

LOS ANGELES GENERAL MEDICAL CENTER

DEPARTMENT OF NURSING SERVICES

**CENTRAL VENOUS CATHETER & MIDLINE PERIPHERAL VENOUS CATHETER:
CARE, MAINTENANCE, AND TROUBLESHOOTING PROCEDURE**

PURPOSE: To outline nursing methodology in care, maintenance, troubleshooting of central venous catheters (CVC) and midline peripheral venous catheters.

SUPPORTIVE DATA:

CVCs are placed for long-term or short-term purposes. Patients may go home with long-term catheters, which include Peripherally Inserted Central Catheters (PICCs), midline peripheral venous catheters, implanted ports, tunneled catheters, and tunneled (permacath) dialysis catheters. Short-term CVCs, which include triple lumen, pulmonary artery, non-tunneled (vascath) dialysis, and introducer catheters (Cordis), may only be used in the inpatient setting.

CVC catheters can be further classified according to the presence of control valves. The valve differentiates the care and maintenance of these catheters.

- With valves:
The valve opens during infusion/injection and closes off when not in use. Valves may be located at various locations in the catheter (e.g., tip versus next to lumen bifurcation). These catheters do not have external clamps. The valves prevent blood backflow; therefore, only normal saline (NS) is required for flushing.
- Without valves:
These catheters have external clamps (except cordis and PA infusion ports) that need to be unclamped during infusion/injection and must always be clamped when not in use. These clamps do not eliminate backflow, and therefore, heparin is required for flushing.

Consult Central Venous Catheter (CVC) & Midline Peripheral Catheter Standard prior to performing this procedure.

Removal of all CVCs and midline peripheral venous catheters requires a provider's order. They are removed by Physicians, Physician's Assistants and Nurse Practitioners (as approved) and as follows:

Type of Catheter	Who May Remove
Short-term CVCs in adults (except for hemodialysis catheters)	ICU Registered Nurses whose competency has been validated annually. Consult Central Venous Catheter (Short term) Removal Procedure-ICU
PICCs	PICC certified nurses
Midline Peripheral Venous Catheters	PICC certified nurses and home health nurses

- Pediatrics: Nurses may not remove any CVC.
- All introducer catheters (Cordis) must be removed prior to patient transfer to general medical/surgical wards.
- **Only dialysis nurses may access and change ports, reflux valves, and remove, dialysis catheters**
- **Staff nurses may:**
 - **Apply/ change the red alcohol protector cap on dialysis hubs**
 - **Access the pigtail port of triple lumen dialysis catheters**
 - **Change the dressing when soiled, non-occlusive or when it is time to be changed**

- **Only nurses who have been trained may access implantable ports.** Consult Implantable Port: Accessing and Removing Needle and Care Procedure.

EQUIPMENT LIST:

For Cleaning Injection Hub

- Chlorhexidine applicator (1 per hub)
- Non-sterile gloves

- Lab labels
- Non-sterile Gloves

For Flushing - use above list and add the following:

- 10 mL syringe prefilled with NS or heparin, as appropriate

- Sterile gauze
- Drape (optional)
- Blood Transfer Device
- Alcohol cap protector
- Reflux valve

For Changing Reflux Valve

- Positive Pressure Reflux Valve (Reflux Valve) (1 per hub)
- Chlorhexidine applicator (1 per hub)
- 4x4 gauze (1 per hub)
- Non-sterile gloves (1 pair)
- Alcohol cap protector (1 per hub)
- 10 mL syringe prefilled with NS or heparin, as appropriate

For Dressing Change

- Central line dressing kit
- Statlock® (PICCs & Midlines only)



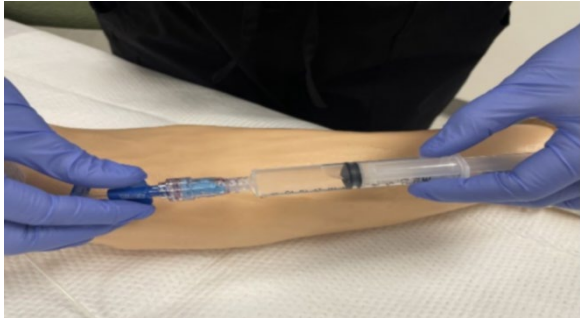
For Blood Withdrawal


- Chlorhexidine applicator (1)
 Or if allergic to chlorhexidine:
- Povidone-iodine swabs (3)
- 12 mL syringe (1-2)
- Syringe, appropriate size for blood sample
- Blood specimen tubes

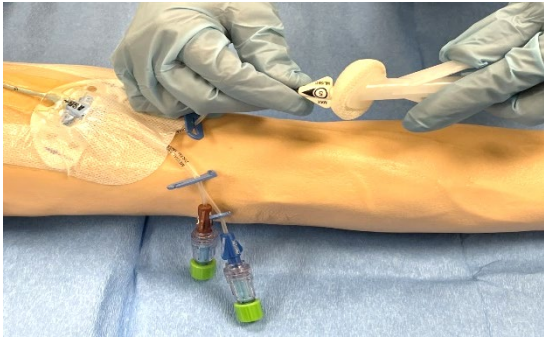

For Removing Short-Term Catheters

- Suture removal kit
- 4x4 gauze (2 packs)
- Non-sterile gloves
- Chlorhexidine applicator
 Or if allergic to chlorhexidine:
- Povidone-iodine swabs (4)
- 2x2 gauze (1)
- Tape or transparent dressing (e.g. 3M Tegaderm™ CHG Chlorahexidine Gluconate I.V. Securement Dressing) (1)


<u>STEPS</u>	<u>KEY POINTS</u>
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> CLEANING INJECTION HUB </div>	
1. Wash hands and don non-sterile gloves	Injection port must be cleaned: <ul style="list-style-type: none"> • If found without alcohol protector cap • If alcohol protector cap has not been in place for a least 1 minute • Between consecutive medication administration
2. Activate the chlorhexidine applicator <ul style="list-style-type: none"> • Pinch wings to break ampule • Squeeze until sponge is saturated 	Chlorhexidine is bactericidal and therefore does not need to be applied in one direction

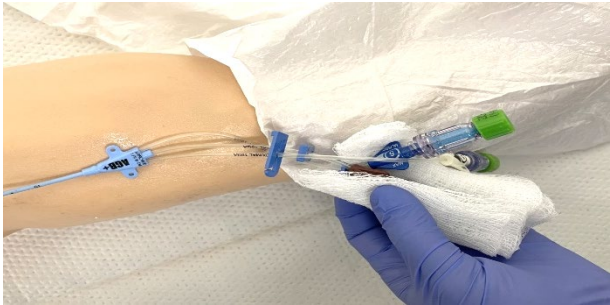
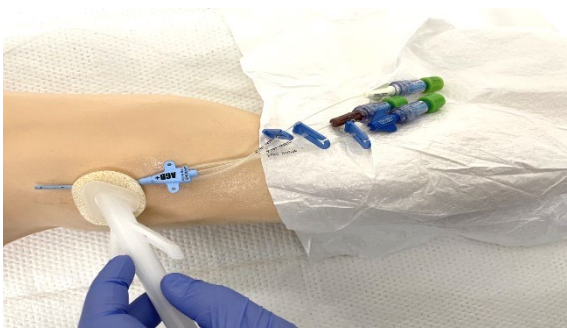

<u>STEPS</u>	<u>KEY POINTS</u>
	
<p>3. Scrub hub and sides of hub using chlorhexidine applicator for 15-30 seconds. Allow to air dry for 15 seconds</p> 	<p>Do not touch the sponge.</p>
<p>4. Repeat steps 2 and 3 for other hubs</p>	<p>Use a new chlorhexidine applicator for each hub</p>
<div style="border: 1px solid black; padding: 5px; display: inline-block;">CATHETER FLUSH</div>	
<p>5. Wash hands and don non-sterile gloves</p>	
<p>6. Remove alcohol protector cap or perform steps 2-3 if alcohol protector cap not present</p>	<p>If application of alcohol cap is less than 1 minute, length of time the cap has been on is questionable, or has visible debris, perform steps 2-3</p>
<p>7. Attach 10 mL syringe prefilled with NS or heparin, as appropriate, per standard, to injection port</p> <ul style="list-style-type: none"> • Unclamp catheter as appropriate 	

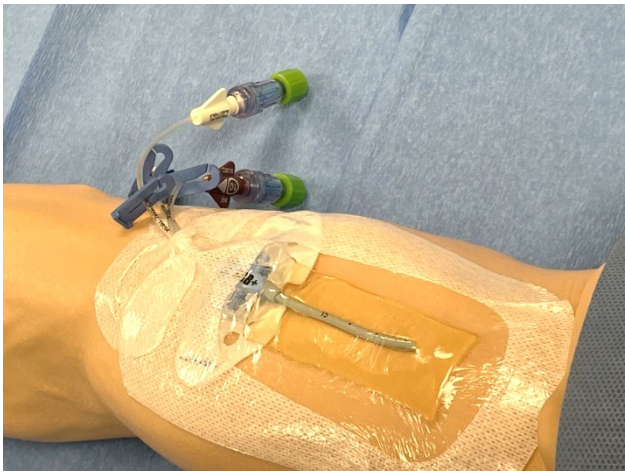
<u>STEPS</u>	<u>KEY POINTS</u>
8. Slowly pull to aspirate about 1 to 2 ml of blood into the syringe to check for blood return	The blood return should look like whole blood with the same color and consistency. There are no requirements on aspirating a specific amount before use of the catheter
9. Keeping the syringe attached to the catheter hub, flush gently using positive pressure <ul style="list-style-type: none"> • With the reflux valve, use the “push-stop” method <ul style="list-style-type: none"> ◊ Gently flush solution in 0.5-1 mL increments until complete. Disconnect the syringe while pushing last of flush solution • See troubleshooting section if resistance is met 	
10. Re-clamp catheter as appropriate	
<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;"> <p>POSITIVE PRESSURE REFLUX VALVE CHANGE</p> </div>	
11. Open chlorhexidine	
12. Wash hands and don non-sterile gloves	
13. Prime reflux valve with 10 mL syringe prefilled with NS, holding valve upright	
14. Lift catheter and hold catheter downwards	
15. Remove old reflux valve <ul style="list-style-type: none"> • Ensure catheter is clamped before removing valve, if external clamps are present 	

<u>STEPS</u>	<u>KEY POINTS</u>
<p>16. Clean hub opening and sides of lumen of catheter vigorously, for 15 – 30 seconds with one chlorhexidine applicator.</p> 	<p>Use new chlorhexidine applicator for each hub</p>
<p>17. Inspect hub for debris</p>	<p>If debris is visualized, additional cleaning is needed</p>
<p>18. Allow to dry for 15 seconds</p>	
<p>19. Replace with new sterile reflux valve</p>	
<p>20. Apply new alcohol cap protector.</p> 	
<p>BLOOD WITHDRAWAL</p>	
<p>21. Wash hands and don non-sterile gloves</p>	<p>PICC and Midline: Consult CVC & Midline Peripheral Venous Catheter Standard for which catheter size to use or not to use for blood withdrawal Small- sized PICCs (e.g., ones that may be used for pediatrics, neonates) are not ideal for blood withdrawal because of hemolysis</p> <p>Pediatrics may use a 3 – way stopcock for blood withdrawal and re-infusion to minimize risk of contamination</p>
<p>22. Remove alcohol protector cap or perform steps 2-3 if alcohol protector cap not present</p>	<p>If application time of alcohol cap is less than 1 minute, length of time cap has been on is questionable, or visible debris is present, perform steps 2-3</p>


<u>STEPS</u>	<u>KEY POINTS</u>
23. Slowly aspirate to check for blood return	
24. Flush catheter with 10 mL syringe prefilled with NS using push stop method	Flush before drawing blood is not required for short term catheters
25. Attach appropriate syringe to catheter hub/ reflux valve. Aspirate blood discard per standard	
26. Remove syringe filled with blood for discard	<p>If not contraindicated, perform any of the following to facilitate aspiration of blood:</p> <ul style="list-style-type: none"> • Reposition patient (sit up, lay flat or slightly rotate body) • Instruct patient to take deep breaths • Encourage to cough • Raise arms above head • Using 10 mL syringe prefilled with NS, expel 5 mL NS, flush catheter with 2 mL using push stop method, then pull back 4-6 mL of blood discard • Close clamps (if present) then remove reflux valve following steps Positive Pressure Valve Change section of this procedure <p>If unsuccessful after performing the above, consult with the PICC team or primary provider</p>
27. Attach appropriate syringe and slowly aspirate required amount	
28. Clamp catheter if clamp is present	
29. Transfer blood to appropriate blood specimen tubes using Blood Transfer Device	
30. Scrub valve hub and sides of valve with one chlorhexidine applicator for 15-30 seconds <ul style="list-style-type: none"> • Allow to dry for 15 seconds 	
31. Flush catheter as CVC & Midline Peripheral Catheter Standard Part II	
32. Replace with new reflux valve and alcohol protector cap	
I.V. INFUSION/TRANSFUSION	
33. Wash hands and don non-sterile gloves	
34. Prepare IV infusion equipment	<p>PICC: Refer to CVC & Midline Peripheral Catheter Clinical Standard for infusion/transfusion limitations due to catheter size.</p> <p>For new lines, use new IV tubing(s).</p>

<u>STEPS</u>	<u>KEY POINTS</u>
35. Remove alcohol protector cap or perform steps 2-3 if alcohol protector cap not present	If application time of alcohol cap is less than 1 minute, length of time cap has been on is questionable, or visible debris is present, perform steps 2-3
36. Flush per CVC & Midline Peripheral Venous Catheter Nursing Clinical Standard Part II	
37. Slowly aspirate to check for blood return	
38. Attach IV tubing to the reflux valve/ implantable port <ul style="list-style-type: none"> • Open clamp as appropriate 	
39. Begin IV infusion <ul style="list-style-type: none"> • If resistance is met, refer to Troubleshooting section of this procedure 	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">DRESSING</div>	
40. Wash hands	
41. Open outer wrap of dressing kit	
42. Put on mask	
43. Don first pair of gloves	
44. Remove and discard old dressing and Statlock™ (if present) <ul style="list-style-type: none"> • Assess site for evidence of infection or leaking • If PICC, note number of centimeters exposed 	<p>DO NOT USE SCISSORS to remove dressing</p> <ul style="list-style-type: none"> • Peel back dressing towards catheter insertion site • As needed, use alcohol swab or sterile saline to facilitate removal of CHG gel pad <p>Refer to PICC Central Line Insertion Procedure (CLIP) note or X-ray for correct placement (length of catheter) If displaced 2 cm in either direction according to most recent CLIP note, call provider to obtain X-ray to confirm placement. Do not use until there is a communication order stating it is ok to use</p> <p>If concerned about accidental dislodgement (e.g. due to patient is uncooperative) secure catheter at lumen bifurcation with tape or obtain assistance from second nurse</p>
	
45. Remove and discard dirty gloves	
46. Perform hand hygiene (wash/or gel)	
47. Open inner wrap of dressing kit	

<u>STEPS</u>	<u>KEY POINTS</u>
<p>48. Don sterile gloves</p>	<p>May obtain and use properly sized sterile gloves from stock (rather than gloves in kit)</p>
<p>Pick up 4x4 gauze in the middle with non-dominant and and place it on top of the catheter hub</p> <ul style="list-style-type: none"> • Lift the catheter 	<p>The gauze will be used to lift catheter when cleaning skin surface under the catheter</p>
<p>49. Take sterile disposable drape with dominant hand and place it under the catheter</p> 	<p>The gauze is used to lift the catheter while placing the drape The drape must be under two thirds of the length of the catheter starting at insertion site</p>
<p>50. Activate the chlorhexidine applicator.</p> <ul style="list-style-type: none"> • Pinch wings to break ampule • Squeeze until sponge is saturated 	<p>Do not touch the sponge</p>
<p>51. Clean catheter site using chlorhexidine applicator.</p> <ul style="list-style-type: none"> • Use vigorous back-and-forth strokes with sponge for 30 seconds • Completely wet area with antiseptic • Allow to air dry for 30 seconds 	<p>Be careful not to dislodge catheter with scrubbing. If the skin is not allowed to dry it may become irritated/excoriated. Chlorhexidine must dry completely, to have antimicrobial effects</p>
<p>52. Clean exposed length of catheter (starting with insertion site) and “wings” of catheter with chlorhexidine applicator and allow to air dry for 30 seconds</p>  <p>If the patient has hypersensitivity to chlorhexidine: Clean the site with 3 povidone-iodine swabs</p> <ul style="list-style-type: none"> • Use circular motion. Begin in the center and move outward • Allow the area to air dry for 1 minute then 	<p>If the catheter is a PICC or midline, ensure “wings” of catheter is also cleaned</p>  <div data-bbox="1219 1566 1382 1625" style="border: 1px solid black; padding: 2px; display: inline-block;">Wings</div>

<u>STEPS</u>	<u>KEY POINTS</u>
<ul style="list-style-type: none"> Clean the exposed length of catheter (starting with insertion and including the catheter “wings” with an additional povidone-iodine swab <p>Allow the area to dry for 1 minute</p>	
<p>53. Apply Statlock™ to PICC lines and midlines</p>	
<p>54. Apply sterile occlusive dressing covering insertion site and Statlock™</p> <p>Dressing may be:</p> <ul style="list-style-type: none"> Transparent e.g., 3M Tegaderm™ CHG Chlorhexidine Gluconate I.V. Securement Dressing™ <ul style="list-style-type: none"> 4" x 6-1/8" (10 cm x 15.5 cm) 2-3/4 "x 3-3/8" (7cm x 8,5cm) 3-1/2"x 4-1/2"(8.5 cm x 11.4 cm) Gauze dressing 	<p>Consult Central Venous Catheter & Midline Peripheral Venous Catheter Standard for frequency of dressing change.</p> <p>Do not allow exposed catheter to touch insertion site. Avoiding catheter touching insertion site helps to prevent risk of infection.</p> <p>The insertion site and Statlock™ should be treated as one unit dressing and should <i>occlusively</i> cover the whole unit.</p> <ul style="list-style-type: none"> Be careful not to stretch the dressing during application Cover the insertion site with gel pad Apply firm pressure to entire dressing to enhance adhesion <p>Use gauze dressing for patients who are:</p> <ul style="list-style-type: none"> Hypersensitive to transparent dressing In situations that require frequent dressing changes (e.g., oozing blood, diaphoresis). <p>Use paper tape for patients with tape allergies</p> <p>Complete gauze dressings are changed every 48 hours and as needed.</p> <p>Transparent dressings are changed every 7 days and as needed.</p>
<p>55. Securely tape catheter</p>	<p>Securing the catheter helps to avoid accidental dislodgment of the catheter</p>
<p>56. Write initial, date, and time on dressing</p>	<p>Congruent to documenting on the chart; this makes the last dressing date/time readily visible</p>
<p>CARE OF THE TUNNELED CATHETER SITE(POST-INSERTION)</p>	

<u>STEPS</u>	<u>KEY POINTS</u>
57. Don non-sterile gloves	
58. Clean surgical insertion site for 30 seconds with a chlorhexidine applicator by using vigorous back-and-forth strokes with sponge. Completely wet area with antiseptic	Clean insertion site each day for 3 days post insertion
59. Allow area to air dry for 30 seconds	
60. Apply a band-aid or a gauze dressing	No dressing is usually required after the third day
TROUBLESHOOTING	
MECHANICAL PHLEBITIS (PICC and MIDLINE)	
61. Assess arm for any of the following S/Sx: <ul style="list-style-type: none"> • Tenderness/pain • Redness/warmth • Induration/swelling 	Inflammation of the vein is caused by the body’s response to a foreign material (PICC) and usually occurs within the first week post insertion. This may not be an infectious process.
62. Notify provider	
63. Apply warm compress 3 - 4 times a day for 20 minutes as ordered	
64. Elevate arm when patient is in bed or chair	
BLOOD BACKFLOW	
65. Assess for presence of blood in tubing	Blood backflow may occur for a variety of reasons, e.g., physical activities (coughing, Valsalva maneuver) disconnection within the IV system
66. Flush per CVC & Midline Peripheral Venous Catheter Standard	
DIFFICULTY IRRIGATING CATHETER	

<u>STEPS</u>	<u>KEY POINTS</u>
67. Assess the following: <ul style="list-style-type: none"> • Resistance to flushing • Blood clot in hub/tubing 	
68. Attach 10 mL syringe prefilled with NS and attempt to aspirate and then flush. If clot is removed, flush with new 10 mL syringe prefilled with NS <ul style="list-style-type: none"> • If unsuccessful or there is any resistance, DO NOT force flush 	
69. Clamp catheter if unable to clear and label as clotted catheter	
70. Notify primary provider (or notify PICC team for declogging of PICC lines and midlines)	
<div style="border: 1px solid black; padding: 5px; display: inline-block;">LEAKAGE</div>	
71. Assess for leakage <ul style="list-style-type: none"> • Exposed portion - assess: <ul style="list-style-type: none"> ◇ Reflux valve ◇ Catheter hub ◇ Tubing • Indwelling portion - assess for: <ul style="list-style-type: none"> ◇ Pain ◇ Erythema ◇ Redness ◇ Swelling 	Change if gel pad has absorbed drainage that obscures the insertion site 
72. Stop infusion and transfer medication infusions to alternate IV line	
73. Cover area with sterile dressing <ul style="list-style-type: none"> ◇ If infusion is a vesicant, follow Extravasation Management by Chemotherapy Certified Registered Nurses Standardized Procedure (Chemotherapy certified nurses only) or call provider 	
74. Notify provider/PICC team for ruptured catheters	
<div style="border: 1px solid black; padding: 5px; display: inline-block;">SYSTEMIC INFECTION</div>	

<u>STEPS</u>	<u>KEY POINTS</u>
75. Assess for any S/Sx of systemic infection such as fever, chills, and assess vital sign changes	
76. Notify provider	
SITE INFECTION	
77. Assess catheter site for the following S/Sx (especially when changing dressing): <ul style="list-style-type: none"> • Redness and warmth • Purulent discharge • Foul odor • Swelling • Pain 	
78. Notify provider	
CATHETER MIGRATION	
79. Assess for the following: <ul style="list-style-type: none"> • Any complaint of palpitations or chest pain • Length of PICC or midline catheter from insertion site to the hub (in centimeters exposed) • Patient report of gurgling sound in the jugular area, upon flushing • Headache • Swelling and pain in the neck • Dyspnea • Dysphagia and/or painful swallowing • Loss of consciousness 	Patient may present with dysrhythmia if migrated catheter irritates the heart
80. Notify provider and PICC team STAT	
81. Repeat chest x-ray, as ordered, to verify catheter placement	
PAIN DURING INFUSION (PICC & MIDLINE)	
82. Assess for pain at insertion site when administering medications or flushing catheter	May indicate internal leak
83. Notify provider and PICC team	
EXCESSIVE BLEEDING	
84. Assess for continuous oozing of blood, saturated dressing, and abnormal lab values (PT/PTT, platelet count, hemoglobin, and hematocrit)	A small amount of bleeding is expected during the first 24 hours post- insertion

<u>STEPS</u>	<u>KEY POINTS</u>
85. Apply pressure.	
86. Notify PICC team (if PICC or midline) and provider <ul style="list-style-type: none"> • Notify dialysis nurse for dialysis catheters 	
THROMBOPHLEBITIS	Thrombophlebitis can occur in the subclavian vein and is confirmed by diagnostic intervention, e.g., venogram, ultrasound
87. Assess for the following S/Sx: <ul style="list-style-type: none"> • Edema of affected arm, shoulder, neck, or face • Distended neck veins • Pain at site or along catheter tunnel 	
88. Notify provider STAT	
89. Prepare patient for diagnostic intervention as ordered	
90. Administer anticoagulant as ordered	Provider may elect to remove catheter
AIR EMBOLISM	Air embolism occurs when air enters the circulatory system and travels to the brain and/or heart, which, may be fatal. Positive pressure reflux valve must be placed on all ports to minimize the risk of air embolism
91. Assess for the following S/Sx: <ul style="list-style-type: none"> • Unresponsiveness • Chest pain, tachycardia • Hypotension • Lightheadedness, confusion • Pallor • Dyspnea, tachypnea 	
92. Assess all ports <ul style="list-style-type: none"> • Cover all open ports with reflux valve/ positive pressure port 	
93. Turn the patient on left side in Trendelenburg position	
94. Notify provider STAT	
95. Administer oxygen per provider order	
96. Monitor vital signs Q 5 minutes until provider arrives	

Resources:

- [3M Tegaderm™ CHG Chlorhexidine Gluconate Gel Pad Package Insert-English \(Microsoft Word - 34872163505_GB.docx \(3m.com\)\)](#) Central Venous Access Catheter Blood Sampling. Lippincott Procedures. August 18, 2022 ([Lippincott Procedures - Central venous access catheter blood sampling \(lww.com\)](#))

Initial date approved: 02/94	Reviewed and approved by: Professional Practice Committee Pharmacy & Therapeutics Committee Nurse Executive Council Attending Staff Association Executive Committee	Revision Date: 04/94, 03/95, 06/95, 06/00, 12/01, 03/05, 10/05, 9/12, 8/17, 12/18, 2/20, 5/23
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