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KINGSTON HEALTH SCIENCES CENTRE
Kingston General Hospital site

CENTRAL VENOUS LINES: REMOVAL

LEARNING GUIDE
FOR
REGISTERED NURSES

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This learning guide has been developed
Kingston Health Sciences Nursing Staff

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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 Clinical Policy and Procedure Manual in your clinical area for ongoing current information.

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1.0 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 Health Sciences Centre (KHSC) as identified in Nursing Policy C-1820. The Registered Nurse (RN) authorized to practice this skill must have successfully completed the instructional program, including successful demonstration of the skill to the Clinical Learning Specialist 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 care providers 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: RN's may **not** remove a pulmonary artery catheter or temporary transvenous pacemaker. However, authorized RN's 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.

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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.

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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.)

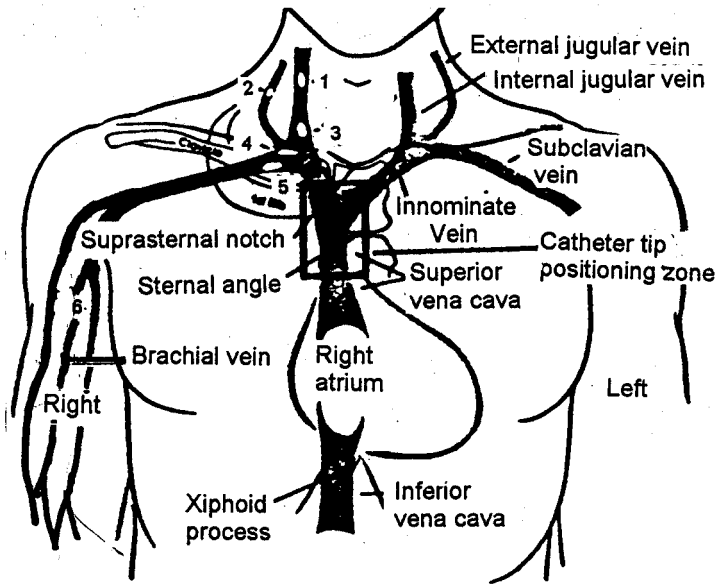

Figure 2: Femoral Vein Access Site
The femoral vein is the site of access. The femoral artery is included in the diagram as an adjacent structure.
(Adapted from American Heart Association. 1987.)

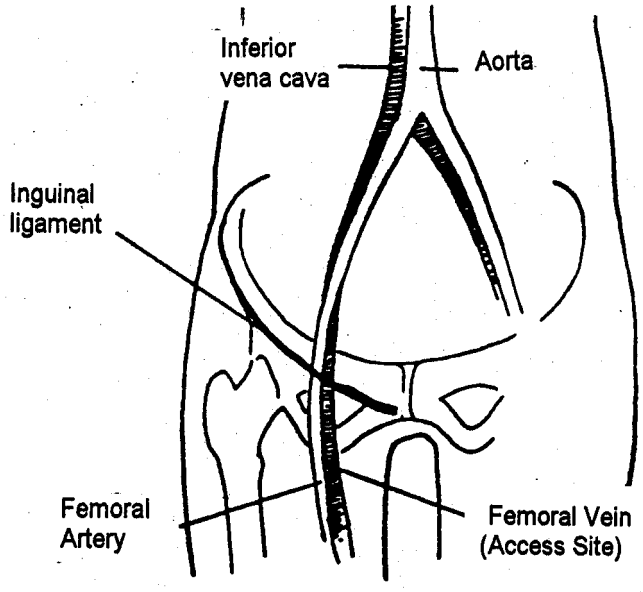

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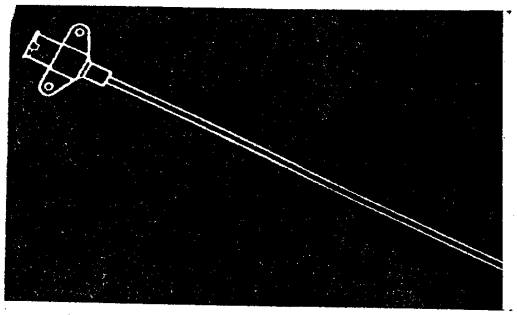
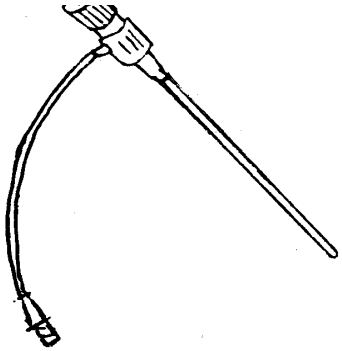
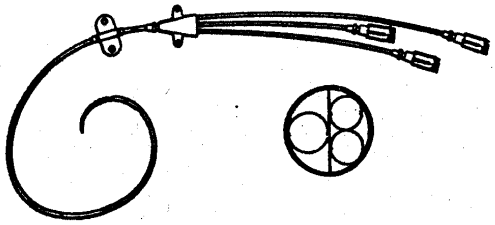
Figure 3: Catheters and Sheaths Used for Central Lines



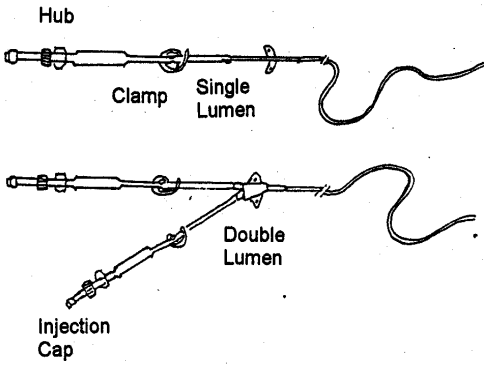
A. Single Lumen Catheter



B. Introducer Sheath



C. Multilumen Central Venous Catheter



D. Peripherally Inserted Central Catheter (PICC)

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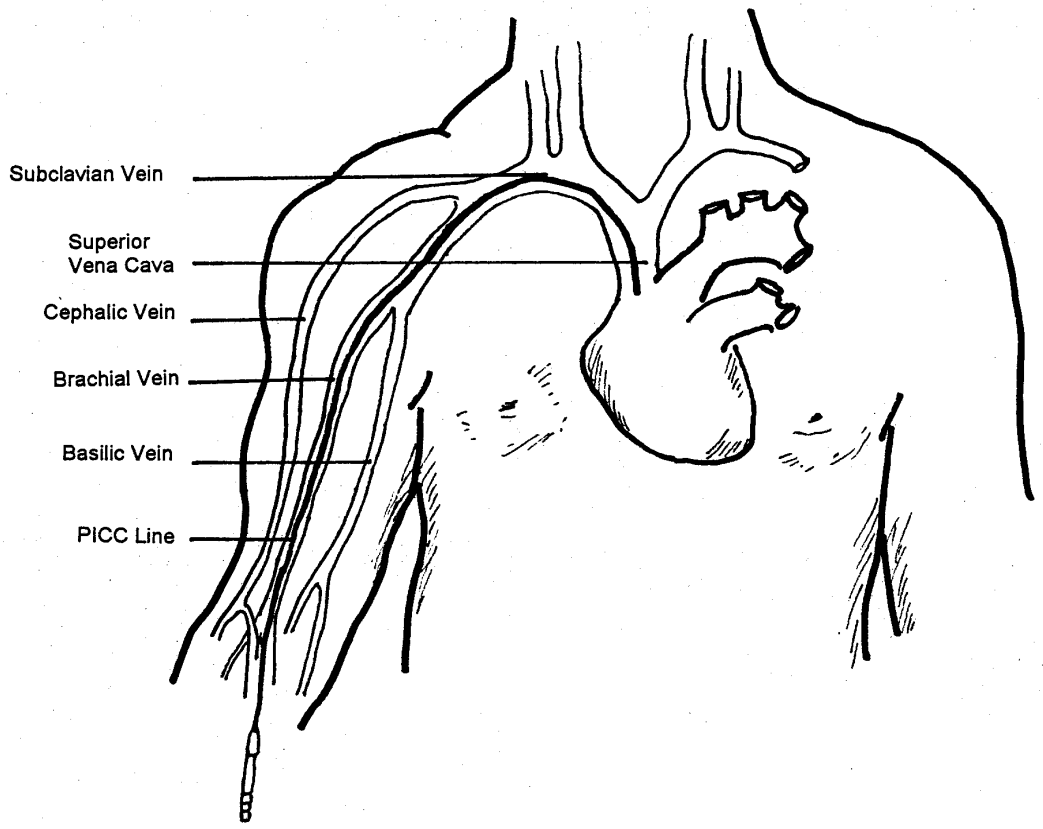
Figure 4: Peripherally Inserted Central Catheter (PICC) in Place



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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)

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3.0 REMOVAL OF CENTRAL LINES

Equipment Required

Sterile Scissors
Mask (if patient immunocompromised or in NICU)
Sterile Gloves
Chlorhexidine Gluconate (CHG) 2% with 70% Isopropyl Alcohol swabs or solution(use povidone iodine or CHG2% alcohol free 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

3.1 Nursing Actions

NOTE: Review coagulation status and report any abnormal findings before removing central line.

NOTE: It is recommended that a patient remain on bedrest for a minimum of 30 minutes post removal to decrease the risk of air embolism or bleeding that may occur due to changes in the central venous pressure.

1. Perform hand hygiene and don PPE.

2. Introduce self to patient and verify correct patient using two identifiers.
3. Explain procedure and ensure that the patient agrees to treatment...

4. Position patient to ensure the exit site is below the level of the heart
   4.1 Turn patient's face away from the site, as appropriate.

   NOTE: When removing Internal Jugular lines position patient in Trendelenburg if tolerated, otherwise the patient should be in a supine position to reduce the risk of developing an air emboli during removal.

   NOTE: For PICC Lines ensure the patients arm is positioned at a 45 – 90 degree angle to the body. An outstretched arm straightens the vein and facilitates ease of removal.

5. Close the flow clamp on the I.V. tubing, stop infusion and disconnect patient, if applicable.

6. Remove dressing.
   6.1 Do not exert tension on the catheter.
   6.2 Observe exit site for signs of infection.
   6.3 Collect swab for culture if discharge present.
   6.4 Note complaints of tenderness from the patient.

7. Remove gloves and perform hand hygiene.

8. Prepare dressing tray and occlusive dressing.

9. Perform hand hygiene and don sterile gloves

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10. Cleanse catheter exit site with CHG 2% with 70% Isopropyl Alcohol (use Alcohol free CHG 2% or povidone iodine on renal lines and CHG2% alcohol free in NICU) and allow drying (at least 30 seconds).

11. Remove suture(s), if applicable.

    NICU: Exercise caution when using scissors to avoid injury to the neonate and damage to the catheter.

12. Apply sterile occlusive dressing with gentle pressure over the insertion site.
    NOTE For PICCS, no pressure should be applied directly to the insertion site as this may induce venous spasm.
    Grasp catheter by the hub and slowly withdraw parallel to the skin using gentle even pressure while instructing the patient to perform a Valsalva manoeuvre.

    RATIONALE: Instructing the patient to bear down and hold breath (Valsalva) increases the intra thoracic pressure reducing the risk of air embolism.

    NOTE: The Valsalva maneuver may be contraindicated, as it can stimulate a vasovagal response, resulting in a decreased heart rate and blood pressure. The Valsalva maneuver may also be contraindicated in patients with increased intracranial pressure.

    12.1 Do not use force.
    12.2 If the patient is mechanically ventilated, withdraw the catheter on end expiration.
    12.3 For PICCs: withdraw onto sterile field in case resistance requires re-dressing site.

13. Apply manual pressure directly over the site with occlusive dressing for a minimum of 5 minutes or until the bleeding stops.
    13.1 Observe site for bleeding and hematoma

    NOTE: Do not remove gauze to observe site as this puts patient at risk for developing an air embolism

    NOTE: The literature suggests that the site should be checked Q5mins x3, Q15minsx4, Q1hourx4

    13.2 Secure occlusive dressing in place with transparent membrane dressing.

14. Occlusive dressing should stay in place for a minimum of 24hours, and then it should be changed daily until the site has healed. Observe catheter for:
    14.1 rough edges;
    14.2 contamination; and
    14.3 length.
    14.4

    NOTE: If catheter is ragged or damaged, notify the physician immediately. Retain catheter and measure its length. If resistance is felt during removal, do not forcibly remove the catheter. Instead, immediately secure the catheter with an occlusive dressing and notify the practitioner.

    NICU: If the neonate has a surgically placed catheter, assist as the practitioner removes it.

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Remove gloves and perform hand hygiene.

14. If ordered, send the tip of catheter to the Microbiology Laboratory with requisition for culture and sensitivity.
    14.1 Use sterile scissors to cut off at least three (3) cm of the tip;
    14.2 Place tip in a sterile container and seal; and
    14.3 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).

Reporting and Recording:

1. Document on the Progress Notes, Renal Unit Treatment Log, or NICU Record:
   1.1 date and time of removal;
   1.2 reason for removal;
   1.3 Patient and family education
   1.4 condition of catheter exit site;
   1.5 condition of catheter; and
   1.6 collection of catheter tip specimen for culture, if ordered
   1.7 How the patient tolerated the procedure and outcomes of the procedure, expected and/or unexpected, if required.

Expected Outcomes	Unexpected Outcomes
1. The catheter is removed intact 2. Hemostasis is achieved at the catheter removal site	1. Inability to remove catheter 2. Catheter not intact upon removal 3. Venous air embolus 4. Persistent bleeding 5. Hematoma 6. New onset vital sign instability

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 Trendelenburg position if tolerated, otherwise in a supine position, with face turned away from the site • 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 end expiration with the patient who is mechanically ventilated.)

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	• On removal of cannula, cover with an occlusive dressing in case of an air embolus: - Turn the patient to left lateral Trendelenburg position. - Administer 100% oxygen via non re-breather mask. - Call the prescriber STAT and activate RACE if necessary.
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, ensure an order has been written and check coagulation status removing central line. • Upon removal, apply steady pressure to exit site for a minimum of 5 minutes.

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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. •
6. Infection Infection may occur at the insertion site. Localized infection could develop into septicemia.	• Use aseptic technique during catheter removal. Chlorhexidine CHG 2% with 70% Isopropyl Alcohol 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 aerobic samples may be sent.

4.0 REFERENCES

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Reference Policies and Procedure

Clinical Policy C-1800	Central Line Infusions
ClinicalPolicy C-1820	Central Line Removal:
Clinical Procedure B-4581	Blood Cultures

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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 Trendelenberg if tolerated, or 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 gauze and petroleum based dressing or gel ~~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 • Patients response and outcomes	
Signature of Observer: _____ Date: _____	

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6.0 AUTHORIZATION TEST: REMOVAL OF CENTRAL LINES

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

1. What catheters are Registered Nurses **not** permitted to remove?

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

2. What are the common sites for central venous lines?

   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. What statement describes the correct technique for removal of a central line?

   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, how long should you apply manual pressure directly over the site?

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

5. Observe the removed catheter for all except:

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

6. If the catheter appears infected do all of the following except:

   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. What is a possible complication of central line removal?

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

8. How do you prevent air emboli when removing a central line?

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. What is the most common site for a peripherally inserted central line (PICC)?

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

10. Which of the following is a common type of central line?

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

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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

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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.