca/HPI/Nursing/References/NursingBCCA/C-080.htm**

Camp-Sorell, D. "Assessing Venous Access Devices: When to Obtain a Venogram", Clinical Journal of Oncology Nursing. Vol. 7, No. 2, (2003). Pp.234.

Care and Maintenance to Reduce Vascular Access Complications. Nursing Best Practice Guideline, Registered Nurses Association of Ontario. (2005). Retrieved from **http://www.rnao.org/Storage/11/570_BPG_Reduce_Vascular_Access_Complications.pdf**

"Cathflo®, Alteplase, recombinant", Product Monograph. Hoffman-La Roche Ltd, 2003.

Cummings-Winfield,C., Mushani-Kanji, T. "Restoring Patency to Central Venous Access Devices." Clinical Journal of Oncology Nursing. Vol. 12, No. 6 (2008) p. 925-934.

Deitcher, S.R., Fesen, M.R., Kiproff, P.M., Hill, P.A., Li, X., McCluskey, E.R., Semba, C.P. "Safety and Efficacy of Alteplase for Restoring Function in Occluded Central Venous Catheters: Results of the Cardiovascular Thrombolytic to Open Occluded Lines Trial", Journal of Clinical Oncology, Vol. 20, No. 1, (2002), pp. 317-324.

e-CPS [Internet]. Ottawa (ON): Canadian Pharmacists Association; c2007 [updated 2003 Sept 6]. Cathflo [product monograph]. Available from: http://www.e-cps.ca.

Haire, W.D., & Herbst, S.F. "Consensus conference on the use of Alteplase (t-PA) for the management of thrombotic catheter dysfunction". Journal of Vascular Access Devices, 5(2), (2000), pp. 28.

McGill University Health Centre. Instillation of Alteplase 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 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.

Ponec, D., Irwin, D., Haire, W.D., Hill, P.A., Li, X., McCluskey, E.R., "Recombinant Tissue Plasminogen Activator (Alteplase) for Restoration of Flow in Occluded Central Venous Access Devices: A Double-Blind Pacebo-Controlled Trial – The Cardiovascular Thrombolytic to Open Occluded Lines (COOL) Efficacy Trial", J Vasc Interv Radiol, Vol. 12, No. 8 (2001), pp.951-955.

Semba, C.P. et al., "Treatment of Occluded Central Venous Catheters with Alteplase: results in 1,064 Patients", J Vasc Interv Radiol, Vol. 13, No. 12, (2002), pp. 1199-205.

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

RELATED DOCUMENTS

(return to ToC)

Policies

CC 80-021 Central Venous Access Device (CVAD) Umbrella Policy

CC 80-016 Care of Tunneled External Central Venous Catheter (Hickman)

CC 80-018 Care of Peripherally Inserted Central Catheter (PICC) Lines

CC 80-020 Implanted Infusion Port/Vascular Access Device (IVAD)

CC 80-015 Non-tunnelled Central Venous Access Catheter (multilumen)

Appendices

Appendix A: Partial Occlusion Decision Tree
Appendix B: Total Occlusion Decision Tree

Other

Intravenous Drug Therapy Manual, IV monograph: Alteplase

*** * ***

Appendix A

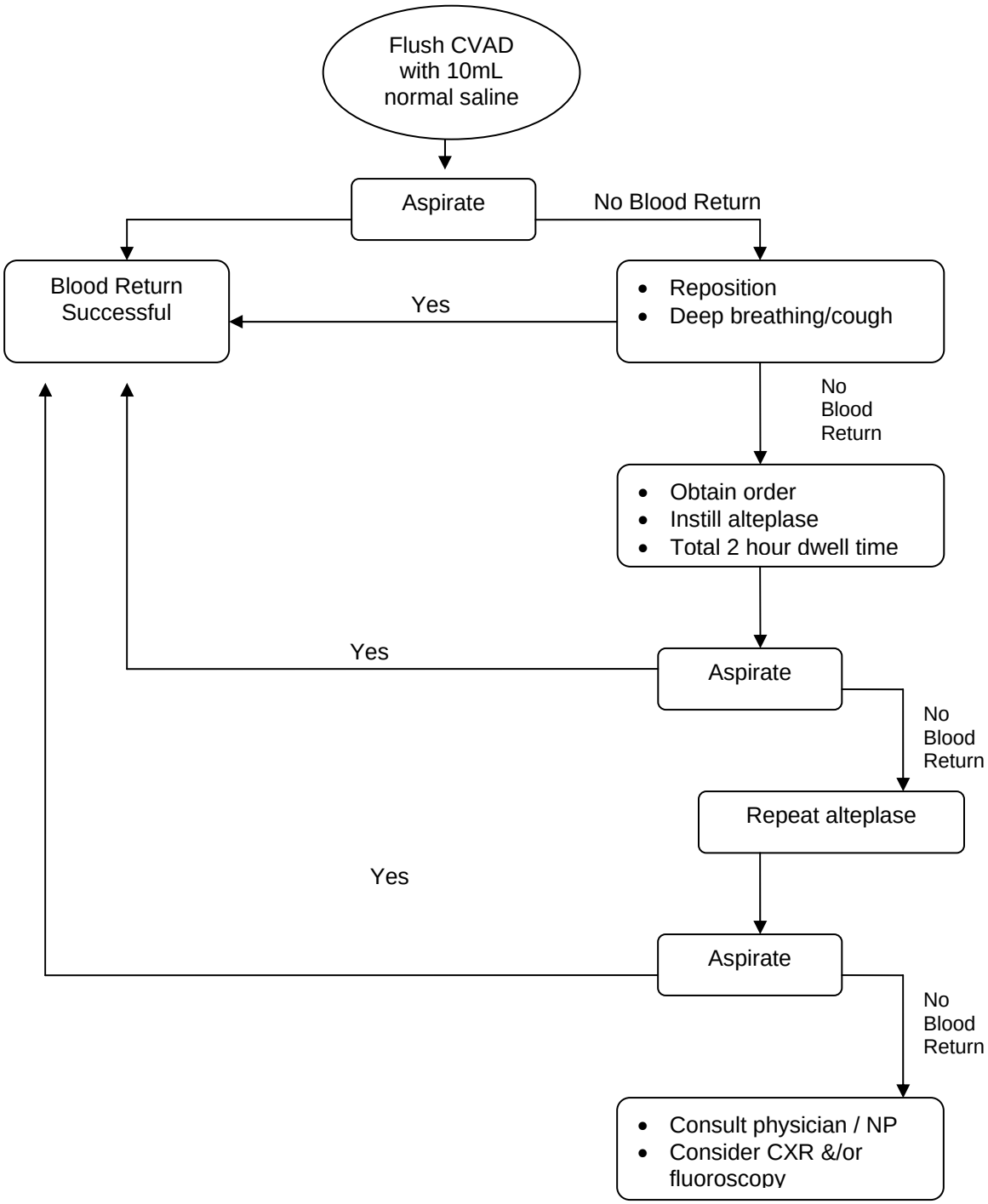
PARTIAL OCCLUSIONS

(Able to flush, but unable to aspirate blood return from CVAD)

OPTIMAL TIME FOR INTERVENTION.
Do not wait until the line is completely occluded.

(return to ToC)

Decision Tree



Appendix B
TOTAL OCCLUSIONS (unable to flush or aspirate)
(return to ToC)
Decision Tree