EXECUTIVE SUMMARY

SCOPE

METHODOLOGY

DEFINITIONS

INTRODUCTION

RECOMMENDATIONS

UW HEALTH IMPLEMENTATION

APPENDIX A. EVIDENCE GRADING SCHEME(S)

APPENDIX B. SUMMARY OF INTERIM REVISIONS (AS APPROPRIATE)

REFERENCES
Executive Summary
Guideline Overview
This clinical practice guideline is intended to promote the use of a standardized process for the assessment and interventions needed to treat central venous access device (CVAD) occlusions. For recommendations on prevention of CVAD occlusion please see recommendations in the Flushing/Locking of Venous Access Devices – Adult/Pediatric – Inpatient/Ambulatory.

The clinical interventions and practices recommended in this guideline are for mechanical, thrombotic or chemical CVAD occlusions. Practices considered may include patient repositioning or replacement of damaged devices for mechanical occlusions, alteplase for thrombotic occlusions, and hydrochloric acid, sodium bicarbonate, sodium hydroxide and/or ethanol for chemical occlusions.

Key Revisions (2017 Periodic Review)
1. Change in volume of alteplase for CVAD clearance
2. Removal of Hydrochloric acid as a recommendation for chemical occlusions as not able to obtain medication from a high-risk sterile compounding pharmacy.

Key Practice Recommendations
1. Assess CVAD patency and identify the type of occlusion by flushing affected lumen(s) and attempting to withdraw blood using a 10 mL syringe of Preservative Free Normal Saline (UW Health GRADE moderate quality evidence, strong recommendation).

2. Once the type of occlusion is identified it should be treated with the recommended management strategy as outlined in this guideline (UW Health low quality evidence, weak/conditional recommendation).

3. Assess for signs of mechanical occlusion (UW Health high quality evidence, strong recommendation)
   3.1 Visually inspect the CVAD and administration set for signs of kinked or clamped tubing, loose tubing connections, clogged filter, tight sutures, or change in external catheter length.
   3.2 Inspect visually and by palpation for catheter damage as seen by swelling, bulging and leaking from CVAD.
   3.3 Consider subjective complaints from patients that may suggest occlusion like hearing a swishing sound or pain during infusion or having altered sensation during infusion.

4. Resolve the mechanical Occlusion (UW Health moderate quality evidence, weak/conditional recommendation)
   4.1 Attempt to move catheter tip away from vessel wall by repositioning patient (raise arms and sit forward), forced coughs, or deep inhalations
   4.2 Remove any add-on devices (cap/needleless connectors)
   4.3 Change dressings and loosen sutures to ensure no kinking
   4.4 Replace clogged filter
   4.5 Repair or replace a damaged catheter

5. For thrombotic occlusions attempt to resolve the thrombotic occlusion by using the alteplase dose that corresponds to the volume of the CVAD. (UW Health high quality evidence, strong recommendation)
   5.1 Alteplase dosing is based on a concentration of 1 mg/mL. The addition of 0.2 mL will be supplied for overfill. The following standardized doses/volumes will be supplied
5.1.1 Alteplase 0.5 mg/0.5 mL (common pediatric CVAD volume)
5.1.2 Alteplase 1.2 mg/1.2 mL
5.1.3 Alteplase 2.2 mg/2.2 mL

5.2 Administer enough volume to fill the CVAD with an additional 0.2 mL for overfill and allow to dwell for 60 minutes (UW Health moderate quality evidence, strong recommendation)

6. If patient is not restored then attempt to withdraw the first dose of alteplase and administer a second dose of alteplase. Allow alteplase to remain the catheter for an addition 60 minutes (total 120 minutes of alteplase) UW Health low quality evidence, weak/conditional recommendation)

7. Assess for signs of a chemical occlusion through visual observation of precipitate or identification of co-administration of incompatible agent. (UW Health high quality evidence, strong recommendation)

8. Select the corresponding clearance agent and instill sufficient volume to fill catheter lumen.
   8.1 There is no data to support overfill (UW Health very low quality evidence, weak/conditional recommendation)

9. If patency not restored then consult a physician or DVI (UW Health very low quality evidence, weak/conditional recommendation)

Companion Documents
1. Appendix B. Management of Central Venous Access Device Occlusion Algorithm
2. Flushing/Locking of Venous Access Devices - Adult/Pediatric - Inpatient/Ambulatory

**Scope**

**Disease/Condition(s):** Occluded central venous access devices

**Clinical Specialty:** Hospitalists, Oncology, Cardiology, Surgical Specialities, Hemodialysis, Nursing, and Pharmacy

**Intended Users:** Physicians, Advanced Practice Providers, Nurses, and Pharmacists

**Objective(s):** This clinical practice guideline is intended to promote the use of a standardized process for the assessment and interventions needed for central venous access device occlusions.

**Target Population:** The recommendations within the guideline would apply to adult, pediatric and neonatal patients with a catheter occlusion in a tunneled cuff catheter (i.e. Hickman, Groshong), PICC, dialysis, triple lumen subclavian/femoral/jugular or implanted venous port catheter.

**Interventions and Practices Considered:** The clinical interventions and practices recommended in this guideline are for mechanical, thrombotic or chemical CVAD occlusions. Practices considered may include patient repositioning or replacement of damaged devices for mechanical occlusions, alteplase for thrombotic occlusions, and hydrochloric acid, sodium bicarbonate, sodium hydroxide and/or ethanol for chemical occlusions.
Major Outcomes Considered: The major outcome considered in this guideline is for the preservation of the CVAD through correct identification of the type of occlusion and the selection of the most appropriate method for resolving the occlusion.

Methodology

Methods Used to Collect/Select the Evidence:
Electronic database searches (e.g., PUBMED) were conducted by the guideline author(s) and workgroup members to collect evidence for review. Expert opinion and clinical experience were also considered during discussions of the evidence.

Methods Used to Formulate the Recommendations:
The workgroup members agreed to adopt recommendations developed by external organizations and/or arrived at a consensus through discussion of the literature and expert experience. All recommendations endorsed or developed by the guideline workgroup were reviewed and approved by other stakeholders or committees (as appropriate).

Methods Used to Assess the Quality of the Evidence/Strength of the Recommendations:
Recommendations developed by external organizations maintained the evidence grade assigned within the original source document and were adopted for use at UW Health.

Internally developed recommendations, or those adopted from external sources without an assigned evidence grade, were evaluated by the guideline workgroup using an algorithm adapted from the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology (see Figure 1 in Appendix A).

Rating Scheme for the Strength of the Evidence/Recommendations:
See Appendix A for the rating scheme(s) used within this document.

Cost Analysis: (As Appropriate) Describes any formal cost analysis performed and any published cost analyses reviewed.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Price per 1 mL</th>
<th>Price per 2 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alteplase 1 mg/mL</td>
<td>$77 (1.2 mL)</td>
<td>$141</td>
</tr>
<tr>
<td>Sodium Bicarbonate</td>
<td>$0.15</td>
<td>$0.30</td>
</tr>
<tr>
<td>Ethanol 70%</td>
<td>$11.27</td>
<td>$22.54</td>
</tr>
<tr>
<td>L-Cysteine</td>
<td>$0.55</td>
<td>$1.10</td>
</tr>
</tbody>
</table>

Recognition of Potential Health Care Disparities: none recognized
Definitions

1. Common catheter types with adult and pediatric volumes are listed in Table 2.

Table 2: Central venous catheter type and capacitance

<table>
<thead>
<tr>
<th>Catheter Type</th>
<th>Adult Capacity</th>
<th>Pediatric Capacity</th>
<th>Neonatal Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialysis-Pheresis Catheters</td>
<td>Volume on catheter lumen (common 2 mL)</td>
<td>1 mL or less</td>
<td></td>
</tr>
<tr>
<td>Implanted Venous Port</td>
<td>2 mL</td>
<td>1 mL or less</td>
<td></td>
</tr>
<tr>
<td>Non-tunneled Triple Lumen (ex. Arrow)</td>
<td>1 mL</td>
<td>1 mL or less</td>
<td></td>
</tr>
<tr>
<td>PICC</td>
<td>1 mL</td>
<td>1 mL or less</td>
<td>0.1 mL (1.9 fr)</td>
</tr>
<tr>
<td>Powerline</td>
<td>1 mL</td>
<td>1 mL or less</td>
<td></td>
</tr>
<tr>
<td>Tunneled Cuff Catheter (ex. Groshong)</td>
<td>1 mL</td>
<td>1 mL or less</td>
<td></td>
</tr>
<tr>
<td>Tunneled or Non-Tunneled Central (ex. Hickman, Broviac)</td>
<td>2 mL</td>
<td>1 mL or less</td>
<td></td>
</tr>
<tr>
<td>Umbilical Catheters (Double and Single Lumen 3.5 and 5 fr)</td>
<td></td>
<td></td>
<td>0.5 mL or less</td>
</tr>
</tbody>
</table>

2. Type of occlusions\(^1,2\)
   2.1 Mechanical – may be caused by kinks in catheter or tubing, CVAD dislodgement or tip migration, a clogged connector or filter, or incorrect positioning of patient or catheter.
   2.2 Chemical – caused by precipitate when incompatible drugs are administered or from lipid build up
   2.3 Thrombotic – caused by fibrin build up within or around CVAD or surrounding vessel

3. Type of thrombotic occlusion\(^3,4\)
   3.1 Intraluminal – Thrombus forms within the lumen from insufficient flushing, inadequate flow through lumen or frequent blood aspirations. This may cause partial or complete occlusions.
   3.2 Fibrin Tail – Occurs when fibrin adheres to the end of the catheter and extends into the blood stream. This causes a withdrawal type of occlusion.
   3.3 Fibrin Sheath – Occurs when fibrin covers the external surface of a catheter. This causes a withdrawal type of occlusion.
   3.4 Mural – Thrombus forms when fibrin from a vessel wall binds to fibrin on the catheter surface. This may cause partial catheter occlusion and can progress into a venous thrombosis.

4. Degree of occlusion (Table 3.)
### Table 3. Degree of CVC occlusions\(^{2,5,6}\)

<table>
<thead>
<tr>
<th>Degree of Occlusion</th>
<th>Signs</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial</td>
<td>Sluggish flow through catheter</td>
<td>Mechanical</td>
</tr>
<tr>
<td></td>
<td>Resistance with flushing and aspiration</td>
<td>Chemical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thrombotic</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Able to infuse without resistance</td>
<td>Mechanical</td>
</tr>
<tr>
<td></td>
<td>Unable to withdraw blood</td>
<td>Thrombotic</td>
</tr>
<tr>
<td>Complete</td>
<td>Unable to infuse or withdraw blood</td>
<td>Mechanical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thrombotic</td>
</tr>
</tbody>
</table>

### Introduction

Central venous access devices (CVAD) facilitate the administration of drugs, fluids, blood products, and parenteral nutrition and the aspiration of blood samples, providing essential therapy for and management of patients in inpatient and ambulatory settings. Compromised CVAD function may interrupt treatment, increase morbidity, decrease patient comfort, and require catheter replacement and/or removal. The lumen(s) of a CVAD may become occluded due to mechanical, chemical or thrombotic factors; accumulation of a thrombotic fibrin sheath accounts for 58% of all occlusions.\(^7\)-\(^12\) In the event of a CVAD occlusion, the goal of therapy is to salvage the CVAD rather than replace or remove it, with the exception of the midline catheter. At this time it is not recommended to use catheter clearance techniques for thrombotic or chemical occlusions and instead removing or replacement the midline is recommended. For other CVADs there are recommended interventions that can successfully restore patency to CVADs for each type of occlusion.\(^10,11\)

### Recommendations

Assessment of catheter patency should be done by a health care professional who is knowledgeable in CVAD use and maintenance.

1. Assess CVAD patency and identify the type of occlusion by flushing affected lumen(s) and attempting to withdraw blood using a 10 mL syringe of Preservative Free Normal Saline\(^3,5\) *(UW Health GRADE moderate quality evidence, strong recommendation)*
   1.1 Sluggish blood flow is present when it is difficult to flush the CVAD or inability to withdraw > 3 mL of blood in 3 seconds or > 1 minute in PICC\(^5,8\) *(UW Health GRADE moderate quality evidence, strong recommendation)*
   1.2 Table 4 lists common signs of CVAD occlusion and can assist in the assessment of occlusion type.

### Table 4. Signs of CVAD occlusion\(^3-5,12\)

<table>
<thead>
<tr>
<th>Infusion or Flushing</th>
<th>Aspiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance when flushing</td>
<td>Unable to withdraw blood</td>
</tr>
<tr>
<td>Sluggish flow</td>
<td>Sluggish blood return</td>
</tr>
<tr>
<td>Unable to infuse fluids</td>
<td></td>
</tr>
<tr>
<td>Frequent occlusion pump alarm</td>
<td></td>
</tr>
<tr>
<td>Infiltration, extravasation, swelling or leaking at insertion site</td>
<td></td>
</tr>
</tbody>
</table>
2. Once the type of occlusion is identified it should be treated with the recommended management strategy as outlined in this guideline\(^\text{13}\) (UW Health low quality evidence, weak/conditional recommendation)

2.1 Attempt to resolve occlusion using mechanical manipulations first\(^\text{13,14}\) (UW Health moderate quality evidence, strong recommendation)

2.2 If unable to determine the type of occlusion treat first as a thrombotic occlusion\(^\text{6,13}\) (UW Health low quality evidence, weak/conditional recommendation)

2.3 Alteplase is not effective in restoring patency to a CVAD due to mechanical or chemical occlusion\(^\text{2-5,11,15}\). (UW Health high quality evidence, strong recommendation)

Mechanical Occlusions

A CVAD occlusion caused by a mechanical process can be either internal or external. Common external causes include catheter tubing which has been clamped or kinked. Common internal causes include incorrect positioning of the catheter tip, kinking of catheter inside vein, or the catheter tip adhering to the vessel wall.\(^\text{2,13,16}\)

3. Assess for signs of a mechanical occlusion\(^\text{2,13,14,16}\) (UW Health high quality evidence, strong recommendation)

3.1 Visually inspect the CVAD and administration set for signs of kinked or clamped tubing, loose tubing connections, clogged filter, tight sutures, or change in external catheter length.

3.2 Inspect visually and by palpation for catheter damage as seen by swelling, bulging and leaking from CVAD.

3.3 Consider subjective complaints from patients that may suggest occlusion like hearing a swishing sound or pain during infusion or having altered sensation during infusion.

4. Resolve the mechanical occlusion\(^\text{2,13,14,16}\) (UW Health moderate quality evidence, weak/conditional recommendation)

4.1 Attempt to move catheter tip away from vessel wall by repositioning patient (raise arms and sit forward), forced coughs, or deep inhalations

4.2 Remove any add-on devices (cap/needleless connectors)

4.3 Change dressings and loosen sutures to ensure no kinking

4.4 Replace clogged filter

4.5 Repair or replace a damaged catheter

5. Consider a chest x-ray if catheter placement is questionable or to assess for internal kinking, pinch-off syndrome, and positioning of catheter tip.\(^\text{13}\) (UW Health low quality evidence, weak/conditional recommendation)


Thrombotic Occlusions

In the event of a thrombotic occlusion, alteplase (tPA) has become the agent of choice for catheter clearance.\(^\text{6,17}\) Alteplase is indicated for use in catheter clearance in a variety of catheter types (see Table 1.) and has also shown to be beneficial in restoring hemodialysis catheter function.\(^\text{15,18,19}\) While utilization of low dose thrombolytic therapy used locally is well established, the doses and techniques outlined in the literature are variable. Most randomized, controlled trials
evaluate alteplase 2 mg versus placebo\textsuperscript{6,17,20}. There is limited published data available for lower dosing of alteplase\textsuperscript{21,22}.

One small trial sought to evaluate two dosing options of alteplase for thrombotic occlusions in tunnel catheters and ports in 45 patients (61 lumens). This trial evaluated alteplase 1 mg/mL versus 2 mg/2mL. Similar clearance rates were seen between these two dosing options with 81.1\% and 83.3\% respectively. This trial, however, was not powered for significance\textsuperscript{21}.

7. Assess for signs of a thrombotic occlusion\textsuperscript{2-4,13} (\textit{UW Health high quality evidence, strong recommendation})
   7.1 Review patient allergies and consider contraindications, adverse events, preparation and administration requirements of alteplase prior to administration.

8. Attempt to resolve the thrombotic occlusion by using the alteplase dose that corresponds to the volume of the CVAD\textsuperscript{5,13-15,17-21,23} (\textit{UW Health high quality evidence, strong recommendation})
   8.1 Determine the volume of the CVAD (Table 2) to determine the dose/volume of alteplase needed for adequate fill.
   8.2 Alteplase dosing is based on a concentration of 1 mg/mL. The addition of 0.2 mL will be supplied for overfill. The following standardized doses/volumes will be supplied:
   8.2.1 Alteplase 0.5 mg/0.5 mL (\textit{common pediatric CVAD volume})
   8.2.1 Alteplase 1.2 mg/1.2 mL
   8.2.2 Alteplase 2.2 mg/2.2 mL

9. Administer enough volume to fill the CVAD with an additional 0.2 mL for overfill and allow to dwell for 60 minutes\textsuperscript{6,13-15,17-21,23} (\textit{UW Health moderate quality evidence, strong recommendation})
   For pediatric patients may consider utilizing 110\% of the CVAD volume\textsuperscript{15} (\textit{UW Health low quality evidence, weak/conditional recommendation})
   9.1 Follow the procedures outlined in Nursing and Patient Care Policy AP 1.56 Central Vascular Access Device Use, Maintenance, and Removal (Adult and Pediatric) (\textit{UW Health low quality evidence, weak/conditional recommendation})
   9.1.1 For partial occlusions utilize a syringe method for catheter clearance
   9.1.2 For complete occlusions utilize a stopcock method for catheter clearance
   9.2 Treat occluded lumen(s) of the CVAD with corresponding dose of alteplase. Use caution when treating triple lumen catheters. Maximum recommended dose of alteplase per treatment is 4 mg\textsuperscript{15} (\textit{UW Health low quality of evidence, weak/conditional recommendation})
   9.3 Document assessment, alteplase dose, administration time, removal time, total dwell time, and response to intervention in the medical record. (\textit{UW Health very low quality evidence, strong recommendation})

10. If patency is restored then follow the procedures outlined in Nursing and Patient Care Policy AP 1.56 Central Vascular Access Device Use, Maintenance, and Removal (Adult and Pediatric)
   10.1 Adults: withdraw 5 mL, discard and flush catheter with 20 mL 0.9\% sodium chloride (\textit{UW Health very low quality evidence, strong recommendation})
   10.2 Pediatrics: withdraw 1-2 mL, discard and flush catheter with 5-10 mL of 0.9\% sodium chloride (\textit{UW Health very low quality evidence, strong recommendation})
   10.3 Resume IV fluids, medications, or lock CVAD as appropriate (\textit{UW Health very low quality evidence, weak/conditional recommendation})

11. If patency is not restored then attempt to withdraw the first dose of alteplase and administer second dose of alteplase. Allow alteplase to remain in catheter for an additional 60 minutes
(total of 120 minutes of alteplase)\textsuperscript{6,13-15,17-21,23} (UW Health low quality evidence, weak/conditional recommendation)

12. If unsuccessful after a second alteplase dose then consult a physician\textsuperscript{3,13} (UW Health low quality evidence, weak/conditional recommendation)
   12.1 Consider a chest X-ray to verify catheter tip placement (UW Health low quality evidence, weak/conditional recommendation)
   12.2 Consider a dye study to rule out mechanical occlusion or vessel thrombosis (UW Health low quality evidence, weak/conditional recommendation)

13. Monitor for potential adverse effects, including minor bleeding and bruising. (UW Health very low quality evidence, weak/conditional recommendation)

Chemical Occlusions
Chemical occlusions occur when precipitates form within the lumen of the CVAD and when lipid residue builds from continuous 3 in 1 parenteral nutrition. Common causes of chemical occlusions include co-administration of incompatible medications or lipid infusions.\textsuperscript{1,14} Catheter salvage is still the main goal and attempts to clear chemical precipitate or lipid residue should be tried. Agents known to dissolve precipitate can be considered to restore patency. Chemical occlusions make up a smaller percentage of catheter occlusions therefore thrombotic and mechanical occlusions should be ruled out before treating for chemical occlusion.\textsuperscript{1}

14. Assess for signs of a chemical occlusion through visual observation of precipitate or identification of co-administration of incompatible agent\textsuperscript{14,23-28} (UW Health high quality evidence, strong recommendation)
   14.1 Select the corresponding clearance agent (Table 5) and instill sufficient volume to fill the catheter lumen.
      14.3.1 There is no data to support the use of overfill\textsuperscript{13} (UW Health very low quality evidence, weak/conditional recommendation)
   14.1.2 Use of 70% ethanol in a polyurethane catheter may result in damage to the catheter. Use with caution.\textsuperscript{15} (UW Health low quality evidence, weak/conditional recommendation)
Table 5. Types of Chemical Occlusion and Treatment Options

<table>
<thead>
<tr>
<th>Cause</th>
<th>Clearance Agent</th>
<th>Dwell Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium Phosphate Precipitate</td>
<td>L-Cysteine</td>
<td>Irrigate with gentle to and fro motion for 1-2 minutes. If not restored dwell 60 minutes and repeat above hourly</td>
</tr>
<tr>
<td>Acidic Drug Precipitate – pH &lt; 6 (ex. vancomycin, piperacillin, parenteral nutrition amino acids)</td>
<td>L-Cysteine</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Alkaline Drug Precipitate – pH &gt; 7 (ex. phenytoin, ganciclovir, ampicillin, heparin)</td>
<td>Sodium bicarb (NaHCO₃ 8.4% 1 meq/mL)</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Lipid Deposition (ex. parenteral nutrition)</td>
<td>70% Ethanol</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>

15. If patency is restored then follow the procedures outlined in Nursing and Patient Care Policy AP 1.56 Central Vascular Access Device Use, Maintenance, and Removal (Adult and Pediatric)
   15.1 Adults: withdraw 5 mL, discard and flush catheter with 20 mL 0.9% sodium chloride (UW Health very low quality evidence, strong recommendation)
   15.2 Pediatrics: withdraw 1-2 mL, discard and flush catheter with 5-10 mL of 0.9% sodium chloride (UW Health very low quality evidence, strong recommendation)
   15.3 Resume IV fluids, medications, or lock CVAD as appropriate (UW Health very low quality evidence, weak/conditional recommendation)

16. If patency not restored then consult a physician or DVI (UW Health very low quality evidence, weak/conditional recommendation)

17. Document assessment, intervention and response to intervention in the electronic medical record. (UW Health very low quality evidence, strong recommendation)

UW Health Implementation

Potential Benefits:
The benefits of implementation of this guideline include preserving CVAD patency in a standardized process that limits therapy interruptions, reduces complications and decreases costs that are associated with catheter replacement. Additionally, this guideline will provide guidance for the provision of safe and cost-effective use of alteplase for the clearance of thrombotic CVAD occlusions.

Potential Harms:
While it is anticipated that the overall safety and quality of CVAD clearance will be improved in this patient population there is a risk for hemorrhagic complications when alteplase is used for thrombotic occlusions. With the low doses of alteplase used in CVAD clearance this risk is considered to be minor. The use of ethanol for chemical occlusions may affect blood levels. Ethanol should also be used with caution with polyurethane CVADs as it may damage the
catheter. Additionally for thrombotic and chemical occlusions treatment strategies may delay therapies while waiting for appropriate dwell times.

Qualifying Statements:
None

Pertinent UW Health Policies & Procedures
1. UWHC Nursing and Patient Care Policy 1.56 AP Central Vascular Access Device Use, Maintenance, and Removal (Adult and Pediatric)

Guideline Metrics
Using a numbered list, describe metrics to assess compliance with the stated recommendations or to gauge improvement resulting from implementation of the guideline.
NOTE: All metrics required or reported externally should be included (consider guidance from OSI).
1. Alteplase, HCL, L-cysteine, NaHCO₃, an/or 70% ethanol administration data (time to administration, dose, dwell time)
2. Success of CVAD clearance
3. Number of attempts at clearance
4. CVAD replacement

Implementation Plan/Clinical Tools
Include an education plan, methods of communication, and identification of related tools. Guideline content is expected to have some integration into the Health Link documentation system.
1. Guideline will be posted on uConnect in a dedicated location for Clinical Practice Guidelines.
2. Release of the guideline will be advertised in the Physician/APP Briefing newsletter.
3. Content and hyperlinks within clinical tools, documents, or Health Link related to the guideline recommendations (such as the following) will be reviewed for consistency and modified as appropriate.

Delegation Protocols
[16] – Central venous access device clearance – adult/pediatric/neonatal

Order Sets & Smart Sets
[3600] – IP - Catheter Clearance – Supplemental Order Set

Disclaimer
Clinical practice guidelines assist clinicians by providing a framework for the evaluation and treatment of patients. This guideline outlines the preferred approach for most patients. It is not intended to replace a clinician’s judgment or to establish a protocol for all patients. It is understood that some patients will not fit the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.
Appendix A. Evidence Grading Scheme(s)

Figure 1. GRADE Methodology adapted by UW Health

GRADE Ranking of Evidence

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>We are confident that the effect in the study reflects the actual effect.</td>
</tr>
<tr>
<td>Moderate</td>
<td>We are quite confident that the effect in the study is close to the true effect, but it is also possible it is substantially different.</td>
</tr>
<tr>
<td>Low</td>
<td>The true effect may differ significantly from the estimate.</td>
</tr>
<tr>
<td>Very Low</td>
<td>The true effect is likely to be substantially different from the estimated effect.</td>
</tr>
</tbody>
</table>

GRADE Ratings for Recommendations For or Against Practice

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>The net benefit of the treatment is clear, patient values and circumstances are unlikely to affect the decision.</td>
</tr>
<tr>
<td>Weak/conditional</td>
<td>Recommendation may be conditional upon patient values and preferences, the resources available, or the setting in which the intervention will be implemented.</td>
</tr>
</tbody>
</table>
Appendix B. Central Venous Access Device Occlusion – Adults/Pediatric CPG
Management of Central Venous Access Device Occlusion – Algorithm

If a partial or complete occlusion is identified:

Assess for signs of mechanical occlusion

Treatment:
- Reposition patient, forced coughs, deep breaths
- Remove add-on devices or replace clogged filters
- Change dressing, loosen sutures, open clamps to ensure no kinking or twisting

No

Patency Restored?

No

Assess for thrombotic occlusion

Treatment:
- Alteplase
- Dwell 60 minutes

Patency Restored?

Yes

No

Consult with MD:
- CXR
- Dye study
- CVC replacement
- CVC removal

Assess for chemical occlusion

Treatment:
- Acidic Drug (pH < 6) – vancomycin, piperacillin
  - L-cysteine
- Basic Drug (pH > 7) – phytosteryl, ganciclovir, ampicillin
  - NA bicarb
- Lipid
  - Ethanol 70%
  - Dwell 60 minutes

Patency Restored?

Yes

Resume Use of CVC

Yes

No
References