STANDARDIZED PROCEDURE
CENTRAL VENOUS CATHETER INSERTION

These procedures are intended to describe procedures performed by Nurse Practitioners and/or Certified Nurse Midwives (depending on the clinical privileges granted to the individual practitioner) at UC San Diego Health.

I. Policy

a. Function: To insert a central venous catheter when indicated.

b. Circumstances:

I. Setting: See Cardiothoracic Surgery Nurse Practitioner General Policy Standardized Procedure

II. Supervision: See Cardiothoracic Surgery Nurse Practitioner General Policy Standardized Procedure

III. Patient Conditions/Indications for Central Venous Catheter Insertion include but are not limited to:

- Large-volume parenteral fluid administration
- Monitoring of central venous pressure
- Emergency venous access
- Administration of some medications (i.e.: chemotherapy, vasopressors), and hyperosmolar or irritating solutions (i.e.: Parenteral nutrition, 3% NaCl)
- As an alternative for repetitive venous cannulation of chronically ill patients or patients with small, thrombosed, or difficult to find veins
- Placement of Swan-Ganz catheter

IV. Contraindications to the placement of a central venous catheter by the Nurse Practitioner includes, but not limited to:

1. Distortion of local anatomy or landmarks
2. Suspected acute or prior injury to the vein
3. Bleeding diathesis or current anticoagulation therapy (i.e.: Heparin gtt currently infusing)
4. Full-thickness burn, cellulitis, or other infection over the anticipated insertion site
5. Pneumothorax or hemothorax on the contralateral side, or inability to tolerate pneumothorax on ipsilateral side
6. Patients unable to tolerate Trendelenburg position
7. Prior infection of a sclerosing agent in the intended vein
8. Morbid or marked obesity
9. Marked cachexia
10. Vasculitis that predisposes to sclerosis or thrombosis of veins
11. Mastectomy proposed on the side of subclavian insertion

12. Patients receiving ventilatory support that have high-end expiratory pressures (if possible, ventilation should be
13. briefly interrupted while the catheter introducing needle is being employed to locate the vein)
14. Patients undergoing cardio-pulmonary resuscitation
15. Severe hypovolemia
16. For the internal jugular: Significant carotid artery disease distorting cervical anatomy, and recent unsuccessful contralateral cannulation

II. Protocol

a. Definition: Central Venous Catheter placement for the above conditions
b. Objective: See section I-b-iii for indications for central venous catheter placement
c. Assessment: Patient which meets central venous catheter placement as described above in section I-b-iii and does not have any contraindications outlined in section I-b-iv
d. Plan:

Subclavian Approach

1. Equipment necessary includes but is not limited to:

- Sterile prep solution (povidine-iodine, or hexachlorophene if patient is iodine-allergic)
- Sterile swabs
- Prep razor
- Sterile gloves
- Sterile drapes/towels
- 1% Lidocaine without epinephrine
- 25 gauge needle used for anesthetizing
- 3 or 5 cc syringe used testing ports on CVC
- 10 cc syringe used for local anesthetic
- Intravenous solution (i.e.: sterile saline)
- Connector Tubing for central venous pressure measurement if applicable
- Central Venous Catheter and Insertion Set
- Rolled bath towel
- 4x4 inch sterile gauze pads
- Needle holder
- Silk or nylon sutures (3-0 or 4-0) on cutting needle
- Suture scissors
- Topical antimicrobial ointment
- Tincture of benzoin
- Adhesive or cloth tape
- Completed chest radiograph request form
- Goggles
- Introducer needle

- Guide wire or J-wire
- Catheter or sheath introducer
- No. 11 blade and scalpel

2. Pre-procedure

a. Education

- Explain the need for CVC insertion and assess patient and family understanding of CVC (if patient awake and or family available in person or by phone)
- Explain the procedure and time involved
- Explain the need for sterile technique and that the patient's face may be covered
- Explain the benefits and potential risks for the procedure

b. Obtain consent from the patient if legally able or from power of attorney/next of kin unless emergent situation

3. Patient Position

a. Place patient in the Trendelenburg position at an angle of 15-30 degrees
b. Turn the patient's head contralateral to insertion site
c. Consider placing a rolled bath towel between the patient's scapula to allow the shoulders to fall backwards, making the clavicle more prominent
d. Both arms should be at the patient's side, restrained if necessary

4. Catheter insertion procedure

a. Scrub and prepare a wide area over the insertion site in sterile fashion, drape the infraclavicular areas
b. Anesthetize the skin at the puncture site with several millimeters of 1% Lidocaine, using the 10 cc syringe and 25 gauge needle. Anesthetize the subcutaneous tissue and periosteum of the clavicle along the anticipated route of cannulation. Aspirate the needle while it is being advanced to assure that injection into the vein does not occur.
c. With your thumb over the costoclavicular ligament and index finger in the suprasternal notch, insert the needle caudad to the clavicle just medial to the thumb, and aim slightly cephalad and posterior to the index finger in the suprasternal notch. (Note: If the patient is being ventilated with positive pressure, it is advisable to temporarily stop the ventilator or decrease the tidal volume as the needle punctures the chest wall. Ventilation should not be interrupted longer than 30 seconds. A respiratory therapist should be available to assist if necessary.)
d. Advance the needle (while aspirating to detect puncture of a large vessel) at a 5-10 degree angle relative to the patient's chest wall until the needle contacts the patient's clavicle. At this point, decrease the angle of the needle so that it is parallel to the patient's chest wall, and carefully advance it under the clavicle while still directing it slightly cephalad to your finger in the suprasternal notch. Continue to aspirate, and advance the needle slowly while keeping the needle shaft parallel to the patient's chest wall. Entry of the vein is indicated by a flash of dark venous

blood, which usually occurs at a depth of 3 to 4 cm. Blood return should flow freely if the needle is truly intraluminal and not lodged against the vessel wall. (Note: A flash of pulsatile, bright red blood indicates inadvertent subclavian artery puncture. In an elective situation, withdraw the needle and apply firm pressure for 10 minutes over puncture site. In an emergency, withdraw the needle and immediately repeat the process to attempt to cannulate the vein, noting the position of the artery to avoid repeat puncture).

e. If no flash of blood is observed, slowly withdraw the needle while maintaining negative pressure on the syringe. A flash will sometimes be encountered during needle withdrawal.
f. If the first attempt is unsuccessful, completely withdraw the needle and flush it with air. Repeat steps c, and d, but direct the needle approximately 5 degrees cephalad to the finger in the suprasternal notch and more posterior.
g. When the vein has been successfully entered, rotate the needle so that the bevel faces caudally.
h. Stabilize the needle with your thumb and index finger and detach the syringe. Immediately occlude the needle hub with your thumb (if the patient is awake you can ask them to Valsalva).
i. Thread the flexible end of the guide wire through the needle until at least ¼ of its length is within the vessel lumen.
j. Remove the needle so that only the guide wire remains in the vessel.
k. Using a No. 11 mounted scalpel blade, make a small skin incision approximately the diameter of the catheter at the site of entry of the guide wire.
l. Thread the dilator over the guide wire to a point 1-2 cm from the skin surface. If the guide wire is not visible with the dilator in place, withdraw the guide wire through the dilator until it is visible.
m. Grasp the guide wire and advance the dilator introducer unit over the guide wire. Advance the dilator down to the vessel and then withdraw and remove it from the guide wire.
n. Thread the catheter over the guide wire and advance to its full length in the vessel. The catheter should advance without resistance. Never force the catheter against resistance, rather, gently twist and push the sheath to advance
o. Remove the guide wire, leaving the catheter in the desired vessel.
p. With a 3 or 5 cc syringe, withdraw on each port of the catheter to check for blood return, following with normal saline flush.
q. Secure with suture and dress the catheter and saline lock all the ports until catheter placement is confirmed with chest x-ray.
r. Order stat chest x-ray to confirm placement and to evaluate for pneumothorax.

Internal Jugular Approach

1. Equipment necessary
    a. See Section II-d-i-1
2. Pre-Procedure
    a. See Section II-d-i-2

3. Patient Position
    a. Place the patient in Trendelenburg position at an angle of 15-30 degrees
    b. Turn the patient's head contralateral to insertion site
    c. Both arms should be at the patient's side, restrained if necessary
4. Catheter Insertion Procedure
    - Scrub and prepare a wide area over the insertion site in sterile fashion, drape the internal jugular area.
    - Anesthetize the skin at the puncture site with several milliliters of Lidocaine 1% using the 10 cc syringe and the 25 gauge needle. Anesthetize the skin at the catheter puncture site just caudad to the apex of the triangle formed by the two heads of the sternocleidomastoid muscle. Anesthetize the subcutaneous tissue, directing the needle toward the ipsilateral nipple and the junction of the medial third and middle thirds of the clavicle. The angle of the needle shaft should be 30-45 degrees above the horizontal plane of the patient. Aspirate before injecting to check for absence of blood in the syringe to prevent injecting lidocaine intravenously.
    - Note anatomic land marks: Palpate with your left index finger the triangle formed by the clavicle and the two heads of the sternocleidomastoid muscle. Puncture the skin at the anesthetized site with the catheter device and direct the needle caudally toward the ipsilateral nipple as noted in step b.
    - Advance the needle (while aspirating to detect puncture of a large vessel). A flash of dark venous blood, which usually occurs at a depth of 1 to 3 cm, indicates entry into the vein. Blood return should flow freely if the needle is truly intraluminal and not lodged against the vessel wall. (Note: A flash of pulsatile, bright red blood indicates inadvertent carotid arterial puncture. In an elective situation, withdraw the needle and apply firm pressure for 10 minutes over the puncture site. In an emergency, withdraw the needle and immediately repeat the process to attempt to cannulate the vein, nothing the position of the artery to avoid repeat puncture).
    - If no flash of blood is observed, slowly withdraw the needle while maintaining negative pressure on the syringe. A flash will sometimes be encountered during needle withdrawal.
    - If the first attempt is unsuccessful, completely withdraw your needle and flush it with air. Repeat the process (c, d) but direct the needle approximately 5-10 degrees lateral to the initial landmarks.
    - When the vein has been successfully entered, rotate the needle so that the bevel faces caudally.

    - Stabilize the needle with your thumb and index finger and detach the syringe. Immediately occlude the needle hub with your thumb (if the patient is awake, ask them to valsalva).
    - Thread the flexible end of the guide wire through the needle until at least ¼ of its length is within the vessel lumen.

- Remove the needle so that only the guide wire remains in the vessel.
- Using a No. 11 mounted scalpel blade, make a small incision approximately the diameter of the catheter at the site of entry of the guide wire.
- Thread the dilator over the guide wire to a point 1-2 cm from the skin surface. If the guide wire is not visible with the dilator in place, withdraw the guide wire through the dilator until it is visible.
- Grasp the guide wire and advance the dilator introducer unit over the guide wire. Advance the dilator down to the vessel and then withdraw and remove it from the guide wire.
- Thread the catheter over the guide wire and advance to its full length in the vessel. The catheter should advance without resistance. Never force the catheter against resistance, rather, gently twist and push the sheath to advance.
- Remove the guide wire, leaving the catheter in the desired vessel.
- With a 3 or 5 cc syringe, withdraw on each port of the catheter to check for blood return and saline lock all ports until catheter placement is confirmed with chest x-ray.
- Secure with suture and dress the catheter.
- Order a stat chest x-ray to confirm placement and evaluate for pneumothorax.

Femoral Approach

1. Equipment Necessary
    a. See Section II-d-i-1
2. Pre-Procedure
    a. See Section II-d-i-2
3. Patient Position
    a. Place the patient in Trendelenburg position at an angle of 15-30 degrees
    b. Turn the patient's head contralateral to insertion site
    c. Both arms should be at the patient's side, restrained if necessary
4. Catheter Insertion Procedure
    - In a sterile fashion, don personal protective equipment. Shave, prep & drape left or right groin
    - Palpate the femoral pulse at the midpoint along the imaginary line between the anterior superior iliac spine and the symphysis pubis. The femoral vein runs parallel and immediately medial to the artery.
    - Administer anesthetic with 25 gauge needle into the skin and subcutaneous tissue 1 cm caudally and laterally to palpated pulse
    - Retracting the artery laterally with your finger, use the 18 gauge insertion needle with a 5 ml syringe to puncture the skin.
    - Advance the needle while aspirating cranially at a 45° angle to the skin, parallel to the pulse. There is less risk being medial to the vein than lateral to it.
    - If there is no venous blood return after 5 cm, slowly withdraw the needle while aspirating. If still no return, redirect the needle through the same puncture site, aiming in a cranial, more lateral direction 1-2 cm closer to the artery.

- If still no blood return, reassess landmarks and attempt to access 0.5 cm medial to the femoral pulse.
- If arterial blood is encountered, withdraw the needle and hold manual pressure for 15-25 minutes with a sand bag placed for 30 minutes thereafter.
- If venous access is obtained with good flow, remove syringe, while keeping a finger over the needle to prevent air embolism.
- Introduce the J wire, with the tip aimed toward the heart, through the needle while maintaining the needle in the same location. The wire must pass without resistance.
- If resistance is met, remove the wire and check placement by withdrawing blood with a syringe.
- Once the wire is passed, remove the needle while keeping control of the wire at all times.
- Enlarge the puncture site with a scalpel
- Introduce the dilator over the wire 3-4 cm to dilate the subcutaneous tissues. Remove the dilator
- Introduce the catheter over the wire to the length of 15 cm.

- Remove the wire, aspirate blood from all ports to confirm venous placement, and flush with sterile saline
- Suture the catheter to the skin and apply a sterile dressing.
- Patient should remain on bed rest until the catheter is removed.

Patient conditions requiring Physician Consultation (Limitations):

1. Thrombosis
2. Hemorrhage
3. Air embolism
4. Ischemia or necrosis to distal site
5. Aneurysm
6. Infection
7. Arteriovenous Fistula
8. Local Hematoma

Follow Up:

1. Further evaluation and treatment as indicated
2. Check placement on chest x-ray
3. Instruct nursing staff to observe for signs of infection, hemorrhage, or ischemia

Record Keeping:

See Cardiothoracic Surgery Nurse Practitioner General Policy Standardized Procedure

III. Requirements for the Nurse Practitioner

a. Education and Training: See Cardiothoracic Surgery Nurse Practitioner General Policy Standardized Procedure
b. Evaluation: See Cardiothoracic Surgery Nurse Practitioner General Policy Standardized Procedure

IV. RESPONSIBILITY

Please contact the Advanced Practice Council if you need help. The administrative assistant for the Chief Nursing Officer can direct you. Call; 619-543-3438.

V. HISTORY OF PROCEDURE

Revised by the Committee of Interdisciplinary Practices: 2/26/2014, 9/28/2016

Reviewed by the Medical Staff Credentials Committee: 3/5/2014, 10/6/2016

Approved by the Medical Staff Executive Committee: 3/20/2014, 10/7/2016