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|  | Policies & Procedures Title: HEMODYNAMIC MONITORING - ARTERIAL LINE - ADULT <ul style="list-style-type: none"> ▪ Assisting with insertion ▪ Invasive site care ▪ Blood sampling ▪ Removal I.D. Number: 1092 |
| Authorization: <input checked="" type="checkbox"/> SHR Nursing Practice Committee <input type="checkbox"/> Tri-Site Critical Care Committee | Source: Critical Care Committee Cross Index: Date Revised: September 2013 Date Effective: December 1999 Scope: Saskatoon City Hospital Royal University Hospital St. Paul's Hospital |

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1. PURPOSE

- 1.1 To maintain the patency of arterial lines
- 1.2 To minimize the risk of infection, damage, displacement and other complications associated with the care and use of hemodynamic lines.
- 1.3 To provide accurate invasive pressure monitoring.
- 1.4 To facilitate blood withdrawal for diagnostic and patient management purposes.

2. POLICY

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| Staff who will perform these procedures | <ul style="list-style-type: none"> • Registered Nurses as identified by their manager, will be certified in this Special Nursing Procedure/Added Skill to care for arterial lines in accordance with the SHR policy. • Registered Respiratory Therapists |
| Physician order | <ul style="list-style-type: none"> • Required for insertion and discontinuation of arterial monitoring |
| Special Considerations | <ul style="list-style-type: none"> • Prior to accessing arterial lines, clinician must perform appropriate Hand Hygiene procedures • For radial arterial line, a Modified Allen's Test is responsibility of person inserting catheter. • Accessing arterial lines will be kept to a minimum • The continued need for arterial line will be assessed daily • The site will be assessed hourly. • Insertion site / dressing should be visible at all times if possible. • The neurovascular and peripheral vascular status of the cannulated limb will be assessed hourly |

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| | <ul style="list-style-type: none"> • The Physician will be notified if: <ul style="list-style-type: none"> ○ If color-sensation-movement (CSM) is compromised ○ The insertion site shows signs of inflammation, phlebitis, infection, infiltration, etc. If infection at the site and/or sepsis is suspected obtain appropriate cultures as ordered. • Arterial readings (systolic, diastolic, mean) will be documented q1h, as patient’s condition warrants or as ordered. |
| Accessing an arterial line | <ul style="list-style-type: none"> • Aseptic technique will be performed with any access. |
| Pressure tubing | <ul style="list-style-type: none"> • Pressure tubing will be changed every 96hrs and labeled with IV set change sticker (start date, discard date, initial) • For set up of tubing and pressure monitoring refer to Policy “Hemodynamic Monitoring - Setting Up Of Invasive Pressure Lines - 1033” New tubing will be used when arterial line is inserted, contaminated or new site initiated. |
| Dressing Changes | <ul style="list-style-type: none"> • Skin will be cleansed with Chlorhexidine/alcohol or Chlorhexidine during dressing changes (Note: for patient sensitive to Chlorhexidine, povidine-iodine swab or 70% alcohol swab will be used) • Dressing will be changed q96 hours, when no longer occlusive or if visibly soiled • Semi-permeable transparent dressing will be used • If patient diaphoretic or patient movement disrupts integrity of the dressing, consider a non-constricting overwrap for protection. |
| Blood Withdrawal | <ul style="list-style-type: none"> • See current lab blood tube chart for correct order of draw, tube choice and waste discard volumes • Vacutainer (preferred) or syringe for blood withdrawal will be used • Blood transfer device will be used for transferring blood to tubes • Blood Cultures: syringe method will be used in order to draw specified volume. No discard required • Note: venipuncture is preferred for blood cultures. |

3. PROCEDURE

3.1. Insertion

3.1.1 Gather the necessary equipment

- Catheter for insertion
- Primed pressure tubing
- Transducer cable / module
- Pressure bag
- Protective pad
- Dressing tray (if applicable).
- Sterile tape (i.e. steristrips)
- Semitransparent dressing.
- Sterile gauze pads (4 x 4 or 2 x 2)
- Chlorhexidine/alcohol or Chlorhexidine (Note: for patient sensitive to chlorhexidine, use a povidine-iodine swab or 70% alcohol swab)
- Personal protective equipment for clinician inserting – sterile gloves, mask, eye shield. Clean gloves for assistant.
- Leveling device

3.1.2 Explain procedure to patient / family.

3.1.3 Perform Hand Hygiene (person inserting and person assisting)

- 3.1.4 Ensure bedside invasive pressure line is appropriately labeled, correct scale is chosen, and zeroed per Policy & Procedure - Hemodynamic Monitoring – Setting Up of Invasive Pressure Monitoring Lines – 1033.
- 3.1.5 Once insertion completed, attach the catheter to pressure tubing. Observe for arterial waveform and numerical reading on bedside monitor. Flush to ensure patency and to clear blood from pressure line.
- 3.1.6 Apply appropriate sterile dressing ensuring catheter is well secured.
- 3.1.7 Document
 - Date and time of insertion.
 - Type and size of catheter in place.
 - Artery cannulated and by whom.
 - CSM of distal portion of cannulated limb.
 - Problems encountered and interventions
 - Patient response.
 - IV flush bags, line, dressing and date commenced on appropriate Record (if applicable).

3.2. Ongoing Care

- 3.2.1 Every Hour:
 - 3.2.1.1 Assess site and distal circulation
 - The neurovascular and peripheral vascular status of the cannulated limb.
 - The insertion site for signs of inflammation, phlebitis, infection, infiltration, bleeding, leakage at insertion site etc.
 - Note: SpO₂ monitoring of a digit distal to the insertion site may assist with circulation assessment.*
 - 3.2.1.2 Monitor integrity of dressing.
 - 3.2.1.3 Ensure transducer remains leveled to phlebostatic axis.
 - 3.2.1.4 Monitor for overdamped or underdamped waveforms.
 - For trouble shooting, see Hemodynamic Monitoring – Setting Up of Invasive Pressure Monitoring Lines #1033
- 3.2.2 Every 4 Hours, check the arterial line flush system to ensure:
 - 3.2.2.1 Pressure bag or device is inflated to 300 mmHg.
 - 3.2.2.2 Fluid is present in the flush solution bag.
- 3.2.3 PRN:
 - 3.2.3.1 Perform square wave test when the accuracy or if reading is in question
- 3.2.4 Rezero the transducer If a disconnection occurs between the transducer, cable and/or monitor or when the values displayed do not fit the clinical picture.

3.3. Site Care

3.3.1 Gather the necessary equipment:

- Dressing tray.
- Sterile tape (i.e steristrips)
- Semitransparent dressing.
- Sterile gauze pads (4 x 4 or 2 x 2).
- Chlorhexidine/alcohol or Chlorhexidine during dressing changes (Note: for patient sensitive to chlorhexidine, use a povidine-iodine swab or 70% alcohol swab)
- Clean gloves.
- A sterile solution such as normal saline for removal of blood, secretions, etc. is optional.

NOTE: *it is suggested to assign a helper to reduce risk of accidental decannulation*

3.3.2 Perform appropriate hand hygiene.

3.3.3 Use clean gloves to remove dressing. Discard gloves and dressing. Apply clean gloves.

3.3.4 Use normal saline to remove any dried secretions/blood.

3.3.5 Cleanse skin using friction to disinfect an area larger than the size of the dressing. Allow site to completely dry.

3.3.6 Apply sterile dressing ensuring catheter is well secured.

3.3.7 Document

- 3.3.7.1 Pressure tubing change
- 3.3.7.2 Dressing change
- 3.3.7.3 Assessment of insertion site
- 3.3.7.4 CSM of distal portion of limb.
- 3.3.7.5 Date of tubing change on care plan or other appropriate document
- 3.3.7.6 IV flush bags on IV Infusion Therapy Record (if applicable).

3.4. Blood withdrawal

3.4.1 Gather and prepare the necessary equipment:

- Check lab blood tube chart for required specimen tubes, order of draw and waste discard volume.
- Vacutainer luer lock access device if using vacutainer method (preferred method)
- Vacutainer blood transfer device (if using syringe method)
- Sterile 3 mls syringe for blood discard and 12-ml syringes if using syringe method.
- Blood sample tubes (including discard tube)
- ABG syringe and ice pack/ice if ABG's ordered
- Clean gloves
- Protective pad
- Alcohol swabs
- Approved disinfecting solution (for cleaning blood tube tops)
- Cotton tipped applicators
- Plastic bags
- Requisitions and labels
- Sterile gauze
- Sterile male/female luer lock adapter

- 3.4.2 Perform hand hygiene. Don clean gloves.
- 3.4.3 Confirm ID band on patient matches requisition and labels
- 3.4.4 Temporarily disable beside monitor alarms.
- 3.4.5 Place protective pad under limb that has arterial line.
- 3.4.6 Remove the male/female luer lock adapter cap on the stopcock and cleanse port with alcohol using friction in a twisting motion for 15 seconds and allow to dry before attaching syringe or vacutainer holder.
- 3.4.7 Vacutainer method
 - 3.4.7.1 Attach vacutainer.
 - 3.4.7.2 Turn the stopcock off to the transducer and open to the patient.
 - 3.4.7.3 Attach discard tube. See current lab-blood tube chart for recommended order of withdrawal and tube choice for each test.
Note: *for blood cultures, do not draw off a discard sample.*
 - 3.4.7.4 Remove discard tube and withdraw total blood sample as required attaching tubes in quick succession
- 3.4.8 Syringe method
 - 3.4.8.1 Attach discard 3 ml syringe
 - 3.4.8.2 Turn the stopcock open to the patient and aspirate 3ml of discard.
Note: *if drawing for bedside glucose monitor (BGM) or ABGs, use 1.5 ml discard*
Note: *if drawing coagulation studies, draw off 6 mls discard*
Note: *for blood cultures, do not draw off a discard sample*
 - 3.4.8.3 Remove the discard syringe and attach a 12-ml plain syringe or ABG syringe.
 - 3.4.8.4 Turn the stopcock off again to transducer and draws blood slowly until desired amount obtained.
 - 3.4.8.5 Repeat steps if additional syringes of blood required.
 - 3.4.8.6 Use the vacutainer blood transfer device to connect the syringe to tube. Allow the vacuum to draw blood from the syringe, to avoid damaging the specimen. Exception: inject gently for coagulation tubes to ensure filled to correct level if draw of blood is poor.
 - 3.4.8.7 If unable to withdraw blood using vacutainer or syringe method:
 - Reposition patient's limb
 - Reposition blood tube and needle
 - Try a new blood tube
 - Flush pressure line and reattempt vacutainer method. Remember to obtain a new discard
- 3.4.9 Draw ABGs last.
- 3.4.10 Immediately following blood withdrawal, flush lumen and stopcock of residual blood using start and stop method to create a turbulent flow to clear internal lumen. Apply new sterile male/female luer lock adapter cap.

- 3.4.11 Observe for return of arterial waveform.
- 3.4.12 Ensure alarms are enabled.
- 3.4.13 Clean top of specimen tubes . Label specimen tubes at bedside, initial label and place in plastic bag for transportation to lab with appropriate requisition. Put appropriate specimens on ice for transport.
- 3.4.14 Document
 - 3.4.14.1 On nursing progress notes, chart that blood work was drawn
 - 3.4.14.2 Indicate arterial line as source of specimen on blood requisition.

3.5. Removal of Arterial Line Catheter

- 3.5.1 General considerations prior to removal of arterial line catheters
 - 3.5.1.1 Achieving hemostasis may be affected by the patients' coagulation profile, anticoagulant / antiplatelet medication currently on board, blood pressure, size of catheter and length of time in place.
 - 3.5.1.2 Avoid milking the catheter during removal as it may damage the vessel or may push any clots located in the catheter into vessel.
 - 3.5.1.3 A very brief spurt of blood at the time of catheter removal ensures that any existing clots are expelled.
 - 3.5.1.4 When applying pressure, ensure distal circulation is maintained while pressure is being applied. Pressure which totally occludes the artery should not be applied for more than 3 minutes. The site needs blood flow to obtain the clotting factors needed for hemostasis . Pressure should be held an additional few minutes once hemostasis is obtained to decrease risk of re-bleeding
 - 3.5.1.5 When hemostasis obtained, apply a sterile dressing to site.
 - 3.5.1.6 Limit movement of insertion site following removal of the catheter.
 - 3.5.1.7 Continue frequent checks of insertion site to monitor for re-bleeding every 15 minutes x 1 hour, every 30 minutes x 1 hour and every hour x 2.
- 3.5.2 Gather the necessary equipment
 - Dressing tray / kit
 - Normal Saline for cleansing site if dried secretions
 - Chlorhexidine/alcohol or Chlorhexidine during dressing changes (Note: for patient sensitive to chlorhexidine, use a povidine-iodine swab or 70% alcohol swab)
 - Suture scissors / suture removal kit
 - Gauze – 2 x 2 or 4x 4
 - Absorbent pad
 - Sterile dressing
- 3.5.3 For all sites: (review 3.5.1)
 - 3.5.3.1 Check the physician order for removal of the arterial catheter
 - 3.5.3.2 Turn off arterial monitoring alarms
 - 3.5.3.3 Remove dressing
 - 3.5.3.4 Cleanse insertion site with chlorhexidine/ alcohol
 - 3.5.3.5 Remove sutures if present
 - 3.5.3.6 Turn stopcock off to flush solution
 - 3.5.3.7 Remove the catheter
 - 3.5.3.8 When hemostasis achieved, apply a sterile dressing

Note: *If catheter is inserted by physician for Percutaneous Coronary Intervention (PCI), the MRP/designate must remove the line.*

3.5.4 Radial/Pedal

- 3.5.4.1 Apply pressure 1-2 finger widths proximal to insertion site
- 3.5.4.2 Compress the site for 5 – 10 minutes or until hemostasis achieved.
- 3.5.4.3 Apply a sterile dressing.

3.5.5 Brachial

- 3.5.5.1 Position three fingers proximal to insertion site to stabilize artery. Remove the catheter.
- 3.5.5.2 Compress the site for 5 – 10 minutes or until hemostasis achieved.
- 3.5.5.3 Apply a sterile dressing.

3.5.6 Femoral

Note: Femoral arterial line removal post PCI is a separate Special Nursing Procedure.

- 3.5.6.1 Position the patient supine in bed with the HOB bed flat. Ensure the patient's weight is distributed evenly across both buttocks. Place the patient's feet approximately 30 cm (12") apart. Rotate the patient's foot externally on the side in which the sheath is placed.
- 3.5.6.2 With a sterile gloved hand, hold a folded 4x4 gauze next to skin just above the insertion site about 1-2 cm cranial and 1 cm medial to the puncture site.
- 3.5.6.3 With a slow continuous pulling motion, remove catheter and maintain pressure at site until hemostasis is obtained (minimum 20-25 minutes)
- 3.5.6.4 Apply a sterile dressing.
- 3.5.6.5 The patient should remain supine with HOB flat/reverse trendelenberg (may have small pillow under head)for 1 hour and then may log roll. (Ensure hip is in non-flexed position).
- 3.5.6.6 Keep the patient on bed rest 2-3 hours post line removal

Note: If a femoral venous sheath is in place adjacent to the arterial sheath, it should be removed first and hemostasis obtained prior to removing the arterial sheath to decrease the risk of AV formation.

Note: Following femoral artery line removal, a false aneurysm may occur if the initial pressure is not firm enough to prevent leakage from the artery into the subcutaneous tissue.

3.5.7 Document

- 3.5.7.1 Condition of insertion site before and after catheter removal, including presence of hematoma and/or bruit at access site.
- 3.5.7.2 Patient response.
- 3.5.7.3 CSM of distal portion of limb.
- 3.5.7.4 Problems encountered, i.e. Inability/prolonged time to obtain hemostasis.

4. REFERENCES

- BCCNP Cardiovascular Hemodynamics and pharmacology (Nursing 229) July 2012.
- Diehl, T. S (Ed.) (2011). Arterial Pressure Monitoring in Hemodynamic monitoring made incredibly easy Ambler PA: Lippincott Williams & Wilkins. Pg. 39 - 52
- Halm, M. A. (2008). Flushing hemodynamic catheters: what does the science tell us? American Journal of Critical Care. 17(1). Pp. 73-76.
- Morton, P. G. et al. (2013). Arterial Pressure Monitoring. In: Critical Care Nursing: a Holistic Approach. 8th ed. Philadelphia: Lippincott, Williams, Wilkins. Pg. 300 – 302.
- Porter, R. S. (Ed.) (2012), Hemostasis and coagulation disorders in Merck manual. Down loaded July 6,
http://www.merckmanuals.com/professional/hematology_and_oncology/hemostasis/overview_of_hemostasis.html#v971545
- Procedures for removal of vascular catheters. London Health Sciences Center, 2012.
- SHR Central Venous Catheters – Blood Withdrawal Policy (#1086) march 2011
- Tuncali, B. E., Kuvaki, B., Tuncali, B., and Capar, E. (2005). A comparison of the efficacy of heparinised solution of the maintenance of perioperative radial arterial catheter patency and subsequent occlusion. International Anesthesia Research Society. 100:1117-21.
- Weigand, D. L., (ed.) (2011) Arterial Catheter Insertion (Assist), Care, and Removal. In: AACN Procedure Manual for Critical Care. (6th ed). St. Louis: Elsevier Saunders. pp. 534 -547.
- Whitta, R. K., Hall, K.F., Bennetts, T. M., Welman, L., and Rawlings, P. (2008). Comparison of normal or heparinised saline flushing on function of arterial lines. Critical Care Resuscitation. 8(3). Pg.205-8.
- Woodrow, P (2009). Arterial Catheters: promoting safe clinical practice. Nursing Standard. 24 (4), pp 35 – 40.