Central Venous Catheter (CVC): Tunneled, Peripherally Inserted (PICC) and Implanted – Instillation of Thrombolytic Agent (Alteplase) for Occlusion Management

Related Documents and Resources:

1. B-00-13-10005 - Implanted Central Venous Catheter (CVC) - Port or Dome: Patient Care
2. B-00-13-10030 - Peripherally Inserted Central Catheter (PICC): Patient Care
3. Occlusion Management (Not Responsive to Thrombolytic) – *in development*

Skill Level:

Specialized:

- IV Therapy (IVT) staff, the Nurse Educator(s) for IV Therapy and the Patient Educators for the Home Infusion Programs in PHC
- RN staff that have been competency checked by the Nurse Educator for IV Therapy

Need to Know (click here)

PRACTICE GUIDELINE

Equipment & Supplies:

1. Alteplase 2 mg vial
2. Sterile water in vial for reconstitution
3. Sterile 10 mL syringe – empty for alteplase
4. Mask
5. Sterile gloves
6. Alcohol swabs
7. Pre-filled 10 mL syringe with normal saline (NS)
8. Sterile red dead-end cap
9. 3-way stopcock connector (in sterile package) – **if necessary**
10. Sterile 10 mL syringe – for 3-way stopcock method **if necessary**
11. Dressing tray (optional)

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Instillation of Alteplase (t-PA) into a Suspected Blocked CVC

Steps	Rationale
1. Confirm CVC blockage / sluggishness with IV Team or nursing staff (as necessary) and in patient's chart. Obtain order for alteplase with PPO completed and sent to Pharmacy.	
2. Clean work area, wash hands.	
3. Prepare and reconstitute alteplase from vial into syringe: Withdraw 2.2 mL of **sterile water** for injection. (Do NOT use bacteriostatic water or sodium chloride 0.9% (NS) for reconstitution). Inject 2.2 mL of sterile water into alteplase vial (2 mg). Slight foaming is not unusual. **MIX GENTLY** by swirling the contents until completely dissolved. DO NOT SHAKE vial. The reconstituted alteplase will be a clear, pale yellow solution. Withdraw 2 mL (2 mg) into new sterile syringe for administration. There is no preservative in the vials, administer alteplase as soon as possible. Can use within 8 hours if stored at 3 to 30 degrees Celsius (will require refrigeration).	
4. Put on mask. Open packages of alcohol swabs and syringe. Have pre-filled syringe of alteplase on work area.	May use dressing tray for larger sterile field (optional).
5. Put on sterile gloves.	Strict asepsis must be maintained to prevent infection and further CVC complications.
6. Pick up connection point (with sterile 2 x 2 gauze) of CVC line and cap and remove cap from CVC.	
7. Clean the open end of the CVC hub tubing with an alcohol swab.	

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Steps	Rationale
8. If CVC is only ***partially*** blocked (i.e. sluggish flow or flush but unable to aspirate), directly instill alteplase with syringe. a) Attach syringe with alteplase to CVC lumen. b) Inject alteplase into CVC. Instill 2 mg in 2 mL. c) Remove syringe from CVC hub. d) Attach new sterile red dead-end cap.	
9. If CVC is ***completely*** blocked, (i.e. unable to flush or aspirate from CVC), use either **single-syringe** (preferred, default) or **3-way stopcock** for instillation. Do NOT over tighten. Keep CVC end closed off with stopcock. **Single-syringe method (preferred):** a) Attach syringe with alteplase to CVC lumen. b) Have syringe in upright position to prevent air from entering the CVC. c) Pull back on plunger to achieve negative pressure with a vacuum. d) Slowly release and "let-go" of plunger – this vacuum will allow the alteplase to be drawn/pulled into the CVC. e) Repeat this action with the plunger several times until the full amount of alteplase is pulled into the CVC. This may take 15 to 30 minutes depending on the clot burden – allow for extra time for procedure. **3-way stopcock method:** a) Attach 3 mL syringe with alteplase to one connection of stopcock. b) Attach empty 10 mL syringe to other connection of stopcock. c) Open stopcock to empty 10 mL syringe and CVC (close off alteplase syringe). Pull back on plunger of syringe to create "negative pressure" within CVC. Close off connection to 10 mL syringe. d) Open stopcock to alteplase syringe and CVC – the alteplase should easily be instilled into the CVC if enough negative pressure is generated with the 10 mL syringe.	

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Steps	Rationale
e) Repeat procedure until all of alteplase is instilled into CVC. Allow for extra time at procedure. f) When all of alteplase has been instilled, close off the CVC connection. Replace alteplase syringe and 10 mL syringe with new sterile red dead-end caps.	
10. Wait for minimum of 30 minutes - can be up to 4 to 8 hours to restore catheter function. Communicate with unit RN not to use CVC lumen with alteplase.	Potential but rare adverse reactions to low-dose alteplase include allergic reactions, bleeding and pulmonary embolus.
11. After minimum 30 minutes, return to patient and attempt to aspirate instilled alteplase with a new sterile syringe. (Keep stopcock in place if necessary for repeat of instillation of alteplase).	According to the literature, appropriate dwell time for alteplase is typically 30 to 120 minutes.
12. If unable to aspirate, repeat procedure for instillation and leave for another 24 hours.	According to the literature, additional doses of alteplase may be given if CVC function is not restored after one dose.
13. If successful with aspiration, flush CVC as necessary to restore patency and use. Put on needlefree connector (NC) and flush appropriately.	
14. If unable to aspirate after the 2nd dose, flush CVC with NS (if possible), cap lumen off and consult Nurse Educator for IV Therapy to determine course of action for occlusion.	Further and alternate interventions may be necessary (e.g. venogram, ultrasound, etc.) or possible removal of CVC may be indicated. Refer to Occlusion Management (not responsive to thrombolytic) (*in development)* for alternative interventions.
15. Check with patient and patient's chart if CVC occlusion may be caused by something else other than fibrin or thrombus formation (blood). Consult pharmacy to determine if TPN or medication may be the cause. If occlusion found to be caused by **lipids** (with TPN) or chemotherapy (such as etoposide) consider instillation of ethanol alcohol. If occlusion found to be caused by **medication that is acidic** (based on pH and	

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Steps	Rationale
osmolarity), consider instillation of an alkaline solution such as NaHCO3. If occlusion found to be caused by **medication that is alkaline** (based on pH and osmolarity), consider instillation of acidic solution such as 0.1 HCl. Consult pharmacy for medication properties and dosing of instillation of agents other than alteplase. Refer to specific protocol for instillation procedure for agents other than alteplase.	

Resources:

Contact the IV Team (SPH), the CNL for IV Team or the Nurse Educator for IV Therapy (PHC) if you have questions or concerns

Documentation:*

Communicate with unit RN and IV Team with results. Document:

Interdisciplinary Notes and on the IV Therapy section on the 24-hour Flow Sheet:

- Date/time
- Location of CVC
- Interventions, procedure(s)
- Cap change
- Flushing

References:

1. Canadian Vascular Access Association (CVAA). (2013). Occlusion management guideline for central venous access devices (CVADs). *Vascular Access, 7*(Suppl.1), 1-34.
2. Infusion Nurses Society (INS). (2016). Infusion therapy standards of practice. *Journal of Infusion Nursing, 39*(1Supplement), S1-159.
3. Weinstein, S., & Hagle, M. (2014). *Plumer's principles and practice of infusion therapy* (9th ed.). Philadelphia, PA: Wolters Kluwer Health, Lippincott Williams & Wilkins.

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Persons/Groups Consulted:

CNL, IV Team SPH

Pharmacy Clinical Specialist, TPN/Chemotherapy PHC

Pharmacy Coordinator, Parenteral Services PHC

Developed By:

Nurse Educator, IV Therapy and Home Infusion Programs – PHC

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Need to Know

1. Alteplase (t-PA) is a thrombolytic agent that works specifically by binding to fibrin in a thrombus, then converting the entrapped plasminogen to plasmin resulting in local fibrinolysis (i.e. digests fibrin and dissolves blood clots). Alteplase is highly "clot-sensitive".
2. The instillation of **low**-dose alteplase into a CVC via syringe method is documented as safe and effective for the immediate restoration of CVC patency that was affected by a thrombotic occlusion.
3. Alteplase and heparin are not to be mixed or given concurrently – the mixing of the two agents results in inactivation of alteplase.
4. A suspected blocked CVC may be ***partially*** or ***completely*** blocked due to thrombus formation / occlusion. A partially blocked CVC refers to the ability to flush the CVC but not to aspirate for blood return or the sluggish flow of a CVC with infusion or flushing. A completely blocked CVC refers to the inability to flush the CVC or aspirate for blood return.
5. If the CVC / PICC is a double or triple lumen, instill alteplase into all lumens in case of fibrin flap affecting more than one lumen.
6. When performing instillation procedure into CVC / PICC lumens, IV infusions should be stopped for the duration of alteplase instillation.
7. Common sites of thrombus formation: within the catheter lumen, the site where catheter enters the vein, the catheter tip and along the external surface of the catheter.
8. Types of thrombotic occlusions include:
    - Intraluminal thrombus: may cause sluggish flow that is apparent upon flushing or infusing solutions
    - Fibrin tail (fibrin flap): inability to aspirate blood is frequently caused by a fibrin tail (acts as a one-way valve allowing catheter flush but not aspiration).
    - Fibrin sheath (fibrin sleeve): extraluminal, occurring when fibrin adheres to the external surface of the catheter – may resemble a sock covering the terminal tip of the catheter or extend from the catheter to the point where the catheter enters the vein.
    - Mural thrombus: if the catheter tip causes a vessel wall injury, a mural thrombus may form as fibrin from the vessel wall injury attaches to the fibrin building on the catheter surface.
9. The pre-printed order form #PH011 titled: Management Protocol for Blocked Central Venous Catheters with Alteplase (t-PA) Instillation must be filled out and sent to pharmacy.
10. The standard dose for alteplase instillation is: 2 mg in 2 mL.
11. Although rare, the following potential adverse reactions may occur with low-dose alteplase infusion. Literature describing use of low-dose IV infusion of alteplase does not report significant occurrences of these potential reactions. However, as they are

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possible, nurses are advised of them and patient assessment is based on this knowledge.

- **Allergic reactions** – can include laryngeal edema, rash and urticaria.
- **Bleeding** – especially from recent puncture sites, gums, urine or GI tract.
- **Pulmonary embolus** – may result from a portion of the thrombus/fibrin sheath dislodging and floating into the pulmonary circulation.

The responsible physician must be notified immediately in case of adverse reaction.