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KINGSTON GENERAL HOSPITAL

CENTRAL VENOUS LINES: REMOVAL

LEARNING GUIDE
FOR
REGISTERED NURSES

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This learning guide has been developed
by
Kingston General Hospital Nursing Staff

3nd Edition

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Note: This learning guide contains information current at the time of distribution. Policies and procedures are frequently updated and revised. Please refer to related policies and procedures in the Nursing Policy and Procedure Manual in your clinical area for ongoing current information.

INTRODUCTION

A central line refers to:

1. a central venous catheter that is inserted centrally through the subclavian, internal jugular or femoral vein, or peripherally through the brachial or cephalic vein (peripherally inserted central catheter: PICC). The distal end of the catheter is positioned in the superior or inferior vena cava and on rare occasions, the distal tip of the PICC line is positioned in the right atrium.

2. a venous introducer sheath. The sheath may be needed for the introduction of, for example, a pulmonary artery catheter or a temporary transvenous pacer wire. A venous sheath may also be left in place to provide central venous access in the absence of a pulmonary artery catheter or temporary transvenous pacer wire.

The removal of a central line is designated as an added nursing skill for Registered Nurses in specific clinical areas at Kingston General Hospital as identified in Nursing Policy C-1820. The Registered Nurse authorized to practise this skill must have successfully completed the instructional program, including successful demonstration of the skill to the Manager or delegate and achievement of at least 80% on a written examination.

Central venous catheters and sheaths that can be removed include:

- internal jugular;
- external jugular;
- subclavian;
- femoral; and
- brachial/cephalic (PICC).

(The removal of **arterial** catheters and sheaths is addressed elsewhere.)

Note: Temporary dialysis catheters are only to be removed by authorized Registered Nurses identified in Nursing Policy C-1820.

The removal of a central line may be carried out when the following criteria have been met:

- a physician's order is written; and
- medical assistance is immediately available.

Note: Registered Nurses may **not** remove a pulmonary artery catheter or temporary transvenous pacemaker. However, authorized Registered Nurses may remove the venous introducer sheath left in place after their removal.

EXCEPTION: RNs working in the device implant lab may remove temporary transvenous pacemaker wires when patient has an implanted device capable of pacing, is under fluoroscopy, and there is direct supervision by implanting physician.

1.1 Performance Criteria

1. State the criteria to be met prior to the removal of a central line.
2. Name four types of common sites/types of catheters for a central line insertion.
3. Collect the necessary equipment for removal of a central line.
4. Describe the actions to be taken for removal of a central line.
5. State six potential complications of central line removal.
6. Demonstrate removal of a central line according to the policy and procedure.
7. Document the removal of a central line.

2.0 REVIEW OF CENTRAL LINES

2.1 Access Sites for Central Lines

Figure 1: Subclavian and Jugular Access Sites for Central Lines
(Adapted from Cook. [1986]. Critical Care.)

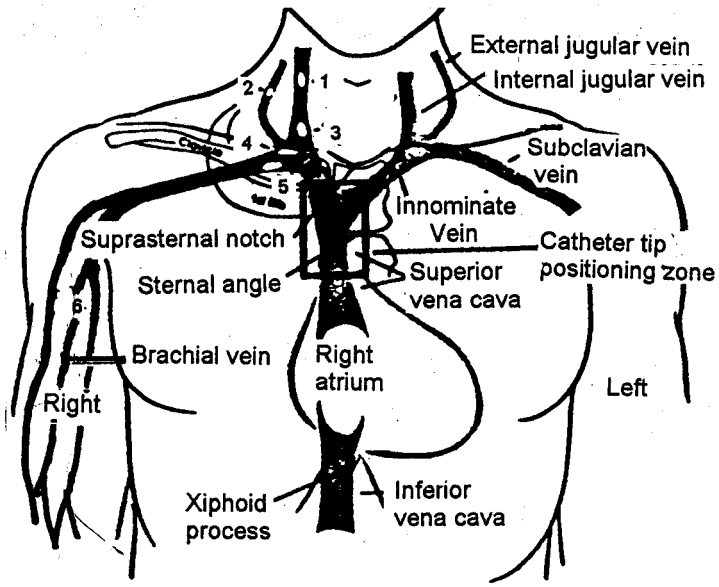


Figure 2: Femoral Vein Access Site
The femoral vein is the site of access. The femoral artery is included in the diagram as an adjacent structure.
(Adapted from American Heart Association. 1987.)

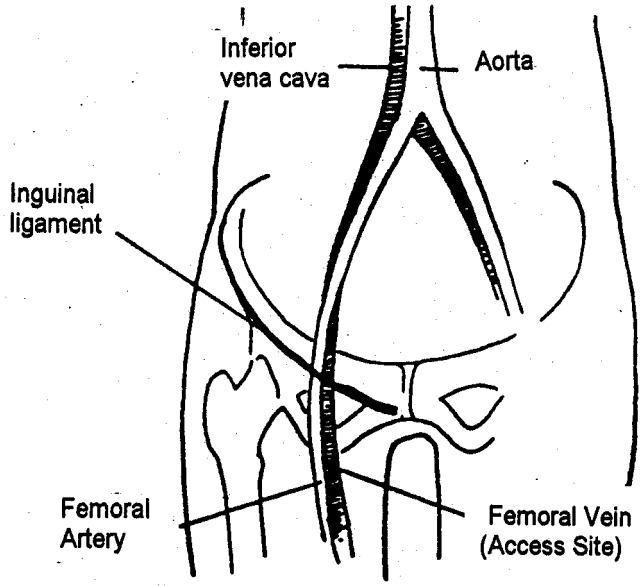
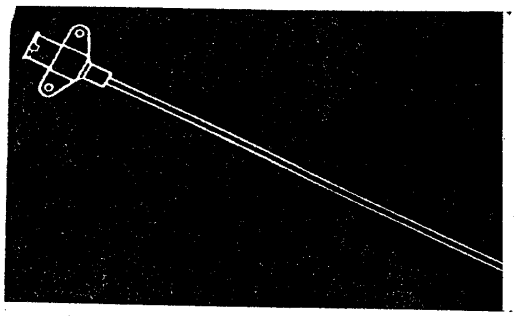
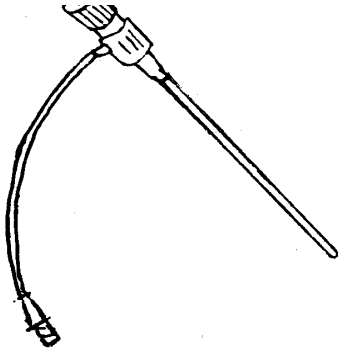


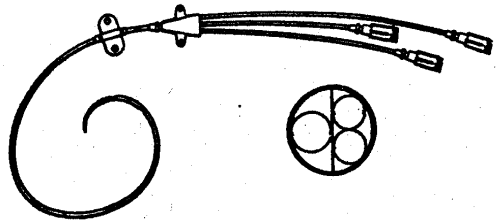
Figure 3: Catheters and Sheaths Used for Central Lines



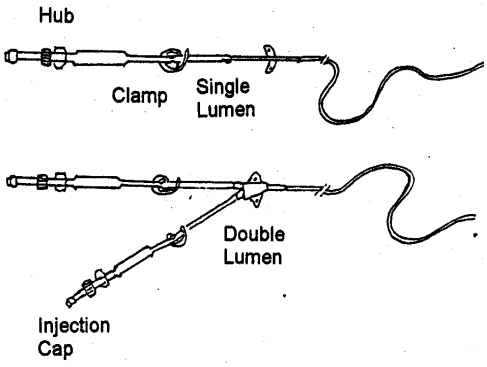
A. Single Lumen Catheter



B. Introducer Sheath

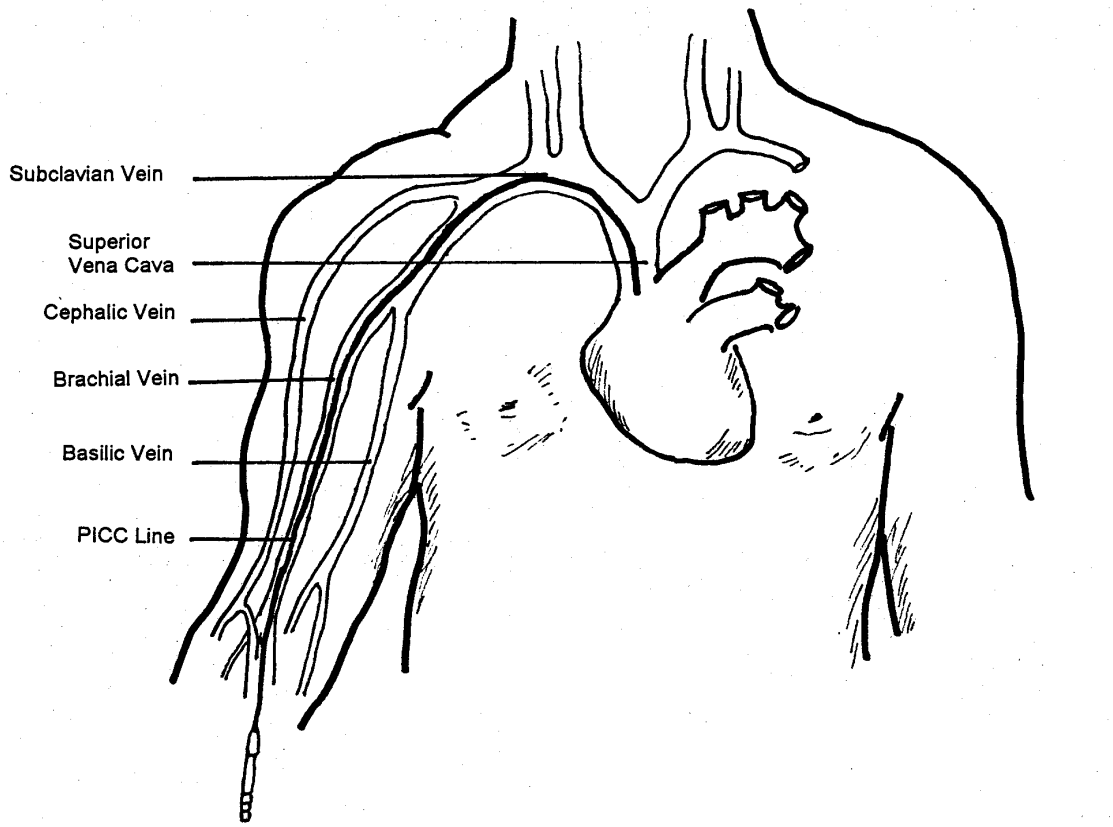


C. Multilumen Central Venous Catheter



D. Peripherally Inserted Central Catheter (PICC)

Figure 4: Peripherally Inserted Central Catheter (PICC) in Place



2.2 Catheters for Central Lines

2.2.1 Jugular or Subclavian Site

- Angiocath: occasionally used for external jugular site;
- Single lumen catheters;
- Multilumen catheters: double or triple lumen;
- Introducer sheath: necessary for pulmonary artery catheter and temporary transvenous pacer wire insertion.

2.2.2 Femoral Site

- Angiocath 12, 14 or 16 gauge; 3 - 5¼" in length;
- Introducer sheath: necessary for pulmonary artery catheter, temporary transvenous pacer wire insertion.

2.2.3 Brachial/cephalic Site

- PICC lines

2.2.4 Umbilical Venous Site (Neonates)

3.0 REMOVAL OF CENTRAL LINES

Equipment Required

Sterile Scissors
Mask (if patient immunocompromised or in NICU)
Sterile Gloves
Chlorhexidine 2% aqueous solution (use povidone iodine for renal lines and chlorhexidine 2% alcohol free in the NICU)
Occlusive Dressing
Sterile Dressing Tray
Optional: When sending tip for C&S:
Sterile Specimen Cup
Addressographed Label
Microbiology Requisition

Note: Povidone iodine is to be used on **renal** lines. The alcohol content of chlorhexidine 2% is thought to deteriorate these lines, especially as they are in place for long periods of time

.

3.1 Nursing Actions

1. Wash hands.

2. Place patient in a supine position.
   2.1 Turn patient's face away from the site, as appropriate.

3. Close the flow clamp on the I.V. tubing, if applicable.

4. Remove dressing.
   4.1 Do not exert tension on the catheter.
   4.2 Observe exit site for signs of infection.
   4.3 Collect swab for culture if discharge present.
   4.4 Note complaints of tenderness from the patient.

5. Wash hands.

6. Prepare dressing tray.

7. Wash hands.

8. Glove.

9. Using sterile gauze, cleanse catheter exit site with chlorhexidine 2% aqueous solution (use povidone iodine on renal lines and chlorhexidine 2% alcohol free in NICU) and allow to dry (at least 30 seconds).

10. Remove suture, if applicable.

11. Apply sterile gauze with gentle pressure over the insertion site. * For PICCS, no pressure should be applied directly to the insertion site.
    11.1 Then grasp catheter by the hub and slowly withdraw the catheter while having the patient perform a Valsalva maneuver or exhale slowly.
        11.1.1 In NICU, remove the catheter 2 - 4 cm with each pull.
    11.2 Do not use force.
    11.3 If the patient is mechanically ventilated, withdraw the catheter on expiration.
    11.4 For PICCs: withdraw onto sterile field in case resistance requires re-dressing site; remove slowly, smoothly and intermittently

12. Apply manual pressure directly over the site with sterile gauze for a minimum of 5 minutes or until the bleeding stops.

12.1 Observe site for bleeding and hematoma.

13. Observe catheter for:
13.1 rough edges;
13.2 contamination; and
13.3 length.
NOTE: If catheter is ragged or damaged, notify the physician immediately. Retain catheter and measure its length.

14. Cover exit site with sterile gauze and an occlusive dressing.
14.1 PICC dressings should remain in place for 24 hours or until epithelialisation has occurred.

15. Wash hands.

16. If ordered, send the tip of catheter to the Microbiology Laboratory with requisition for culture and sensitivity.
16.1 Use sterile scissors to cut off at least three (3) cm of the tip;
16.2 Place tip in a sterile container and seal; and

16.3 Send the specimen immediately to the Microbiology Laboratory.
NOTE: Blood cultures are required (as ordered) when tips are sent for culture and sensitivity (see Nursing Procedure B-4581 Blood Cultures).

17. If the catheter site appears infected:
1.1 swab any discharge prior to cleansing obtain order and send for culture and sensitivity; and
1.2 As needed, notify the physician for orders regarding necessity of antimicrobial ointment.
For PICCs, notify physician if ongoing resistance encountered after interventions.

3.2 Reporting and Recording:

1. Document on the Progress Notes, Renal Unit Treatment Log, or NICU Record:
1.3 date and time of removal;
1.4 reason for removal;
1.5 condition of catheter exit site;
1.6 condition of catheter; and
1.7 collection of catheter tip specimen for culture, if ordered.

Reference Policies and Procedure

Nursing Policy C-1800	Central Line Infusions
Nursing Policy C-1820	Central Line Removal: Added Nursing Skill for Registered Nurses
Nursing Procedure C-1821	Central Line Removal: Added Nursing Skill for the Registered Nurses

Nursing Procedure B-4581 Blood Cultures

3.3 Potential Complications

Potential Complication	Nursing Interventions
1. Air Emboli If the patient inspires at the time the catheter is removed, intrathoracic pressure will decrease compared to atmospheric pressure and may result in air traveling into the venous system. After catheter removal, air can potentially travel down the remaining catheter tract if an occlusive dressing is not applied.	• Before removing the catheter, place the patient in a supine position, with face turned away from the site. Some physicians may place the patient in the Trendelenburg position. • Increase the patient's intrathoracic pressure at the time the cannula is removed by having the patient perform a Valsalva maneuver, i.e., by bearing down or by exhaling through mouth. Humming works well if the patient is awake and responsive or ask the patient to hold his/her breath. (Pull the catheter on expiration with the patient who is mechanically ventilated.) • On removal of cannula, cover with an occlusive dressing. A gauze dressing (4x4) is only occlusive when completely covered by tape. • In case of an air embolus: - Turn the patient to left lateral Trendelenburg position. - Administer oxygen. - Call the physician STAT.
2. Clot Emboli A blood clot may be dislodged from the catheter on removal and travel into the venous system.	• Remove the catheter as outlined in the Nursing Actions section, taking care not to use force. • Assess the patient for any signs or symptoms of emboli, such as complaints of chest pain or shortness of breath following central line removal.
3. Cannula Emboli The cannula may fracture at the skin site if too much pressure is applied during removal or accidental cutting of the cannula may occur when removing the suture.	• When removing the cannula, do not use force or apply finger pressure to the cannula. • Examine the cannula once it has been removed to ensure that it is intact. • Report any incidence of frayed or cut cannula immediately.
4. Bleeding and/or Hematoma at Site Bleeding and/or hematoma may occur if a coagulopathy is present or if inadequate pressure is applied to the exit site after the cannula is removed.	• If patient's PTT and platelet count have not been within normal range, or if the patient has been receiving anticoagulants, check with physician before removing central line. • Upon removal, apply steady pressure to exit site and check to ensure bleeding has stopped before applying dressing.

Potential Complication	Nursing Interventions
5. Bradycardia Pressure applied on the carotid artery may cause severe bradycardia.	• Position fingers away from carotid pulse when removing catheter. • Monitor patient during procedure for bradycardia. • Have atropine at bedside and notify physician if bradycardia occurs.
6. Infection Infection may occur at the insertion site. Localized infection could develop into septicemia.	• Use aseptic technique during catheter removal. Chlorhexidine 2% aqueous should be used to cleanse site prior to catheter removal. • Assess patient for signs and symptoms of local or systemic infection. • Notify physician. • If the site is reddened and/or discharge is noted, send a swab of the discharge and send the catheter tip for culture and sensitivity, as ordered. • When the tip is sent for C&S, two sets of blood cultures are sent as ordered - one anaerobic and one aerobic tube from a peripheral site plus one aerobic tube from the line itself. With a multilumen line, several aereobic samples may be sent.

4.0 REFERENCES

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5.0 AUTHORIZATION CHECKLIST: CENTRAL LINE REMOVAL

Name: _____ **Unit:** _____

Performance Criteria	Demonstration
1. States 3 criteria to be met prior to removal of central line.	
2. States 6 potential complications of central line removal.	
3. Confirms physician's written order.	
4. Verbally prepares patient for procedure. Places patient in supine position, face turned away from site, if appropriate	
5. Closes flow clamp on IV tubing.	
6. Removes dressing. Assesses site for signs of infection and/or complaints of tenderness from patient.	
7. Using aseptic technique, cleanses site and removes suture.	
8. Grasps catheter by hub and slowly withdraws while patient performs Valsalva maneuver (or on expiration for the patient who is mechanically ventilated or cannot follow directions).	
9. Applies manual pressure over site with sterile gauze until bleeding stops.	
10. Applies occlusive dressing.	
11. Assesses catheter for: • rough edges • discharge • length	
12. Documents: • Date and time of removal • Reason for removal • Dressing applied • Condition of catheter and exit site	
Signature of Observer: _____ Date: _____	

6.0 AUTHORIZATION TEST: CENTRAL LINES REMOVAL

Indicate your answers on the answer sheet following the test by circling the letter that best completes each of the following statements.

1. Registered Nurses can not remove

   a. internal jugular catheters
   b. pulmonary artery catheters
   c. femoral catheters
   d. all of the above

2. Common venous sites for central lines include

   a. internal jugular, subclavian, external jugular, anterior tibial
   b. subclavian, femoral, innominate, external jugular
   c. brachial, internal jugular, tibial, external jugular
   d. internal jugular, external jugular, subclavian, femoral

3. When removing the catheter

   a. quickly remove with a strong, firm pull
   b. slowly withdraw while patient performs the Valsalva maneuver
   c. slowly withdraw while the patient slowly inhales
   d. apply very strong manual pressure over the removal site

4. Following removal of a central venous catheter or sheath, apply manual pressure directly over the site for a minimum of

   a. one minute
   b. three minutes or less
   c. five minutes
   d. thirty minutes

5. Observe the removed catheter for all <u>except</u>

   a. patency
   b. rough edges
   c. contamination
   d. length

6. If the catheter appears infected do all of the following <u>except</u>

   a. swab discharge and send for culture and sensitivity as ordered
   b. send catheter tip for culture and sensitivity as ordered
   c. notify physician

d. leave the site open to air

7. Possible complications of central line removal include

    a. tachycardia
    b. air embolus
    c. tinnitus
    d. urticaria

8. To prevent air emboli when removing the catheter

    a. place the patient in a prone position prior to removal
    b. have the patient inhale through the mouth during removal
    c. cover the site with an occlusive dressing following removal
    d. administer oxygen prior to removal

9. The usual insertion site for a peripherally inserted central line (PICC) is the

    a. brachial/cephalic vein
    b. subclavian vein
    c. right atrium
    d. innominate vein

10. Common types of central lines include

    a. single lumen
    b. multiple lumen
    c. venous introducer sheath
    d. all of the above

Test Answer Sheet
Removal of Central Lines

Name: _____ **Date:** _____

1. a b c d
2. a b c d
3. a b c d
4. a b c d
5. a b c d
6. a b c d
7. a b c d
8. a b c d
9. a b c d
10. a b c d

7.0 EVALUATION OF LEARNING GUIDE

Your feedback and comments are most appreciated. Thank you for your time in responding to this questionnaire. It will help us in planning/revising learning materials.

Circle appropriate response	Strongly agree				Strongly disagree
1. The content was clear and easy to understand.	1	2	3	4	5
Comments:					
2. The content was relevant.	1	2	3	4	5
Comments:					
3. My learning needs were met.	1	2	3	4	5
Comments:					
4. This guide will help me to meet the knowledge/skill requirements to carry out the removal of central lines.	1	2	3	4	5
Comments:					

Additional comments/suggestions re education and/or learning guide:

Please return completed evaluation to your Clinical Instructor. Thank you.