ACKNOWLEDGEMENTS:

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Package for Registered Nurses Nov. 2008

Adaptations by: Sylvia Treloar RN, BscN, ONC © March 2009

Reviewed and Approved by: Michael Lee Pharmacist; Dr. Matthey, Anesthesiologist;
Jodi Normandau RN, Janie-Rae Crowley RN, BscN, Sharon Dawson
RN, BscN, MES March 2009
# Regional Nerve Block Analgesia Learning Package

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Introduction

This information package is designed to provide the staff with the information necessary to safely monitor and care for a patient receiving Regional Nerve Block Analgesia for post-operative pain management.

Goal

After completion of this learning module staff will provide knowledgeable, competent care, including pain assessment, monitoring, management, documentation of assessments and nursing care of patients receiving Regional Nerve Block Analgesia.

RN SCC Certification includes:
- Self study package reviewed by staff member
- Successful completion of a written exam
- One satisfactory supervised demonstration of a Tunneled Nerve Block Catheter removal
- Instruction for the infusion pump used to administer the nerve block

LPN Certification to Monitor includes:
- Self study package reviewed by staff member
- Successful completion of a written exam
- Successful demonstration of assessment, documentation and independent double check of the infusion pump and associated patient care orders

Recertification must be done on an annual basis

Learning Objectives

The Licensed Practical Nurse/Registered Nurse will:

1. Accurately describe the anatomy of upper and lower extremity Regional Nerve Block Analgesia.
2. Identify indications and contraindications for Regional Nerve Block Analgesia.
3. Identify potential complications/side effects of Regional Nerve Block Analgesia and appropriate nursing interventions.
4. Outline the nurse's responsibilities in caring for a patient receiving Regional Nerve Block Analgesia to identify and/or prevent adverse side effects associated with the same.
5. Consistently demonstrate competent assessment and documentation of a patient's:
   a. Sensory function, utilizing a sensory dermatome chart.
   b. Motor function and degree of block.
   c. Pain score and effectiveness of pain medication.
6. Change dressing when necessary utilizing appropriate technique

The Registered Nurse with Special Clinical Competency (RNSCC) in addition will be able to:

1. The RNSCC in the **recovery room** will be able to assist the anesthesiologist in initiating a Regional Nerve Block.
2. The RNSCC will be able to maintain, titrate, monitor and administer pharmacy prepared medication via pump through an indwelling Regional Nerve Block catheter according to patient care orders.
3. The RNSCC will be able to safely discontinue or remove the Regional Nerve Block catheter according to patient care orders.
ADMINISTRATION

REGIONAL NERVE BLOCKS

WHAT IS REGIONAL NERVE BLOCK ANALGESIA?

Regional Nerve Block Analgesia is a technique of injecting a local anesthetic solution around a nerve or nerve plexus thus preventing sensory nerve impulses from reaching the Central Nervous System (CNS). Intraoperatively, it is used for surgeries involving joints, muscles, and nerves. Continuous upper and/or lower extremity anesthesia can be continued into the post-operative period for approximately 48 – 72 hours, combined with nonsteroidal anti-inflammatory (NSAIDS) and/or opioids to provide effective and safe analgesia.

Blocks can be either single injection or continuous infusion.

Single Shot Regional Nerve Block: The local anesthetic (either long or short acting) is injected near the area of the plexus or nerve one time only. This injection may be administered using a needle or via a catheter and is given by anesthesia staff.

Continuous Regional Nerve Block Infusion: The local anesthetic (sometimes mixed with a narcotic) is continuously infused via a catheter in the proximity of the nerve or plexus. The patient may have a continuous background rate with or without the option of patient controlled Regional Nerve Block

PHARMACOLOGY

The mode of action is the same for all commonly used local anesthetics. Local anesthetics reversibly block conduction of neural impulses along nerve fibers by binding to sodium channels in the nerve. When the nerve cannot uptake sodium it cannot transmit an impulse.

DRUGS COMMONLY USED:

<table>
<thead>
<tr>
<th>DRUG</th>
<th>ONSET (Concentration dependant)</th>
<th>DURATION (Concentration dependant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bupivacaine</td>
<td>5 - 30 minutes</td>
<td>3.5 – 14 hours</td>
</tr>
<tr>
<td>Ropivacaine</td>
<td>1 - 30 minutes</td>
<td>2 – 8 hours</td>
</tr>
</tbody>
</table>

PATIENT ASSESSMENT

Assessment of the patient is essential for the analgesia to be both safe and highly effective. Normally, with Regional Nerve Blocks, the patient should have:

- Reduced pain at the site of the procedure
- Limited motor control of the limb
- Limited sensation to the limb
Proximal muscle weakness with preservation of distal motor movement, depending on which particular nerves are blocked e.g. upper quadriceps muscles in the thigh are weak but the patient is able to move the ankle and wiggle toes.

**To assess for motor strength,** have the patient try and move the muscle group affected and chart A-absent, W-weak, M-moderate, or S-strong. For example with a 3:1 femoral block the muscle group affected would be the Quadriceps and Obturator.

**To assess for sensory level,** use light touch to the affected area and compare with the unaffected side. You will be documenting the area of decreased sensation. For example with a 3:1 femoral block the patient will have decreased sensation to the anterior and lateral thigh. If you are finding it difficult to assess you may use ice sometimes the patient detects a change in sensation rather than the absence of cold. Remember these patients will have decreased sensation in the area's affected by the block…if they do not, you need to ask " why not ?" Is the block not working appropriately?

**To assess for Pain,** since pain is subjective it is preferred to obtain a self-report from the patient. You may use a visual analogue scale (pain ruler) if available or obtain a verbal report using the Numeric Rating Scale, 0-no pain, 10- worst pain possible.

All patients receiving nerve block should have IV access for 24hr post nerve block discontinuation.

Because of vasodilatation the extremity of the blocked area may be warm and possibly more pink than usual. The block does not preclude patients from receiving other medication for breakthrough pain. Adjuvant medication may be required for adequate pain management, as a nerve block will only provide analgesia in the specific area supplied by the blocked nerve of the plexus.

**PATIENT TEACHING**

It is important that the patient is well informed of any treatment being given. Be sure the patient understands:

- The reason for choosing a Regional Nerve Block.
- The sensation they may feel.
- The expected duration of the Regional Nerve Block.
- The limb is desensitized (without sensation) during the block therefore it is important to protect the limb from trauma, burns, bumps, or pressure.
- Ulnar neuropathy can occur from pressure on the elbow; therefore it is important to avoid continued pressure on the elbow.
- There are no restrictions on ambulatin with a patient with a upper extremity Nerve Block Analgesia. The only restrictions would be those placed on the patient due to the surgical procedure performed, not due to the nerve block. Check the physician’s order if restrictions apply related to the surgical intervention. e.g. WBAT / PWB / FeWB / NWB status
- **There are restrictions** when ambulating a patient with a continuous lower extremity Nerve Block (such as a 3 in 1 femoral block). These patients should be ambulated with caution. While the limb is compromised health care workers should use a transfer belt and have two staff to assist. It may also be necessary to apply a Zimmer Splint to prevent knee buckling and to check with the physiotherapist.
- How and when to use the patient controlled button and/or to ask for breakthrough medication PRN
NURSING CARE

Post operative care for patients with Regional Nerve Block Analgesia

- All Continuous Nerve Block infusions must infuse via tubing that has no ports and a 0.22 Micron filter. The filter is for bacteria and drug precipitate. The tubing does not have ports so that nothing can be inadvertently injected into the nerve block catheter. This tubing should be changed every 72 hours.
- The catheter must be labeled "Nerve Block Catheter" to avoid mistaking it for an Epidural or IV.
- The Nerve Block catheter will be secured with tegaderm and stat lock fixation device.
- The catheter insertion site may leak a small to moderate amount; this is acceptable as long as the patient's pain is adequately controlled and a decrease in sensation and movement is noted this is acceptable. The dressing may require changing at this time; Simply remove the tegaderm carefully, apply 2x2 gauze, and reapply a new tegaderm.

EXPECTED OUTCOME(S):
- Patients will be monitored to ensure their safety while receiving Regional Nerve Block Analgesia. Follow Edmonton Acute Patient Care Policy #VII-A-5, Assessment and Care of the Adult Following Surgery or Procedures Completed Under General, Intraspinal Anaesthetic and/or Regional Nerve Block, Form CH #1346
- Patients will indicate acceptable pain management based on nursing assessments
- Post procedure activity/restrictions will be discussed with the patient/family

RESPONSIBILITY:
Registered Nurse (RN) and Licensed Practical Nurses (LPN)

ACTION:
- The RN / LPN will:
  - Monitor the patient for sensory and motor level every hour for four hours, and then every four hours for the duration of the Regional Nerve Block infusion and every four hours for 24 hours after the Regional Nerve Block catheter is removed.
    i.e. Q1h x 4hours,
    Q4h x duration of infusion,
    Q4h x 24hours once the infusion is discontinued
  - Monitoring will include:
    - Sensory Level, Motor Function, Blood Pressure, Pulse.
    - Respiration, Sedation Scale.
    - Pain Score and Location of Pain.
    - Side Effects (Nausea, Vomiting, Pruritus)
    - Assessment of Need and Use of Adjunct Medication
    - Signs and Symptoms of local anesthetic toxicity: (Tinnitus, Slurred Speech, Disorientation, Seizures, Perioral Numbness, Palpitations)
  - Catheter Insertion Site and Dressing every shift until 24 hours post removal or until patient is discharged
  - Motor strength prior to each ambulation (assist with ambulation)

- Document all findings on the Adult Inpatient Pain Assessment and Analgesic Monitoring Flow Sheet #1343
- When admitting your patient back from operating room or recovery room ensure you do an independent double check by verify the infusion pump program and medication hanging are correct
according to the physicians orders and documented correctly on the Adult Inpatient Pain Assessment and Analgesic Monitoring Flow Sheet. **This check must be done every 8 hours at a minimum, or with every new RN/LPN responsible for the patient.**

Inform the Anesthesiologist immediately of significant changes in patient condition.

**SPECIAL CONSIDERATIONS:**

- Assess the Nerve Block site for potential hematoma formation
INDICATIONS

INDICATIONS FOR REGIONAL NERVE BLOCK ANALGESIA

- Surgeries where upper extremity anesthesia is used:
  - Total elbow
  - Shoulder Arthroplasty
  - Extensive hand/wrist surgery, Re-implantation surgery

- Surgeries where lower extremity anesthesia is used:
  - Open reduction and internal fixation (ORIF) of the ankle
  - Total knee joint replacements and other surgeries of the knee and hip
  - Amputation
  - Vascular surgeries of upper and lower extremities
  - Abdominal surgeries

CONTRAINDICATIONS FOR REGIONAL NERVE BLOCK ANALGESIA

- Patients with significant coagulopathy
- Patients who are combative or agitated
- Patients with unusual anatomy or pathology
- Patients with a systemic infection
- Patients refusal
- Allergy to local anesthetics

ADVANTAGES OF REGIONAL NERVE BLOCK ANALGESIA

- The degree of pain relief obtained is superior to that achieved with the sole use of Patient Controlled Analgesia (PCA) narcotics.
- Used in conjunction with PCA or around the clock analgesia, narcotic requirements are reduced thus decreasing the incidence of adverse effects.
- Patient requires fewer adjuvant medications.
- Especially effective during early, painful mobilizations with continuous passive motion (CPM) machines sympathetic blockade also limits vasospasm and improves circulation.
- Unlike epidurals, lower limb Regional Blocks is not associated with hypotension, postural hypotension or urinary retention.
- Potential for earlier discharge.
- Some studies have shown improved lasting knee joint function
- As part of a multimodal effect, thereby providing safe intra-operative and post-operative analgesia with minimal side effects

DISADVANTAGES OF REGIONAL NERVE BLOCK ANALGESIA

- It is not always successful.
- Pain with placement: a needle is used to initiate the block.
- Decrease or loss of motor function while the nerve block is infusing and for 2-12 hours following discontinuation (extremity or affected area will require support and protection or order to prevent inadvertent injury).
REMOVAL OF THE CATHETER

REMOVAL OF THE REGIONAL NERVE BLOCK CATHETER

PURPOSE:
• To safely remove the Regional Nerve Block catheter.

RESPONSIBILITY:
• Registered Nurse (RN) with demonstrated skill and ability (RNSCC)
• Obtain order from Anesthesiologist

EQUIPMENT
• Dressing tray
• 4x4 gauze
• Betadine or Chlorhexadine swabs (alcohol free)
• Gloves
• Sterile Gloves
If you suspect infection
• Culture swab (if required)
• Sterile specimen container (if required)
• Sterile scissors (if required)

METHOD
1. Explain procedure to the patient/family including that the procedure should not be painful.
2. Remove dressing and fixation tapes.
3. Inspect site for redness, swelling or discharge.

NON Tunneled catheter
4. Put on gloves and clean the insertion site with Betadine/Chlorhexadine swab (alcohol free)
5. Pull catheter out with an even, gentle movement. **If catheter does not come out with ease, DO NOT FORCE:** Reposition the patient and attempt again
6. Notify anesthesiologist if unable to remove catheter.
7. Examine tip of catheter to ensure that it is intact. Look for a black or blue tip on the end of the catheter.
8. Notify anesthesiologist if the catheter appears incomplete.
9. Apply 4x4 gauze and secure with tape or Tegaderm.
10. Document procedure and findings in the narrative patient care chart notes.

TUNNELED CATHETER
4. Open sterile tray and arrange your supplies
5. Put on sterile gloves
6. Clean the insertion site and catheter with Betadine/Chlorhexadine swab (alcohol free)
7. Stabilize distal end of the catheter with one hand, remove the catheter at the skin entry site with one hand. The bridge device may be used to facilitate this if necessary.
9. Once the end of the catheter is seen, ensure it remains sterile and pull the catheter through the skin with that hand holding the distal end of the catheter
10. Inspect the site again for any signs of infection of hematoma, redness or swelling
11. Apply 4x4 gauze and secure with tape or Tegaderm

**If you suspect infection at the site, cut the tip using aseptic technique, place in sterile container and send it to the lab.**
POTENTIAL COMPLICATIONS

POTENTIAL COMPLICATIONS OF REGIONAL NERVE BLOCK ANALGESIA

Nerve damage can occur due to needle trauma or inadvertent injection into the nerve itself. This will present after the block has worn off.

Local Anesthetic Toxicity (LAT)
Local anesthetic toxicity can occur with any type of Regional Nerve Block. This complication is rare but it is important for you to monitor and assess the patient for signs and symptoms.

Anesthetic toxicity may occur as a result of one of the following:

1. **Large amounts of local anesthetics infused over a few days** may be absorbed from the site of the block such as Epidural, Interpleural or Regional Nerve Block.
   - The signs and symptoms of toxicity develop gradually and are more likely to appear if an infusion is continued beyond 24 – 48 hours, particularly if high infusion rates and concentrations are used.
   - The more vascular the area of block, the faster toxicity may develop. i.e. intercostal blocks give rise to the fastest onset, sciatic blocks cause the least.
   - The infusion solutions contain a very dilute concentration of local anesthetic agent that, therefore, it is unlikely that systemic symptoms would develop when given at appropriate infusion rates.

2. **Accidental intravascular injection of local anesthetic** either during performance of the block or due to migration (rare) of the catheter intravascularly.
   - In this situation signs/symptoms of toxicity may appear more rapidly and may be severe. They may include CV collapse and seizures.
   - Relatively uncommon with local anesthetic blocks compared to epidurals. This is because the majority of regional blocks are done near a major thick-walled artery/vein compared to epidurals which are done closer to thin-walled smaller veins. The latter are more easily penetrated, even by the thin catheter.

Signs and Symptoms of Anesthetic Toxicity

<table>
<thead>
<tr>
<th>SIGNS AND SYMPTOMS CNS</th>
<th>SIGNS AND SYMPTOMS CVS</th>
<th>INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peri-oral numbness and tingling of lips</td>
<td>Irregular heart beat</td>
<td>Stop anesthetic infusions</td>
</tr>
<tr>
<td>Metallic taste in mouth</td>
<td>Hypotension</td>
<td>Attach Oxygen via nasal prong</td>
</tr>
<tr>
<td>Tinnitus (ringing in ears)</td>
<td>Hypertension</td>
<td>Assess BP, pulse, respiratory rate and oxygen saturation</td>
</tr>
<tr>
<td>Shaking and twitching of muscles</td>
<td>Cardiac conduction blocks</td>
<td>Assess neurological status (e.g. level of consciousness/orientation)</td>
</tr>
<tr>
<td>Confusion</td>
<td>Ventricular tachycardia or bradycardia</td>
<td>Notify on-call anesthesiologist STAT</td>
</tr>
<tr>
<td>Slurred speech</td>
<td>Cardiovascular collapse</td>
<td></td>
</tr>
<tr>
<td>Talkative (not necessarily clear)</td>
<td>Cardiac arrest</td>
<td></td>
</tr>
</tbody>
</table>
# POTENTIAL PROBLEMS WITH REGIONAL NERVE BLOCK ANALGESIA

The following situations might indicate a problem with the Analgesia. These situations can occur with any type of anesthetic block.

<table>
<thead>
<tr>
<th>POTENTIAL PROBLEMS</th>
<th>CAUSES</th>
<th>INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncontrolled Pain</td>
<td>➢ Catheter may have slipped out of position</td>
<td>➢ Assess pain, monitor block and sensory level</td>
</tr>
<tr>
<td></td>
<td>➢ Local anesthetic and/or narcotic rate (PCA) needs to be reassessed</td>
<td>➢ Give analgesics and adjunctive medication if available</td>
</tr>
<tr>
<td></td>
<td>➢ Pain in the area that is not covered by the block</td>
<td>➢ Re-assess pain, motor block and sensory level after 1 hour.</td>
</tr>
<tr>
<td></td>
<td>➢ Single shot duration completed</td>
<td>➢ Notify on-call anesthesiologist if pain remains uncontrolled</td>
</tr>
<tr>
<td>Blood in Tubing</td>
<td>➢ Catheter may be intravenous or intra-arterial</td>
<td>➢ Stop infusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Assess BP, pulse, respiratory rate and oxygen saturation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Assess for Local Anesthetic Toxicity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Notify on-call anesthesiologist STAT</td>
</tr>
<tr>
<td>Occlusion Reading</td>
<td>➢ Tubing may be kinked</td>
<td>➢ Inspect catheter hub for kinking</td>
</tr>
<tr>
<td></td>
<td>➢ Catheter may be up against vessel wall</td>
<td>➢ Reposition limb if possible; abduct the arm with axillary block or less flexion at hip for femoral block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Notify on-call anesthesiologist if above interventions do not work</td>
</tr>
<tr>
<td>Leakage at Site</td>
<td>➢ Catheter has slipped out of position</td>
<td>➢ Assess for pain control</td>
</tr>
<tr>
<td>(Small amount of serous or sanguinous fluid is normal)</td>
<td>➢ Disconnection at hub</td>
<td>➢ If the Tegaderm becomes non occlusive, remove it and apply 2x2 gauze, protect area with cavalon and reapply Tegaderm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Notify Anaesthesia if pain is unrelieved and motor/sensory block is normal</td>
</tr>
</tbody>
</table>

If at any time you are concerned something is wrong with the patient or the Nerve Block Analgesia: Stop the infusion pump and call the anesthesiologist on call.
POTENTIAL ADVERSE EFFECTS OF REGIONAL NERVE BLOCK ANALGESIA

The following situation might indicate a problem with the Analgesia. These situations can occur with any type of anesthetic block.

<table>
<thead>
<tr>
<th>POTENTIAL ADVERSE EFFECTS</th>
<th>CAUSES</th>
<th>INTERVENTIONS</th>
</tr>
</thead>
</table>
| Anesthetic Toxicity | ➢ Too great a dose of local anesthetic  
➢ Accidental intravenous injection | ➢ Stop infusion  
➢ Assess BP, pulse, respiratory rate and oxygen saturation  
➢ Assess for Local Anesthetic Toxicity  
➢ Assess neurological status  
➢ Notify the on-call anesthesiologist STAT |
| Hematoma | ➢ Inadvertent puncture of blood vessels surrounding the insertion site | ➢ Assess hematoma and catheter site  
➢ Assess patient’s pain status  
➢ Assess circulation to the limb  
➢ Notify the on-call anesthesiologist (catheter will likely be discontinued unless hematoma small) |
| Infection at the Catheter Site | ➢ Systemic infection, break in aseptic technique when catheter inserted, leak at catheter site, loose dressing | ➢ Take a swab for C&S  
➢ Send tip of catheter for C&S on removal  
➢ Assess temperature |
| Migration of the Catheter Tip  
Signs and symptoms may include: leakage at site, decreased pain relief, inadequate block | ➢ Patient movement, and/or tension on catheter/infusion line may dislodge the catheter | ➢ Assess patient’s pain status  
➢ Notify the on-call anesthesiologist |
UPPER EXTREMITY NERVE BLOCKS

REGIONAL NERVE BLOCKS FOR THE UPPER EXTREMITY

Upper extremity anesthesia (also referred to as Brachial Plexus Block) is achieved by blocking the conduction in the brachial plexus with local anesthetic at any point in its course from the neck to the axilla.

Common approaches are:
- Axillary
- Interscalene
- Supraclavicular
- Infraclavicular

Anesthetic agents given in each of these approaches gives a somewhat different distribution of anesthesia. The choice approach depends upon the individual patient and the type of surgery to be undertaken i.e. interscalene block for shoulder surgery.

ANATOMY – THE BRACHIAL PLEXUS

The brachial plexus is formed from branches of the cervical nerves, called roots, (C5, C6, C7, C8) and the 1st thoracic nerve (T1).

The brachial plexus starts at the neck, passes behind the clavicle superficial to the first rib, across the shoulder joint to the axilla. The roots join to form 3 trunks, which lie in close proximity to the subclavian arteries.

Branches from the trunk regroup to form lateral, medial and posterior cords. All of the cords lie in very close proximity to the axillary artery. The terminal branches of the cord include the median, ulnar, radial, and musculocutaneous nerves.

The brachial plexus may be blocked with a single injection of local anesthetic near it or by an infusion of local anesthetic over time in which case the block can be extended indefinitely.
1. Axillary Brachial Plexus Block

- The axillary artery is used as a landmark by the Anesthesiologist during the insertion. The Anesthesiologist inserts either a needle or a catheter above the axillary artery and into the perivascular sheath.

- The sympathetic blockade causing the warmth and dilated veins in the hand and arm occurs within a few minutes. Motor weakness will appear in 5 – 10 minutes but it may take 20 – 40 minutes to produce the full effect.

- The single shot block may be initiated with local anesthetic injected into the sheath.

- Continuous blocks are maintained by an infusion of bupivacaine via this catheter in the sheath containing the axillary artery and brachial plexus.

- The musculoskeletal nerve goes outside the sheath above the axilla; therefore the area is not affected by the block. A large volume of anesthetic is required to fill the sheath thus increasing the changes of local anesthetic toxicity.

- The intercostobrachial nerve supplies the inner aspect of the upper arm, which is not part of the brachial plexus. If the surgical incision extends into this area, the patient will feel pain in spite of brachial plexus block. Usually blockage of this nerve is used for tourniquet pain, rarely surgical incisions.
2. Interscalene Brachial Plexus Block

- The groove between the anterior and middle scalene muscles is used as the landmark as the Anesthesiologist inserts the needle in the interscalene groove.

- Tingling and a feeling of warmth in the limb are the first signs to appear. Sympathetic blockade causing a warm hand and dilated veins appear soon after. Complete anesthesia may take 30 – 40 minutes.

- This block is commonly used for shoulder surgery (for which axillary block is ineffective). Because of the high location of the block in the neck, the area of the arm supplied by C8 and T1 roots may not be affected by this block (i.e. inner aspect of forearm and arm).

- All patients given this block develop paresis/paralysis of the diaphragm on the side of the block. For patients with pre-existing respiratory problems this may cause difficulty with breathing.

Your nursing assessment needs to include respiratory assessment including chest auscultation. Patients may require supplement O₂, Analgesia, CXR and possible removal of interscalene block if the respiratory compromise is significant.
3. Supraclavicular Brachial Plexus Block

- Blockage of the brachial plexus above the midpoint of the clavicle, just behind the subclavian artery is called supraclavicular block.

- Because the nerve trunks run behind the artery in a compact manner, smaller volumes of local anesthetics are sufficient for the complete blockage of the plexus. It is not always effective for shoulder surgery as an Interscalene block.

- The dome of pleura is very close to the puncture site; therefore pneumothorax is a known complication. If a small gauge needles has been used for the block, the onset of pneumothorax may be delayed by several hours. The incidence of this complication has been greatly reduced with the widespread use of ultrasound guided blocks.
4. Infraclavicular Brachial Plexus Block

- This is the least commonly used method of brachial plexus block. This approach may be useful for forearm and hand surgery for patients with frozen shoulders (e.g. rheumatoid arthritis) where positioning for an axillary technique may be uncomfortable or impossible. This approach is used as the catheter is easily secured below the clavicle.

Infraclavicular blocks function the same way as the axillary block.
### POTENTIAL ADVERSE EFFECTS ASSOCIATED WITH UPPER EXTREMITY NERVE BLOCKS

<table>
<thead>
<tr>
<th>Potential Adverse Effects</th>
<th>Type of Block</th>
<th>Interventions</th>
</tr>
</thead>
</table>
| **Spinal Blockage**       | Interscalene  | - Stop infusion  
- Put oxygen on patient to maintain saturation > 90%  
- Notify the on-call anesthesiologist STAT  
- Assess BP, pulse, respiratory rate and O₂ saturation  
- Assess neurological status and call a code blue if required |
| Usually occurs during the initial performance of the block (rare with catheter infusions)  
| Signs and symptoms may include: apnea, hemodynamic compromise, loss of consciousness |

| **Epidural Blockade** | Interscalene  | - Stop infusion  
- Put oxygen on patient to maintain saturation > 90%  
- Notify the on-call anesthesiologist STAT  
- Assess BP, pulse, respiratory rate and O₂ saturation  
- Assess neurological status and call a code blue if required |
| Usually occurs during initial performance of block (rare with catheter infusions)  
| Signs and symptoms may include: bilateral anesthesia of neck and thorax, hypotension |

| **Respiratory Compromise** | Interscalene  
Infraclavicular  
Supraclavicular  
- more common at the initiation of the block | - Complete a thorough respiratory assessment including chest auscultation  
- Put oxygen on patient to maintain saturation > 90%  
- Notify the anesthesiologist on-call STAT |
| Paresis/paralysis of the diaphragm on the side of the block occurs in 100% of patients  
- Clinical significant respiratory distress is uncommon, though a subjective sensation of dyspnea may occur  
- Symptomatic mainly in patients with pre-existing COPD or asthma  
| Signs and symptoms may include: dyspnea, SOB, wheezing or cyanosis |

| **Pneumothorax** | Interscalene  
Infraclavicular  
Supraclavicular | - Complete respiratory assessment, including chest auscultation  
- Put oxygen on patient to maintain saturation > 90%  
- Notify the on-call anesthesiologist if patient is in respiratory distress  
- Apply O₂ as per medical directive |
| May appear up to 6 hours after the initial block, may occur with both single shot and continuous blocks  
- Most likely to occur with supraclavicular block  
<p>| Signs and symptoms may include: SOB, coughing, cyanosis, chest pain |</p>
<table>
<thead>
<tr>
<th>POTENTIAL ADVERSE EFFECTS</th>
<th>TYPE OF BLOCK</th>
<th>INTERVENTION</th>
</tr>
</thead>
</table>
| **Hemothorax**           | Infraclavicular | ➢ Complete respiratory assessment, including chest auscultation  
|                          | Supraclavicular | ➢ Put oxygen on patient to maintain saturation > 90%  
|                          |               | ➢ Notify the on-call anesthesiologist  
|                          |               | ➢ Assess BP and HR |
|                          |               | ➢ Reassure patient that these symptoms will resolve once the block wears off |
| **Horner’s Syndrome**    | Interscalene  | ➢ Reassure patient that these symptoms will resolve once the block wears off |

- **Hemothorax**: Potential for perforation of major blood vessels as these lie on the first rib near the injection site for these blocks. Signs and symptoms may include: SOB, hemoptyis, coughing, cyanosis, hypotension, tachycardia.

- **Horner’s Syndrome**: Horner’s syndrome is produced by blocking the sympathetic chain in the neck. The signs and symptoms are found all on the same side of the block. Signs and symptoms may include: Ptosis (paralytic drooping) of the upper eyelid, sinking in the of the eyeball, slight elevation of the lower lid, reddened eye, congested nose, reduced sweating on the face, hoarseness in the voice.
LOWER EXTREMITY NERVE BLOCKS

REGIONAL NERVE BLOCKS FOR THE LOWER EXTREMITY

The nerves supplying the lower extremity are not anatomically clustered where they can be easily blocked using a superficial injection of local anesthetic. The femoral block is the most commonly used block however, other blocks may be used in conjunction with it, e.g. sciatic

Common approaches are:
- Femoral (3-in-1)
- Sciatic
- Lumbar Plexus
- Popliteal

ANATOMY AND PHYSIOLOGY- LUMBAR PLEXUS

The nerve supply to the lower extremity is derived from the lumbar and sacral nerves. The femoral nerve supplies the anterior thigh muscles and the overlying skin with a cutaneous branch to the medial thigh. The obturator nerve supplies the medial thigh muscle and overlying skin, while the lateral femoral cutaneous nerve supplies the lateral aspect of the thigh.
1. FEMORAL BLOCK

- This block is also called Femoral 3-in-1 block.
- Femoral block is often used for operations on the knee and anterior thigh.
- Frequently used for Knee Arthoplasty
- If this nerve block is used on its own then the patient will still have posterior and occasionally medial knee pain as this block does not affect the sciatic nerve.
- The knee joint is supplied by three nerves:
  
  
  | Femoral   |
  | Sciatic   |
  | Obturator |

- A catheter is inserted just lateral to the femoral artery.
- It is NOT in a blood vessel or vascular sheath
- It sits in the femoral nerve sheath right next to the femoral nerve.
- The catheter placement will supply anesthetic affecting the following nerves:
  
  | Femoral Nerve |
  | Lateral Femoral Cutaneous Nerve |
  | Obturator Nerve |
  | Saphenous Nerve, (terminal branch of the femoral nerve) |
• The patient with a femoral block will experience decreased sensation and limited motor control to the:
  Front and sides of the thigh
  Knee joint to just below the kneecap
  Inner aspect of the leg down to the ankle

• The back of the thigh and knee and the outer aspect of the lower leg are supplied by the sciatic nerve and therefore are not affected by the femoral block.

  Because the sciatic nerve is NOT affected with the femoral nerve block, the posterior part of the thigh and knee (which is supplied by the sciatic nerve), will have full sensation. Your patients will feel some pain in the back of the knee if the femoral 3-in-1 block is given following total knee joint arthroplasty. Therefore, other analgesics will have to be used as supplements for adequate pain management. e.g. PCA, IM morphine, Indocid or Tylenol #3.

• Unlike epidural, there is no significant sympathetic block associated with the femoral block; therefore patient can ambulate better without postural hypotension. The thigh muscles are weaker and therefore ambulation should be non-weight bearing or partial weight bearing with support on that side and the use of a walker or crutches as needed.
2. **SCIATIC BLOCK**

- This block may be performed as a single injection procedure in the OR or as a continuous catheter technique.

- The patient with a sciatic block will experience limited motor control and limited sensation to the:
  - Posterior thigh
  - Lower leg and foot except medially

- May be performed in conjunction with femoral block for operations on the leg and thigh. It is particularly useful in ‘poor-risk’ patients who cannot tolerate other forms of anesthesia.

- The sciatic nerve may be blocked in the buttocks, groin or just above the knee joint (for ankle analgesia).

- With the sciatic block performed in the buttocks or groin, the patient may experience significant weakness in the legs and thigh to the extent that they cannot weight bear on that leg. The sciatic block performed at the knee spares the thigh muscle weakness.

- Patients will experience foot drop and therefore may trip on their toes easily.

- Local anesthetic toxicity is relatively uncommon with sciatic blocks.

- The sympathetic block associated with this block is minimal (unlike epidurals) and therefore patients may ambulate without worry of postural hypotension. Ambulation should be non-weight bearing.
3. LUMBAR PLEXUS BLOCK

- This block is used for managing post-operative pain in the hip and lower limb. A catheter is inserted 2cm lateral to the L4-5 spine in the back into the psoas sheath.

- The patient with a lumbar plexus block will experience limited motor control and sensation from the hip downwards.

- The lumbar plexus refers to the network of nerves formed by the ventral branches of the 2nd to 5th lumbar nerves in the psoas major muscle. Infusion of local anesthetic in the catheter lying in the psoas sheath blocks the lumbar plexus as well as some of the fibres of S1 (sacral plexus).

- May be used instead of intrathecal (spinal)/epidurals for anesthesia.

### Potential Adverse Effects of Lumbar Plexus Block:

<table>
<thead>
<tr>
<th>POTENTIAL ADVERSE EFFECTS</th>
<th>INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spinal Blockade</strong></td>
<td></td>
</tr>
<tr>
<td>➢ Usually occurs during the initial performance of the block (rare with catheter infusions)</td>
<td>➢ Stop infusion</td>
</tr>
<tr>
<td>➢ Has a rapid onset</td>
<td>➢ Put oxygen on to maintain oxygen saturation &gt; 90%</td>
</tr>
<tr>
<td>Signs and symptoms may include: Bilateral leg numbness and weakness, apnea, hemodynamic compromise (decrease in BP and cardiac output), loss of consciousness</td>
<td>➢ Notify the on-call anesthesiologist STAT</td>
</tr>
<tr>
<td></td>
<td>➢ Assess BP, pulse, respiratory rate and O₂ saturation</td>
</tr>
<tr>
<td></td>
<td>➢ Assess neurological status</td>
</tr>
<tr>
<td></td>
<td>➢ Call a code blue if required</td>
</tr>
<tr>
<td><strong>Epidural Blockade</strong></td>
<td></td>
</tr>
<tr>
<td>➢ Usually occurs during the initial performance of the block (rare with catheter infusions)</td>
<td>➢ Stop infusion</td>
</tr>
<tr>
<td>➢ Has a slow onset</td>
<td>➢ Put oxygen on to maintain oxygen saturation &gt; 90%</td>
</tr>
<tr>
<td>Signs and symptoms may include: Bilateral anesthesia, possible hypotension</td>
<td>➢ Notify the on-call anesthesiologist STAT</td>
</tr>
<tr>
<td></td>
<td>➢ Assess BP, pulse, respiratory rate and O₂ saturation</td>
</tr>
<tr>
<td></td>
<td>➢ Assess motor and sensory sensation of the thorax and neck regions</td>
</tr>
</tbody>
</table>

3. POPLITEAL BLOCK

- Sciatic nerve block in the popliteal fossa is performed for procedures on the foot and ankle.

- The patient with a popliteal block will experience limited motor control and limited sensation to all of the foot except the medial malleolus.

- Lateral or posterior approach may be utilized. The sciatic nerve terminates into it branches at the level of the popliteal. The anesthetic is injected into the sheath, which contains the nerves.

- Motor-evoked plantar flexion or dorsiflexion of the foot indicates appropriate placement of the needle for the block (a nerve stimulator is used to locate the sciatic nerve).
If a skin-bridge has been used:

Femoral nerve catheter in place. It has been tunneled with leaving a skin-bridge. Catheter removal should be a sterile procedure.

Stabilize proximal end of catheter at skin entry site with one hand (the right hand in this illustration) and take hold of skin-bridge device with the other.

Gently pull on the skin-bridge device to remove the distal end of the catheter. Catheter should remove easily.
<table>
<thead>
<tr>
<th>Image</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Image" /></td>
<td>Continue to remove the distal part while still stabilizing the proximal part at the skin entry site.</td>
</tr>
<tr>
<td><img src="image2.jpg" alt="Image" /></td>
<td>If the distal end is outside the skin, take care to keep on holding it to prevent contamination. Inspect the tip of the catheter for completeness.</td>
</tr>
<tr>
<td><img src="image3.jpg" alt="Image" /></td>
<td>Now gently pull on the proximal end and guide the distal end such that it remains sterile.</td>
</tr>
<tr>
<td><img src="image4.jpg" alt="Image" /></td>
<td>Again carefully inspect the tip of the catheter and confirm that the catheter is completely removed.</td>
</tr>
</tbody>
</table>
APPENDIX 11

Capital Health
EDMONTON AREA

Adult Inpatient Pain Assessment and Analgesic Monitoring Flow Sheet Guidelines
Sheet #3

Note: Postoperative / post procedural inpatients, monitor and document per Corporate Administrative Directive and Procedure 2.9.6 and in conjunction with guidelines below

Note: For patients with Regional Nerve Blocks, and/or Patient Controlled Analgesia monitor and document:
- Temperature: on arrival to unit, then every 4 hours for 24 hours, then every shift until discharge or as ordered
- Pain: on arrival to unit, then every 2 hours for 24 hours, then every 4 hours and as needed if patient's condition changes
- IV access: hourly
- IV access maintained: for 24 hours post infusion/dose or until discharged
- Analgesic Injection Site: every shift until 24 hours post removal or until discharged

NOTE: Restart initial monitoring when infusion parameters are changed due to undesirable effects or uncontrolled pain

REGIONAL NERVE BLOCK

☐ Regional Nerve Block SINGLE DOSE (RNB), monitor and document
  - Respiratory rate, blood pressure, heart rate, and oxygen saturation:
    - on arrival to unit
    - then every 15 minutes once
    - then in 30 minutes
    - then in 1 hour
    - then every 4 hours for 24 hours
    - then every shift until discharge or as ordered
  - Sensory level, motor function, and signs of toxicity:
    - on arrival to unit
    - then every 1 hour for 4 hours
    - then every 4 hours for 24 hours
    - assist with ambulation
  * Notify Anaesthesia if motor / sensory function has not returned or decreases after 12 hours of injection.

☐ Regional Nerve Block INFUSIONS (RNB & PCHRNB), monitor and document
  - Respiratory rate, blood pressure, heart rate, and oxygen saturation:
    - on arrival to unit
    - then every 15 minutes once
    - then in 30 minutes
    - then in 1 hour for 4 hours
    - then every 4 hours for duration of infusion
  - Sensory level, motor function, and signs of toxicity:
    - on arrival to unit
    - then every 1 hour for 4 hours
    - then every 4 hours for duration of infusion
  - Notify Anaesthesia if sensory / motor function has not returned or decreases within 12 hours
  - Assist with ambulation & monitor motor strength prior to each ambulation

PATIENT CONTROLLED ANALGESIA

☐ Patient Controlled Analgesia (PCA), monitor and document
  - Respiratory rate and sedation scale:
    - every 30 minutes twice
    - then every 2 hours for 24 hours
    - then every 4 hours for the duration of the PCA
  - Opioid consumption, presence of nausea &/or pruritus:
    - every 4 hours for duration of PCA
  - Blood pressure and heart rate:
    - every 8 hours for duration of PCA

NOTE: Monitor and document
  - If increased bolus dose, decreased lockout time and / or undesired effects:
    - Monitor respiratory rate and sedation scale:
      - every 2 hours for 24 hours
      - then every 4 hours for the duration of PCA
  - If 4 hour dose limit is exceeded:
    - Monitor respiratory rate and sedation scale:
      - every hour for 4 hours then resume previous monitoring

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APPENDIX III

PRE PRINTED PATIENT CARE ORDERS FOR:
ADULT CONTINUOUS REGIONAL NERVE BLOCK INFUSION

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Type of CRNBI:</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE:</td>
<td>Maintain Intravenous access during Continuous Regional Nerve Block Infusion (CRNBI)</td>
</tr>
<tr>
<td></td>
<td>If Intravenous becomes interstitial, replace immediately. ALL CRNBI must be controlled by a volumetric pump.</td>
</tr>
<tr>
<td>1. Local Anaesthetic Medication:</td>
<td></td>
</tr>
<tr>
<td>☐ ROVacaine 0.2% in 100 mL normal saline (concentration 2 mg / mL)</td>
<td></td>
</tr>
<tr>
<td>Background infusion rate: _______ mL / hour (suggested range 8 – 10 mL / hour)</td>
<td></td>
</tr>
<tr>
<td>Patient controlled bolus: _______ mL, Lockout: _______ minutes, 4 hour limit: _______ mL</td>
<td></td>
</tr>
<tr>
<td>2. Monitoring as per Regional Nerve Block of the Patient (Nursing Procedure Manual # X55)</td>
<td></td>
</tr>
<tr>
<td>a) Assess infusion site q 12 hours for excessive undue swelling, or discolouration noted at catheter infusion site.</td>
<td></td>
</tr>
<tr>
<td>For lumbar plexus block and 3:1 femoral nerve block, monitor for leg strength, check for signs of pressure on heels, assist with ambulation at all times while infusing.</td>
<td></td>
</tr>
<tr>
<td>3. Adjunctive Medications for Inadequate Analgesia:</td>
<td></td>
</tr>
<tr>
<td>Follow Orthopaedic protocol for pain management.</td>
<td></td>
</tr>
<tr>
<td>4. Notify Anaesthesia IF:</td>
<td></td>
</tr>
<tr>
<td>a) Any signs or symptoms of local anaesthetic toxicity. Stop CRNBI and call immediately.</td>
<td></td>
</tr>
<tr>
<td>b) Systolic blood pressure less than 90 mmHg, OR pulse less than 50 / minute.</td>
<td></td>
</tr>
<tr>
<td>c) Inadequate analgesia or excessive analgesia.</td>
<td></td>
</tr>
<tr>
<td>d) Excessive weakness in blocked extremity.</td>
<td></td>
</tr>
<tr>
<td>f) Catheter becomes disconnected.</td>
<td></td>
</tr>
<tr>
<td>5. Discontinuing Continuous Peripheral Nerve Block Catheter.</td>
<td></td>
</tr>
<tr>
<td>Discontinue Regional Nerve Block</td>
<td></td>
</tr>
<tr>
<td>☐ Post op day 2</td>
<td></td>
</tr>
<tr>
<td>Or: ___________________________</td>
<td></td>
</tr>
</tbody>
</table>

ANAESTHESIOLOGIST SIGNATURE ___________________________ M.D.
REFERENCES:


