

Policies, Procedures, Standard Operating Practices

No. PAT-2-27

Title: Central Venous Access Device (CVAD): Restoring Patency for Thrombotic or Chemical Occlusion (Adult and Paediatric)	☒ Policy ☒ Procedure ☐ SOP
Category: Patient Related-IV/CVL Dept/Prog/Service: Patient Services	Distribution: All Patient Care Areas
Approved: Exec. VP, Patient Services and CNE Signature:	Approval Date: Apr. 3, 2007 Reviewed/Revised Date: Apr. 7, 2015 Next Review Date: Apr, 2018

CROSS REFERENCES: *Central Venous Access Device (CVAD): Care and Maintenance (PAT-2-07)
 Central Venous Access Device: Management of Blocked Lumens and/or Line Migration (PCS-MD-130)

1. **PURPOSE:**

To re-establish patency of central venous access devices (CVADs) where thrombotic or chemical occlusion is suspected as the most likely cause of device occlusion.

Device occlusion is defined as the inability to infuse or withdraw blood. Other possible causes of device occlusion will be ruled out before proceeding with this procedure. Refer to Algorithm for Management of CVAD Occlusion on page 6 to troubleshoot and verify patency prior to the administration of alteplase and/or sodium bicarbonate.

2. **EXCEPTION:**

This policy is not for restoring patency of hemodialysis catheters or for the use on neonates and infants admitted to the Neonatal Intensive Care Unit.

3. **SCOPE:**

Registered nurses (RNs) who are competent in the added skill of CVADs are able to administer alteplase and/or sodium bicarbonate to restore patency in an occluded CVAD.

4. **DEFINITIONS:**

- Partial occlusion: no blood return with aspiration, but able to instill.
- Complete occlusion: no blood return and unable to instill.

5. **PATIENT ASSESSMENT:**

- A. Rule out other causes of device occlusion, if the patient exhibits any of the following signs and symptoms, refer to Central Venous Access Device: Management of Blocked Lumen (PCS-MD-130)
 1. If the patient exhibits the following signs and symptoms, thrombotic or chemical occlusion is not the cause of the occlusion and this procedure will not be used.
 - a. When flushing device, ask patient if he/she hears any noise near the ear, or has pain, burning or discomfort near the port or catheter insertion point. Noise near the ear when flushing may indicate the catheter tip is malpositioned up the jugular vein. Pain near the port body may indicate catheter separation from the portal body and infiltration of IV fluid or medication into the subcutaneous tissue.
 - b. Pain near the entry point of the catheter into the blood vessel may indicate infiltration of IV fluid or medication into the subcutaneous tissue.
 - c. Line migration more than 5 cm.

- B. Interventions to use prior to using dissolving agents:
- Refer to possible mechanical occlusion section on Algorithm for Management of CVAD Occlusion on page 7.
- C. Treatment options: Consider the need to treat thrombotic occlusion first as thrombotic occlusions are more common cause. Consider the need to treat chemical occlusion first if patient is receiving medication(s) with a pH greater than 7 (refer to page 8).

6. **PROCEDURE:**

Thrombotic Occlusion:

Equipment for Reconstitution:

- Alteplase 2 mg vial (obtain from pharmacy department; must be refrigerated)
- Sterile water for injection
- 10 mL syringe
- 18-gauge needle
- Chlorhexidine Gluconate 2% & Isopropyl Alcohol 70% swab

Equipment for Administering Alteplase:

- Reconstituted vial of alteplase 2 mg
- Chlorhexidine Gluconate 2% & Isopropyl Alcohol 70% swab x 3
- CVAD dressing tray
- Vial access cannula x 2 (for paediatric patients only)
- 10 mL syringe
- 18-gauge needle
- Face shield or goggles
- Normal saline 10 mL vial (for paediatric patients only)

- Obtain alteplase from pharmacy department and reconstitute to a final concentration of 1 mg/mL as follows:
 - Perform hand hygiene.
 - Swab vial of alteplase and sterile water with chlorhexidine swab for 30 seconds and let dry.
 - Withdraw 2.2 mL of sterile water for injection.
 - Inject the 2.2 mL of sterile water into vial. Slight foaming is not unusual; let the vial stand undisturbed to allow large bubbles to dissipate.
 - Mix by gently swirling until the contents are completely dissolved. **DO NOT SHAKE.** The reconstituted preparation results in a colourless to pale yellow solution.
 - Alteplase will be reconstituted immediately before use and used within 8 hours following reconstitution (because it does not contain antibacterial preservatives).
- Bring reconstituted vial of alteplase to the patient's bedside.
- Explain the procedure to the patient and/or family/partner-in-care.
- Ensure patient is in the supine position with arms below the level of the heart.
- Ensure that the catheter is clamped (if necessary).
- Perform hand hygiene.
- Open the CVAD dressing tray and add all necessary supplies to the sterile field.
- Don mask and faceshield/eye goggles.
- Don one sterile glove on the dominant hand.
- Swab vial of Alteplase with chlorhexidine swab for 30 seconds and let dry.
- Aseptically withdraw the solution into a sterile 10 mL syringe. For **paediatric patients**, withdraw the solution into a sterile 10 mL syringe according to the table below:

Paediatric Alteplase Dose Ranges – (children up to and including 30 kg), above 30 kg follow adult dosing

Type of Catheter	Less than 10 kg	Greater than or equal to 10 kg
PICC	0.5 mg	1 mg
Non-tunnelled	0.5 mg	2 mg
Tunnelled	0.5 mg	2 mg
Implanted ports (port-a-cath)	0.5 mg	2 mg
Dose listed is per lumen; for multilumen catheters, treat one lumen at a time as per dosing table		

12. **Partial occlusion** (no blood return, but able to instill):

- a. Using aseptic technique, cleanse the connection site of the occluded lumen (where the hub of lumen and injection cap meet) with chlorhexidine swab for 30 seconds and allow to dry.
- b. Ensure lumen is clamped (if required). Have patient take a deep breath and hold it (as developmentally appropriate). Remove the injection cap and luer-lock the 10 mL syringe containing the alteplase onto the end of the lumen. Instruct patient to resume normal breathing.
- c. Unclamp and inject alteplase into the partially occluded lumen.
- d. Leaving the 10mL syringe attached, secure the syringe to the skin at the site, clamp the catheter and wait 30 minutes for adult patients **or** 120 minutes (2 hours) for paediatric patients.

Note for paediatric or confused patients: Family or hospital staff should remain with the patient during the time the syringe is taped to the patient's arm to ensure the patient does not inadvertently remove the syringe.

13. **Complete occlusion** (no blood return and unable to instill):

- a. Using aseptic technique, cleanse the connection site of the occluded lumen (where the hub of lumen and injection cap meet) with chlorhexidine swab for 30 seconds and allow to dry.
- b. Ensure lumen is clamped. Have patient take a deep breath and hold it (as developmentally appropriate). Remove the injection cap and luer-lock the 10 mL syringe containing the Alteplase onto the end of the lumen. Instruct patient to resume normal breathing.
- c. Unclamp and pull back on the syringe to 8 mL and gently release the plunger allowing negative pressure to draw the Alteplase into the lumen. Repeat this negative pressure technique until drug is adequately instilled.
- d. Leaving the 10 mL syringe attached, secure the syringe to the skin at the site, clamp catheter and wait 30 minutes for adult patients **or** 120 minutes (2 hours) for paediatric patients.

Note for paediatric or confused patients: Family or hospital staff should remain with the patient during the time the syringe is taped on the patient's arm to ensure the patient does not inadvertently remove the syringe.

14. After 30 minutes (adult) or 120 minutes (paediatrics) gather the following equipment:

- 2 x 10 mL pre-filled Normal Saline XS syringe (2 per lumen)
- 10 mL syringe with appropriate amount of heparin (if required)
- Primed injection cap (1 per lumen)
- Chlorhexidine Gluconate 2% & Isopropyl Alcohol 70% swab
- CVAD Dressing Tray

15. Perform hand hygiene.

16. Open CVAD dressing tray and add all the necessary supplies to the sterile field.

17. Don sterile gloves.

18. Unclamp and gently aspirate 5 mL of blood and discard for adult patients or 2-3 mL of blood for paediatric patients. If unable to aspirate blood, reposition the patient and re-attempt aspiration.

- a. If still unable to aspirate blood, using aseptic technique remove the syringe and replace with a new primed sterile injection cap.
- b. **Adult:** Wait an additional **90 minutes** (for a total dwell time of 120 minutes) and reattempt aspiration.

19. If still no blood return confer with the physician and/or PICC team for CVAD removal and/or replacement (do not pull PICC line as wire over replacement can be done by PICC team). The procedure may be repeated x 1 as per Central Venous Access Device: Management of Blocked Lumen (PCS-MD-NEW).

20. Following successful aspiration of blood, flush the device with a total of 20 mL (10 mL for paediatric patients) of normal saline using push-pause technique.

21. Heparinize the device as per *Central Venous Access Device (CVAD): Care/Maintenance of (PAT-2-07) Section III. Flushing and/or Heparinization if required, or attach primed IV tubing and commence ordered therapy.

22. Remove gloves and then perform hand hygiene.

23. Document.

Chemical Occlusion:

Equipment for Administering Sodium Bicarbonate 8.4%:

- Sodium bicarbonate 8.4% (obtain from pharmacy department)
- Chlorhexidine Gluconate 2% & Isopropyl Alcohol 70% swab x 3
- 10 mL syringe
- 18-gauge needle
- Face shield or goggles
- CVAD dressing tray

Sodium Bicarbonate 8.4% Dose Ranges – (children up to and including 30 kg), above 30 kg follow adult dosing

Type of Catheter	Less than 10 kg	Greater than or equal to 10 kg
PICC	0.5 mL	1 mL
Non-tunneled	0.5 mL	2 mL
Tunneled	0.5 mL	2 mL
Implanted ports (port-a-cath)	0.5 mL	2 mL
Dose listed is per lumen; for multilumen catheters, treat one lumen at a time as per dosing table		

1. Review patient's infusion and/or IV medication(s) with a pharmacist to identify any possible incompatible medications in order to determine whether the precipitate is most likely alkaline, acidic, or lipid in origin. Refer to Intravenous Medications with a pH Greater Than 7 list on page 7.
 - a. If occlusion is determined to be acidic or lipid, consult PICC team for PICC line reinsertion, for other types of CVADs, contact the physician for reinsertion.
 - b. If occlusion is determined to be alkaline, proceed with procedure as per Central Venous Access Device: Management of Blocked Lumen and/or Line Migration (PCS-MD-NEW).
 2. Obtain sodium bicarbonate 8.4% from pharmacy department. Gather supplies and perform hand hygiene.
 3. Swab vial of sodium bicarbonate 8.4% with chlorhexidine swab for 30 seconds and let dry. Attach 18-gauge needle to 10 mL syringe and then withdraw 2 mL.
 4. Aseptically withdraw the solution into a sterile 10 mL syringe. For **paediatric patients**, withdraw the solution into a sterile 10 mL syringe according to the table above.
 5. Bring sodium bicarbonate and equipment to patient's bedside.
 6. Explain the procedure to the patient, family/partner-in-care.
 7. Ensure patient is in the supine position with arms below the level of the heart.
 8. Ensure that the catheter is clamped (if necessary).
 9. Perform hand hygiene.
 10. Open the CVAD dressing tray and add all necessary supplies to the sterile field.
 11. Don mask, faceshield/eye goggles, and sterile gloves.
 11. **Partial occlusion** (no blood return, but able to instill):
 - a. Using aseptic technique, cleanse the connection site of the occluded lumen (where the hub of lumen and injection cap meet) with chlorhexidine swab for 30 seconds and allow to dry.
 - b. Ensure lumen is clamped (if required). Have patient take a deep breath and hold it (as developmentally appropriate). Remove the injection cap and luer-lock the 10 mL syringe containing the sodium bicarbonate 8.4% onto the end of the lumen. Instruct patient to resume normal breathing.
 - c. Unclamp and inject sodium bicarbonate 8.4% into the partially occluded lumen.
 - d. Leaving the 10mL syringe attached, secure the syringe to the arm, clamp the catheter and wait 30 minutes.
- Note for paediatric or confused patients:** Family or hospital staff should remain with the patient during the time the syringe is taped to the patient's arm to ensure the patient does not inadvertently remove the syringe.
12. **Complete occlusion** (no blood return and unable to instill):
 - a. Using aseptic technique, cleanse the connection site of the occluded lumen (where the hub of lumen and injection cap meet) with chlorhexidine swab for 30 seconds and allow to dry.
 - b. Ensure lumen is clamped. Have patient take a deep breath and hold it (as developmentally appropriate). Remove the injection cap and luer-lock the 10 mL syringe containing the

sodium bicarbonate 8.4% onto the end of the lumen. Instruct patient to resume normal breathing.

- c. Unclamp and pull back on the syringe to 8 mL and gently release the plunger allowing negative pressure to draw the sodium bicarbonate 8.4% into the lumen. Repeat this negative pressure technique until drug is adequately instilled.
- d. Leaving the 10 mL syringe attached, secure the syringe to the arm, clamp catheter and wait 30 minutes.

Note for paediatric or confused patients: Family or hospital staff should remain with the patient during the time the syringe is taped on the patient's arm to ensure the patient does not inadvertently remove the syringe.

13. After 30 minutes gather the following equipment:
 - 2 x 10 mL pre-filled Normal Saline XS syringe (2 per lumen)
 - Primed injection cap (1 per lumen)
 - Chlorhexidine Gluconate 2% & Isopropyl Alcohol 70% swab
 - CVAD Dressing Tray
14. Perform hand hygiene.
15. Open CVAD dressing tray and add all the necessary supplies to the sterile field.
16. Don sterile gloves.
17. Unclamp and gently aspirate 5 mL of blood and discard for adult patients or 2-3 mL of blood for paediatric patients. If unable to aspirate blood, reposition the patient and re-attempt aspiration.
 - a. If still unable to aspirate blood, using aseptic technique remove the syringe and replace with a new primed sterile injection cap.
 - b. Wait an additional 30 minutes (for a total dwell time of 60 minutes) and reattempt aspiration.
18. If still no blood return confer with the MD and/or PICC team for CVAD removal and/or replacement (do not pull PICC line as wire over replacement can be done by PICC team). The procedure may be repeated x 1 as per Central Venous Access Device: Management of Blocked Lumen (PCS-MD-NEW).
19. Following successful aspiration of blood, flush the device with a total of 20 mL (10 mL for paediatric patients) or normal saline using push-pause technique.
20. Heparinize the device as per *Central Venous Access Device (CVAD): Care/Maintenance of (PAT-2-07) Section III. Flushing and/or Heparinization if required, or attach primed IV tubing and commence ordered therapy.
21. Remove gloves and then perform hand hygiene.
22. Document.

8. DOCUMENTATION:

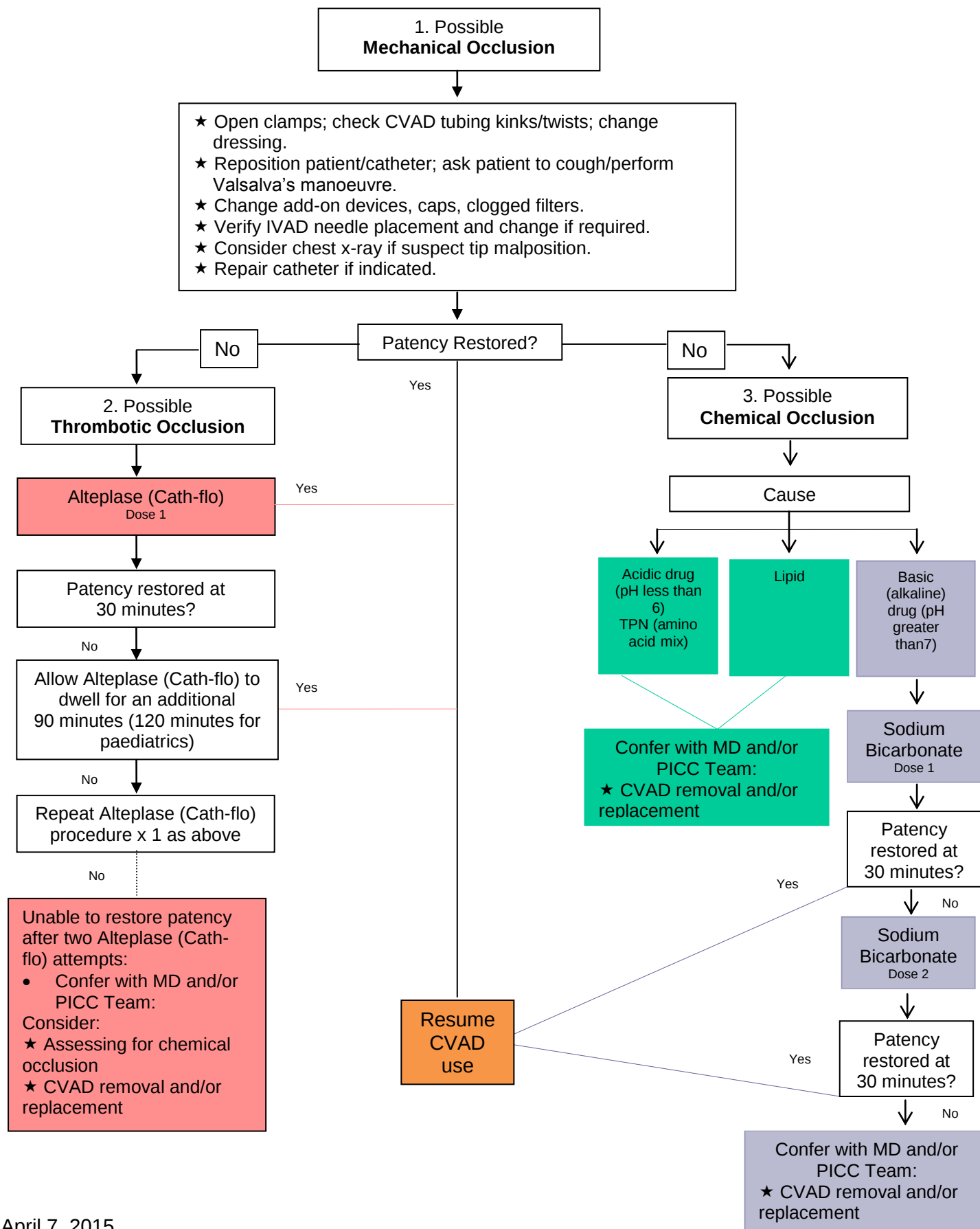
Document the procedure and alteplase and/or sodium bicarbonate instillation on:

- a. Medication Administration Record – Single/STAT Dose Medications (CS-186)
- b. PCS Central/Arterial Line Assessment.
- c. PCS Notes
- d. Interdisciplinary Notes
- e. MOSAIQ – Invasive Line Assessment

7. REFERENCES:

- Blaney, M., Shen, V., Kerner, J. A., Jacobs, B. R., Gray, S., Armfield, J., & Semba, C. P. (2006). Alteplase for the treatment of central venous catheter occlusion in children: Results of a prospective, open-label, single-arm study (The Cathflo Activase Pediatric Study). *Journal of Vascular and Interventional Radiology*, 17, 1745-1751.
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- Canadian Vascular Access Association. (2013). Occlusion management guidelines for central venous access devices (CVADs). *Vascular Access*, 7, 1-34. Retrieved from www.cvaa.info
- Loubnan, V., & Nasser, S. C. (2010). A guide on intravenous drug compatibilities based on their pH. *Pharmacie Globale: International Journal of Comprehensive Pharmacy*, 1, 1-9. Retrieved from <http://pharmacie-globale.info>
- McGill University. (2004). Alteplase protocol. Retrieved from <http://www.mcgill.ca/files/peds/AlteplaseProtocol.pdf>

Algorithm for Management of CVAD Occlusion: Adult and Paediatric



Intravenous Medications with a pH Greater Than 7

- ★ This is not a complete list of alkaline IV medications at TBRHSC; collaborate with pharmacist or clinical nurse specialist to determine medication pH.
- ★ Additional resources to determine medication pH:
 - e-CPS / CPS
 - UpToDate
 - Clinical drug guide

Acyclovir	Fluorouracil	Methotrexate
Amoxicillin	Furosemide	Pantoprazole
Ampicillin	Iron sucrose	Phenobarbital
Dexamethasone	Meropenem	Phenytoin

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