Self-Learning Package

Pain Physiology & Assessment
Patient Controlled Analgesia
Epidural & Spinal Analgesia
Nerve Block Catheters
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Information provided is for educational purposes only.

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Approved by FHA Surgical Acute Pain Nursing Shared Work Team (2012).
THE PAIN MANAGEMENT MODALITIES FOR REVIEW ARE:

1. Patient Controlled Analgesia (PCA)
2. Epidural and Spinal Analgesia/Anaesthesia
3. Nerve Block Catheter Management

***NOTE: When patients are receiving an Acute Pain Modality (PCA, epidural, nerve block and/or spinal) only Anaesthesiology/ Acute Pain Service may order opioids, sedatives, benzodiazepines and NSAIDS. ***

Please review Potential Complications of Opioid and Local Anaesthetic Administration (Appendix 3 & 4) found at the end of this self learning package.

PATIENT CONTROLLED ANALGESIA (PCA)

Patient controlled analgesia (PCA) is a method of pain relief that involves a locked, electronic infusion device that is programmed to allow a preset IV opioid dose that the patient administers themselves by pressing a control button.

PCA is used with a variety of patients with moderate to severe pain; post surgical patients are the most common.

Patients chosen for PCA must be:
• able to understand and follow instructions
• willing to control their own pain medication
• admitted to a unit where the staff is trained in the use of PCA

PCA is used with caution for patients with:
• COPD or obstructive sleep apnea (OSA),
• renal or liver disease
• age extremes
• mental or physical barriers (confusion or cognitive impairment)

DEFINITIONS OF TERMS

**PCA Dose**
The amount of medication given when the control button is pushed.

**Delay Interval**
The length of time that must elapse before another dose of opioid will be delivered. The delay interval begins at the end of the last dose delivered. If the delay interval is 5 minutes, the pump will **NOT** deliver an additional dose of opioid until the 5 minutes has passed regardless of how often the control button is pushed.

**Attempt**
The number of times the patient pushes the control button to receive pain medication. This does **not** mean they have received medication, only that they have tried. The demand for injections may be an indication of how well the pain is being managed or how well the patient understands how to use the PCA.

**Total Injections**
The actual number of times the patient receives a PCA dose of opioid.

**Bolus Dose**
An additional dose of opioid that can that can be given at any time based on the patients need and the nurses’ discretion, (as specified in the pre printed orders).

**Basal Infusion (continuous)**
A basal background opioid infusion can be run using the PCA pump to supplement patient delivered doses. This feature is used most commonly for the patients with high opioid needs and occasionally children.

**Drug Concentration**
The concentration of the opioid solution has to be programmed into the PCA infusion pump so that it can deliver the prescribed dose accurately.

(Chumbley & Mountford, 2010)

PATIENT TEACHING

Patient teaching is an integral part of PCA. Administration of PCA may require significant reinforcement. Below are some important points to include in your teaching.

♦ The patient will need to know how to use the PCA pump. This should include **how to** press the button to get a PCA dose, **when to** press the button and an explanation about the delay interval. Some patients and families are very concerned about the possibility of getting too much medication, so information about the pump safety features is an important inclusion in your teaching.

♦ **The control button is to be used by the patient only.** This is critical in preventing PCA related complications and is one of the cornerstones of PCA delivery.

♦ Patients need to be instructed to inform you of any side-effects, such as nausea, so that you can provide the necessary interventions and/or treatments.

OPTIMIZING THE EFFECTINESS OF PCA

♦ Initially assess the effectiveness of therapy q2h for 24 hours and make any adjustments required. Then assess the effectiveness of therapy every 4 hours while the patient is awake and more frequently if pain is not within their goal until the PCA is discontinued. Use the pain scale 0-10 and compare to the patients pain goal.

♦ Assess the total injections versus attempts. Take note of how many successful PCA doses were given and how many were attempted. If your patient has made 30 attempts in the last hour but only 10 were
given, you can be fairly certain your patient is not getting enough pain relief. Ensure your patient understands the correct use of the PCA button.

- You can trend the amount of opioid given in a specific time period, this is particularly useful when weaning.

**MANAGING INEFFECTIVE ANALGESIA**

If your patient is not receiving enough analgesia take the following steps:

1. Check to make sure that your patient is using the pump appropriately.
2. Increase the PCA dose as ordered. Reassess in 1 hour.
3. Optimize additional multi-modal medications as ordered (e.g. Acetaminophen, NSAID’s etc.). As well, use non-pharmacological interventions such as positioning, distraction and relaxation.
4. Notify APS or Anaesthesia – once you have reached the maximum parameters indicated on the pre printed orders.
5. Be aware to assess your patient for possible surgical complications if pain remains elevated.

**BOLUS DOSES**

You should provide your patient with a bolus dose:

- If pain severity is above patient’s pain goal and/or when first initiating PCA.
- When changes are made to the pump in response to ineffective analgesia.
- Prior to painful procedures.

**MONITORING**

*See Appendix 1*

**COMMON OPIOIDS**

<table>
<thead>
<tr>
<th>OPIOID</th>
<th>INTRAVENOUS DOING</th>
<th>BOLUS DOSE (Usual)</th>
<th>DELAY INTERVAL (Usual)</th>
<th>ONSET (mins)</th>
<th>PEAK (mins)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORrhine</td>
<td></td>
<td>1 – 2 mg</td>
<td>5 – 6mins</td>
<td>5-10</td>
<td>15-30</td>
<td>Most commonly used. Can cause an accumulation of metabolites in pts with renal insufficiency.</td>
</tr>
<tr>
<td>HYDROMORphpine</td>
<td>0.2-0.4mg</td>
<td>5 – 6mins</td>
<td>5</td>
<td>10-20</td>
<td></td>
<td>A semi-synthetic opioid. Suitable alternative to morphine-intolerant patients. Used more often with elderly patients.</td>
</tr>
<tr>
<td>Fentanyl</td>
<td></td>
<td>10 –25mcg</td>
<td>5 – 6mins</td>
<td>1-5</td>
<td>3-5</td>
<td>Quick onset with short duration of action. Extensively metabolized by the liver.</td>
</tr>
</tbody>
</table>

Please check your site specific orders and protocols for opioids used in your area.

- All of the above opioids come in prefilled mini bags and must be stored in the opioid cupboard.
- Please check the expiry date on the opioid mini bag prior to use.
WEANING FROM PCA

If your patient is taking fluids orally and his/her pain score is at or below his/her goal, then your patient is ready to start weaning from PCA. PCA can be discontinued when the patient has demonstrated adequate pain control on oral analgesic.

When weaning your patient from PCA, equianalgesia is an important concept to understand. Equianalgesia refers to varying opioids that provide the same approximate analgesia. For example, if your patient received 10mg of IV morphine in the last 4 hours, you could use the equianalgesia table to determine the approximate oral equivalent. See Equianalgesia table below.

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**MORphine 10mg IV = HYDROmorphone 2mg IV = Oxycodone 15mg po**

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Parenteral (mg)</th>
<th>Oral (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORphine</td>
<td>10</td>
<td>20 - 30</td>
</tr>
<tr>
<td>HYDROmorphone</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>--</td>
<td>15</td>
</tr>
<tr>
<td>Codeine</td>
<td>Not recommended</td>
<td>200</td>
</tr>
</tbody>
</table>

**HYDROmorphone is 5-7X more potent than MORphine**

- Approximate guidelines for conversion from one opioid to another or from parenteral to oral
- Consider reducing dose by \( \frac{1}{3} \) - \( \frac{1}{2} \) when initially changing opioids or routes and titrate doses to each individual's needs
- Oral is the preferred route of administration when available
- Intramuscular (IM) is not a recommended route for administration

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Safety Considerations for PCA

- **INITIAL PROGRAMMING and ANY CHANGES to the PUMP PROGRAMMING such as changes to the dose or delay interval is to be done by a RN and INDEPENDENTLY DOUBLE CHECKED by a 2nd RN.**
  - Most PCA related incidents occur when programming. Pay special attention to decimal placement. The improper placement of the decimal when programming the PCA dose has been found to be a major cause of errors (D'Arcy, 2008).
  - In a study conducted by the Food and Drug Administration, all deaths related to PCA were caused by errors in programming the correct drug concentration (Taylor, 2010).
- Only the patient uses the PCA button. Reinforce this with the patient and family. This is an essential safety feature of the pump.
- Use PCA specific tubing and the specific PCA dedicated pump.
- Check that all medication delivered through the alternate arm of the Y-tubing are compatible with the opioid. A second IV may be necessary.
- DO NOT give any other opioids or sedatives that have not been approved by APS or Anaesthesia (as identified in your area).
- Ensure resuscitation equipment is readily available and in working order.

**Review Appendix 3: Potential Opioid Related Complications**
Children undergoing painful procedures and/or surgery may be ordered PCA analgesia. Generally, it is ordered for children six (6) years of age or older.

- Take special care to note the dosages and concentrations ordered.
- Notify APS or Anaesthesia (as identified to your area) if analgesia ineffective.
- Apply principles of patient teaching, optimizing the effectiveness of the PCA, weaning from PCA, and safety considerations as reviewed in the general PCA section.
- Continue to use additional multi-modal therapies as ordered on the Pediatric PCA orders.

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**Additional Safety Considerations for Pediatrics**

- **Only the child can press the PCA button**
  - You may need to reinforce this with families and identify that it is an essential safety feature of the pump
- Review safety considerations on page 14
- Ensure resuscitation equipment is readily available and in working order

**Monitoring:**
- Continuous oximetry
- RR, HR, and sedation score q1h
- Pain score & BP q4h
- RR (quality & depth) & HR q1h while asleep

**EMERGENCY PROCEDURES**

CALL ANESTHETIST STAT IF:
- RR less than 12/min (ages 10+) or less than 14/min (ages 2 – 10)
- OR
- Sedation score greater than 2
  - Stop the PCA infusion
  - Apply O₂ by mask
  - Rouse patient and encourage to breathe
  - Give NALOXONE IV push STAT as indicated on the APS orders

*Review Appendix 3: Potential Opioid Related Complications*

You have completed the section on PCA.

*Progress to Epidural and Spinal Analgesia as time permits.*
The brain and spinal cord are continuous and are encased by 3 membranes: the dura mater (the tough outermost layer), the arachnoid membrane (the middle layer), and the pia mater (the thin innermost layer directly covering the brain and spinal cord tissue). Cerebral spinal fluid (CSF) is a liquid cushion protecting the brain and the spinal cord and is found in the subarachnoid space between the arachnoid membrane and the pia mater. The spinal cord occupies the upper two thirds of the vertebral canal. It is about 42 cm long and usually ends at the level of the first lumbar vertebra (L1). The spinal cord gives off 31 pairs of spinal nerve roots that relay messages to and from the rest of the body. The spinal nerves ultimately form peripheral nerves that supply a specific region of the skin (dermatome) and skeletal muscles. Each of the spinal nerves contains motor, sensory and sympathetic fibres.
EPIDURAL ANATOMY

- Located outside the three membranes covering the spinal cord, between the ligamentum flavum and the dura mater (the tough outermost layer).
- The ligamentum flavum is a very tough ligament binding the spinal vertebra together.
- The epidural space is a potential space and is normally filled with blood vessels, lymphatic vessels, fatty tissue and spinal nerve roots.
- Epidural catheters in the epidural space do not pose a mechanical threat to the spinal cord.
- The epidural space can be used for a single bolus, or the catheter is left in place for ideally 2 to 5 days with a continuous infusion, depending on the surgery (Chumbely & Thomas, 2010).

**Implications for infusions:**

- tiny air bubbles that may arise in the tubing are NOT considered a danger because the epidural space is a potential space
- infusions can be stopped for hours and restarted without concern that the catheter will become occluded because the epidural space is not a blood vessel
- Do not flush epidural catheter.

(McCaffery & Pasero, 1999)

- Analgesia given via an epidural need to diffuse across several membranes to attach to nerve root receptors located in the dorsal horn of the spinal cord.

![Diagram of epidural space and catheter](http://64.143.176.9/library/healthguide/en-us/images/media/medical/hw/nr551808.jpg)

![Diagram of epidural space and catheter](http://www.pharmacology2000.com/Central/Local_Anes/epidural_block.gif)
SPINAL ANATOMY

- The spinal space is located between the arachnoid mater and the pia mater and contains the cerebrospinal fluid (CSF). The spinal space is also called subarachnoid or intrathecal, these terms are used interchangeably and mean the same thing.
- Termination of the spinal cord for adults is L₁-L₂, with the cauda equina (a bundle of spinal nerve roots that arise from the bottom end of the spinal cord) filling the remainder of space to S₂.
- Spinal needles are fine gauge needles inserted at the L₂-₃ level or lower to avoid the spinal cord.
- The dose of spinal analgesia is only 1/10th of the dose used in the epidural space.
- The spinal space is used only for single dose injection. Morphine is generally used due to its longer duration (McCaffery & Pasero, 1999).

DEFINITION OF TERMS

Regional Anaesthesia
Regional anaesthesia is the temporary interruption of nerve conduction to a particular area of the body by the delivery of local anaesthetic agents. This results in the removal of all or partial autonomic, sensory and motor function.

Regional Analgesia
Regional analgesia is the temporary interruption of nerve fibres conducting pain stimuli, from a particular area of the body. The delivery of opioids in the spinal (intrathecal) or epidural space commonly accomplishes analgesia.

Spinal Anaesthesia/Analgesia
Spinal anaesthesia/analgesia is the injection of local anaesthetic and/or opioids into the subarachnoid space.

Epidural Anaesthesia/Analgesia
Epidural anaesthesia/analgesia is the injection or infusion of local anaesthetic and/or opioid into the epidural space.

McCaffery, M., & Pasero, C. [1999]. *Pain: Clinical manual*. St. Louis:
CONTRAINDICATIONS FOR EPIDURAL/SPINAL ANESTHESIA

- Sensitivity to local anaesthetic
- Concurrent or recent anticoagulation
- Patient refusal
- Uncorrected hypovolemia

Relative contraindications (used with caution):
- Coagulation disorders
- Sepsis (local or generalized)
- Some spinal or central neurological diseases
- Increased intracranial pressure
- Unstable spinal fractures
- Morbid obesity (difficulty with line placement)

(Chumbley & Thomas, 2010)

MEDICATIONS COMMONLY USED IN EPIDURAL INFUSIONS

There are two types of medications commonly administered via the epidural route for surgical patients:

1. Opioid - usually, Fentanyl or Hydromorphone,
2. Local Anesthetics (LA) - usually Bupivicaine or Ropivicaine

These are usually administered as combined (1 local anaesthetic and 1 opioid solution) for continuous epidural infusions.

And similarly two types commonly used via spinal route as a one time spinal dose:

1. Opioid - usually, Fentanyl, Epimorphone or Hydromorphone
2. Local Anaesthetics (LA) - usually Bupivicaine or Lidocaine

Medication delivered via this route must be free from potentially neurotoxic substances such as additives or preservatives. Fentanyl comes without additives. Morphine made for epidural/spinal use is called Epimorph.

MECHANISM OF ACTION

OPIOIDS

Opioids administered via the epidural route will diffuse across the dura mater, the arachnoid membrane and into the spinal space to act on the opioid receptors. Opioids administered via the spinal space bind quickly to the opioid receptors on the dorsal horn, preventing pain signals to be transmitted to the brain (Chumbley & Thomas, 2010).

The tissue of the brain and spinal cord is similar to fat and it easily absorbs and metabolizes lipid-soluble drugs such as Fentanyl. Fentanyl given via an epidural diffuses through the membranes and the dura easily to attach to the opioid receptors in the spinal cord (McCaffery, Pasero, 1999). In contrast, Morphine is less fat-soluble so it will take longer to take effect. Morphine will linger in the CSF because it is not as attracted to the fatty CNS tissue and it takes longer to actually attach to the opioid receptors. Central opioid receptors can be affected by morphine for 18-24 hours, so patients can still be at risk for opioid related side effects for up to 24 hours post spinal anaesthesia and similarly after an epidural with morphine has been stopped. Morphine given via an epidural has been associated with delayed respiratory depression (Visser, 2001). Hydromorphone has an intermediate effect, typically lasting longer than Fentanyl but not quite as long as morphine. Close monitoring of respiratory rate, and for sedation is an integral part of care for the patient receiving opioids via the epidural or spinal route.
The table below represents common opioids used in epidural/spinal administration;

<table>
<thead>
<tr>
<th>OPIOID</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
<th>RR &amp; Sedation After a spinal one time dose</th>
<th>RR &amp; Sedation for continuous epidural</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORPHINE (Epimorph)</td>
<td>30-60 min.</td>
<td>60 min.</td>
<td>12-24 hours</td>
<td>q1h for 12 hours and then q2h for 12 hours</td>
<td>q1h for 12 hours and then q2h for 12 hours q4h for remainder of infusion and q4h x 24 hours once infusion stopped</td>
</tr>
<tr>
<td>HYDROMORPHONE</td>
<td>15-30 min.</td>
<td>45-60 min.</td>
<td>12 -18 hours</td>
<td>q1h for 12 hours and then q2h for 12 hours</td>
<td>q1h for 12 hours and then q2h for 12 hours q4h for remainder of infusion and q4h x 24 hours once infusion stopped</td>
</tr>
<tr>
<td>FENTANYL</td>
<td>5-15 min.</td>
<td>10-20 min.</td>
<td>2-4 hours</td>
<td>q1h for 2 hours</td>
<td>q1h for 12 hours and then q2h for 12 hours q4h for remainder of infusion. Routine VS once infusion stopped</td>
</tr>
</tbody>
</table>

**LOCAL ANESTHETICS (LA)**

Anaesthesia is accomplished by using a local anaesthetic agent. Local anaesthetic agents have the ability to alter the conduction of nerve impulses by blocking sodium channels on the nerve cell membrane. Some nerve fibres are more sensitive to local anaesthetics than others. The size of the nerve fibre and the amount of myelin that surrounds the nerve determine its sensitivity. Small, thin nerves that have little or no myelin are blocked easily, whereas the thicker, heavily myelinated motor nerves are more difficult to block. Sympathetic and sensory nerves have less myelin than motor nerves. When local anaesthetic is given, nerve function will disappear in the following order (very simplified):

**Sequence of Loss of Nerve Function with Local Anaesthetics (LA)**

1. Sympathetic (vasomotor): dilation of skin and blood vessels including arteries and veins
2. Temperature discrimination & pain recognition
3. Touch and pressure sense
4. Proprioception (awareness of body position)
5. Motor function

As the LA agent wears off, these functions will return in reverse order: motor function will come back first; then sensations to touch and pain; and lastly sympathetic response will normalize (such as blood pressure). This benefits your patients postoperatively because most will retain motor control while continuing to experience pain relief (this may depend on site of insertion). The expectation is our patients will have some changes in sensation, but not enough to take away all sensation. The dose of LA provided in a continuous epidural infusion is usually low enough that most patients retain motor function, although some motor block may be inevitable with a
lumbar epidural (McLeod & Cumming, 2004). The epidural catheter is generally inserted at a level that corresponds to the middle dermatome of the incision (Chumbley & Thomas, 2010). Alternatively, the LA dose provided in a spinal anaesthetic is usually high enough for a total nerve block where all of the above fibres will be blocked including the motor fibres.

There are a number of factors that influence the level of analgesia that is obtained once a LA is given: the site of injection, dose, concentration, volume, age and height of the patient (Visser, 2001). For patients who only have LA infusing such as Ropivicaine exclusively, “the rate of the epidural infusion can determine the spread of fluid within the epidural space. As the LA spreads up and down, away from the catheter entry site, it will bathe sensory nerves roots as they pass through the epidural space and block pain signals. The higher the rate, the bigger the spread, the more nerves will be blocked; therefore more of the wound site will be pain free. If patients complain of pain at the top or bottom of the wound, it is an indication that the rate of infusion (may) need to be increased” (Chumbely & Thomas, 2010). If your patient has a combination solution of opioid and local anaesthetic, an increase in infusion rate will increase the amount of opioid. Opioid related side effects such as sedation are dose related; therefore close monitoring of your patients following any increase in infusion is essential (Chumbely & Thomas, 2010).

**Lumbar and Thoracic Epidurals**

While lumbar and thoracic epidurals are very similar, there are some differences to be expected. Here is a brief outline of the clinical differences you will see. Remember though that these are generalizations and that the clinical picture will vary depending upon the exact location of the epidural, the epidural solution and the rate of the epidural infusion.

<table>
<thead>
<tr>
<th>Lumbar</th>
<th>Thoracic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More likely to cause urinary retention</td>
<td>• Less likely to cause a lower extremity motor block</td>
</tr>
<tr>
<td>• More likely to cause lower extremity weakness/motor block</td>
<td>• Less likely to cause urinary retention:</td>
</tr>
<tr>
<td></td>
<td>o Epidural T10 level or higher: question the need for an indwelling urinary catheter.</td>
</tr>
<tr>
<td></td>
<td>o Evidence shows that the risk for developing a UTI is much higher for patients who have a urinary catheter in for the duration of the epidural infusion compared to those who have the urinary catheter removed on Postoperative Day 1.</td>
</tr>
</tbody>
</table>

**COMMONLY USED EPIDURAL SOLUTIONS**

Some common epidural solutions for continuous infusion are:

- Bupivicaine 0.1% with Fentanyl 2mcg/ml in NS
- Bupivicaine 0.08 % with HYDROMorphone 20 mcg/mL in NS
- Bupivicaine 0.0625 % with Fentanyl 2mcg/ml in NS
- Ropivicaine 2mg/ml (0.2%) in NS (local anaesthetic only)

When the epidural infusion is stopped, the LA effects last for approximately:

- Bupivicaine 0.1% (1mg/ml) 3.5 - 5 hours
- Ropivicaine 0.2% (2mg/ml) 4 - 6.5 hours

A common LA used for spinal anaesthesia is:

- Bupivicaine 0.5% - duration is 1.5 – 2 hours (approximately)
PATIENT TEACHING

- Review and reinforce patient teaching found on page
- Provide details about the epidural route and what the patient can expect, (e.g. tape on your back, attached to a pump etc.).
- Explain they may expect decreased sensory function.
- Provide details about how you will do a dermatome assessment and to expect dermatome assessments q8h.
- Ask patient to inform you immediately if they experience any motor weakness, back pain or any untoward symptoms.

MONITORING

See Appendix 1.

Safety Considerations for Epidural Infusions

- **INITIAL PROGRAMMING and ANY CHANGES to THE PUMP PROGRAMMING such as changes to the infusion or infusion rate is required to be independently checked by a 2nd RN.**
  - Most adverse events related to infusions occur due to errors in programming.

- Use non ported, yellow tubing and a locked dedicated infusion pump. Ensure solution labelled for epidural administration. Check the expiratory date of the solution prior to administering.

- Assess integrity of system q shift. (Catheter clearly labelled ‘Epidural’, non ported tubing, luer connection secure, anchored well to anterior chest wall, and tape intact).

- Ensure patient repositioned and free of pressure areas.

- Ensure patient has full lower limb MOTOR control prior to ambulation.

- Inspect and assess epidural insertion site q shift and report any abnormal findings such as bleeding, hematoma and drainage.

- Do not change the dressing. This can result in inadvertent removal of the epidural catheter. Reinforce site and tubing with tape and/or transparent dressing as necessary.

- Do not give any other opioids or sedatives that have not been approved by APS or Anaesthesia (as identified in your area).

- Contact APS or Anaesthesiologist if any anticoagulant ordered other than **low molecular weight heparin** (e.g. dalteparin or enoxaparin) once daily (prophylactic dosing only), or **unfractionated heparin** BID while epidural insitu.

- Maintain IV access, saline lock or continuous infusion through out epidural infusion and for:
  - 24 hours after any epidural infusion with hydromorphone or epimorphine
  - 2 hours after any epidural infusion with fentanyl

- Ensure resuscitation equipment is readily available and in working order.
MANAGING INEFFECTIVE ANALGESIA

- Provide breakthrough analgesia as indicated on the pre printed orders.

- Assess level of sensory block (dermatome), by assessing sensation with ice. This will help you assess whether the block is covering the entire surgical site. See appendix 2 for instruction on how to check dermatome levels.
  
  - The spread of the epidural solution can be gravity influenced. You may want to try to reposition your patient to assist in the spread of solution (Weetman & Allison, 2006).
  - Additionally, if your patient has a unilateral block only on one side, the catheter may have lodged on one side of the epidural space during insertion. Contact anaesthesiology or APS and inform them of the unilateral block, as they may be able to readjust the catheter to fix this. In the interim you may want to encourage your patient to lie on the unblocked side to assist in the spread of the solution (Chumbely & Thomas, 2010).

- Assess the insertion site and catheter to ensure integrity of the system. Check that equipment is functioning correctly and that all connections are intact.

- Increase infusion rate as identified on the pre printed order set.

- Optimize additional multi-modal medications as ordered (e.g. Tylenol, NSAID’s, etc). Include non-pharmacological interventions such as positioning, distraction and relaxation.

- Notify APS or Anaesthesia for inadequate sensory block, or for further orders once you have reached the maximum parameters allowed on the pre printed orders without adequate analgesia.

NOTIFY APS or ANESTHESIA

- **Low blood pressure and/or decrease pulse** - parameters identified on the pre printed orders. The first in the sequence of loss of nerve function when using LA is dilation of skin and blood vessels, including arteries and veins. This vasodilation can cause a drop in blood pressure, especially in hypovolemic patients. Patients are often given rapid IV fluid boluses to compensate.

- **Postural BP** (this is a comparison of BP with the patient lying down and then rechecked with the patient sitting at the side of the bed). **Contact anaesthesiology for a drop greater than 15 to 20 mm hg and/or pulse increase greater than 20/min.** This usually occurs in patients who are hypovolemic. It is usually treated with rapid IV fluid bolus. DO NOT AMBULATE patient at this time.

- **Inability to bend knees (greater than 0 motor block).** See appendix 2
  o If it is accompanied by new onset back pain and/or rapid onset change to sensation in abdomen or legs, notify anaesthesia ASAP as it could also be a sign of an epidural hematoma and would require rapid intervention.

- **Ascending sensory block above T4**
  o A sensory block above T4 requires a decrease in the infusion rate or stopping it completely if the block is extensive.
  o A block that ascends to T2 (axilla) can impede respiratory and cardiac function. Patients should be monitored for respiratory compromise, bradycardia and hypotension. Assess your patient’s ability to cough and deep breathe, if no impairment decreases the infusion by 2mls an hour; encourage patient to sit upright to lower the sensory level with the assistance of gravity and reassess in 30 min. If any impairment or significant bradycardia noted stop epidural infusion and contact APS or anaesthesia for direction.
  o If any respiratory or cardiac compromise is noted, **STOP** epidural infusion, provide O₂ and/or resuscitative measures as necessary and notify APS or anaesthesia STAT.

- **Sudden onset of moderate to severe back pain**, or new onset of increasing sensory deficits and/or motor block, notify ASAP.

- **Inadequate analgesia** or persistent side effects despite treatment.
DISCONTINUING EPIDURAL THERAPY

- Patients should not be started on any anticoagulation medication such as Coumadin, IV heparin or LMWH (bid dosing – for treatment/therapeutic dosing) when they have an epidural insitu without consulting APS or Anaesthesia (Horlocker, et al, 2009). If they have received anticoagulation while an epidural is insitu, notify anaesthesia and DO NOT REMOVE epidural catheter. Removal must be carefully coordinated and often includes holding a dose and/or administering Vitamin K and ensuring PTT/INR are within normal limits prior to removal.

- Epidural infusions can be discontinued when the infusion has been weaned down and the patient has adequate pain control on oral analgesics.

- If recent PTT/INR available ensure INR equal to or below 1.2 and PTT less than 40. If elevated contact APS or anaesthesiology, DO NOT REMOVE CATHETER. If no recent INR/PTT available consult with anaesthesiology prior to removal.

- Remove epidural catheter 2 hours prior to next dose of unfractionated subcutaneous heparin.

- If patient on once a day LMWH such as Dalteparin or Enoxaparin, removal must be 22 hours after last dose (2 hours prior to the next dose of Dalteparin or Enoxaparin).

- **Removal:**
  1. Position patient on side with knees, head and shoulders flexed (fetal position).
  2. Use procedural gloves and remove dressing and tape.
  3. Gently pull epidural catheter close to the insertion site, if resistance met, try repositioning patient either increasing the flexed position, or sitting up as when catheter inserted. If resistance persists, **stop procedure**, tape catheter in place and notify APS or anaesthesia.
  4. Assess black tip of catheter is smooth and round
  5. Apply band aid to site for 24 hours.

- Post removal, monitor and document hip/dorsi/plantar flexion, changes in sensation to abdomen and legs, and for back pain q4h for 24 hours. Report abnormal findings STAT, see “Potential Complications of Epidural Therapy” page 20.

Only acceptable DVT/PE prophylaxis with Epidural Therapy:
- BID unfractionated Heparin OR
- Once a day LMWH (5000 units or less/ 24 hours) or Enoxaparin (40mg or less/24 hours) prophylactic dosing only
Potential Complications of Epidural Therapy

Post Dural Puncture Headache
This occurs if the dura has been punctured and is caused by a leak of CSF. It occurs in 1-2% of epidural blocks (Visser, 2001). The headache is typically frontal, exacerbated by movement or sitting upright, it can occur 24 – 48 hours post puncture. The treatment is bed rest in a supine position, analgesics, and IV fluids. If you suspect a post dural puncture headache, notify the anaesthetist. The leak usually resolves on its own. If it does not resolve on its own, the anaesthetist can perform a blood patch which involves using approximately 5-15mls of the patient's own blood injected in the epidural space to form a 'patch' (clot) to stop the leak of CSF. The clot will then dissolve on its own. (Schwartz, 2006; Chumbley & Thomas, 2010).

Infection
This is extremely rare, but can occur. An infection can lead to an epidural abscess which can compress the spinal cord or compromise the blood supply to the spinal cord. Early detection is crucial. Monitor temperature q4h; observe the insertion site for redness, swelling, tenderness or discharge and report any abnormal findings (McCaffery & Pasero, 1999; Weetman & Allison, 2006).

Epidural Hematoma
An extremely rare, but very serious, complication caused by damage or perforation to small blood vessels in the epidural space. Bleeding into the epidural space can compress the spinal cord. This needs to be treated immediately with surgical evacuation of the hematoma. Compression of the spinal cord can cause permanent damage within 6-8 hours (Weetman & Allison, 2006). Make sure to assess and report any onset of progressive weakness, numbness and/or paralysis (this may be accompanied by moderate to severe back pain) to the anaesthesiologist STAT. If you suspect an epidural hematoma, time is crucial. Patients with coagulopathies, liver and renal impairment, or patients on additional medications that alter or affect coagulation are at increased risk of developing an epidural hematoma. The greatest risk occurs at insertion or removal of the epidural catheter, so you will need to monitor your patients’ hip/dorsi/plantar flexion and extension, for changes in sensation to abdomen and legs and for back pain q4h for 24 hours post epidural catheter removal (Weetman & Allison, 2006; Chumbley & Thomas, 2010).

Local Anaesthetic Toxicity
A very rare but potentially life threatening complication is catheter migration into an epidural vein. The first symptoms of local anaesthetic toxicity will be peri-oral numbness and tingling with a metallic taste in their mouth; other early symptoms include dizziness, tinnitus and anxiety. Stop the epidural infusion immediately, if the local anaesthetic is not stopped the symptoms can progress to muscle twitching, blurred vision, shaking, excitement, convulsions, bradycardia→heart block, hypotension, confusion, sedation, loss of consciousness and ultimately cardiac arrest (Schwartz, 2006; Weetman & Allison, 2006; Chumbley & Thomas, 2010).

Catheter Occlusion or Dislodgment
A locked, designated infusion pump must be used for all continuous epidural infusions. If the epidural is capped, the catheter does NOT require flushing like an IV line. If the infusion pump alarms occlusion, inspect system for integrity and kinks. Additionally repositioning the patient may resolve the occlusion alarm. If, despite troubleshooting efforts, it continues to alarm, suspect catheter occlusion and inform APS or Anaesthesia. If the catheter has been inadvertently removed, inspect catheter tip to ensure tip did not break off in the epidural space and let anaesthesia know. If you suspect the tip has been sheared off, notify the anaesthetist immediately. Continue to monitor your patients’ hip/dorsi/plantar flexion and extension, for changes in sensation to abdomen and legs and for back pain q4h for 24 hours post accidental removal and report any unexpected findings.

Accidental Disconnection
It is recommended that an epidural catheter be removed as soon as possible following an unwitnessed accidental disconnection (Horlocker, Birnbach, Connis et al, 2010; Hebl, 2006). If the catheter becomes disconnected from the infusion do not reconnect it. If the hub remains in-place, cap it with a non-vented cap or if apart at the catheter connector, wrap the epidural catheter in sterile gauze and call anaesthesia ASAP, anticipate removal of the catheter when it is safe to do so depending on the timing of the last dose of anticoagulant. (See page 21 for removal instructions)
**If your patients condition changes or you have concerns don’t hesitate to contact APS or the Anaesthesiologist.

You have completed the section on Epidural & Spinal Analgesia. Progress to Nerve Block Catheters as time permits.

If applicable to your patient population. Check with your educator if you are unsure.

PERIPHERAL NERVE BLOCK CATHETERS

There are 3 main reasons to perform a peripheral nerve block:

1. To perform surgery and avoid general anaesthesia. Peripheral nerve blocks for anaesthesia results in the removal of all sensation.

2. To provide pain management. Peripheral nerve blocks for pain management results in the loss of pain sensation by interrupting the pain carrying sensory fibres which provide for localized pain management.

3. To provide sympathetic blockade. There are situations such as traumatic limb injury or where ↑ blood flow to tissues is desirable or where vasodilation is required to help preserve the tissues of the limb. LAs have the ability to interrupt the autonomic sympathetic fibres so that optimal vasodilation is achieved.

Modalities: Single Injection or Continuous Infusion.

The patient with a nerve block will either have received the block for surgery (single injection) and/or will come to your unit with a nerve block catheter insitu with a continuous infusion for post operative pain management. A peripheral nerve block provides regional anaesthesia or analgesia by temporarily interrupting the conduction of nerve impulses to a specific site or limb. Analgesia/anaesthesia is achieved by infiltration of local anaesthetic around nerve trunks leading to the surgical site.

A continuous peripheral nerve block (CPNB) involves the percutaneous insertion of an indwelling catheter in the proximity of a target nerve that acts as a conduit for a continuous local anaesthetic infusion (Mariano, 2011). A single injection peripheral nerve block with a long acting local anaesthetic can have analgesic effect for 8-20 hours, CPNB provides for longer lasting pain management (Ilfeld, B., Moeller, L. et. al., 2010).

Contraindications for Peripheral Nerve Block

- Patient refusal
- Allergy to local anaesthetic agents (rare)
- Active infection at the site of injection
- Pre-existing neurologic deficit
- Coagulopathy
COMMON PERIPHERAL NERVE BLOCKS

Upper Extremity Blocks:

**Brachial plexus block**: Interscalene, Supraclavicular, Infraclavicular & Axillary

**Indications**: for surgery of the shoulder, upper arm, lower arm, elbow, wrist or hand

**Expected Side Effects**:
- Horner’s syndrome – drooping of one eyelid, unequal pupils, facial flushing and nasal congestion
- Phrenic nerve block occurs in approx. 30-50% of patients, most asymptomatic (Brown, 2007)
- Problems with axillary blocks are infrequent because of the distance from neuraxial structures and the lung (Brown, 2007)

**Precautions**:
- Ambulatory patients with brachial plexus blocks should be fitted with an arm sling to prevent traction injury (Boezaart, 2006)
- Ensure proper position of limb in bed to avoid pressure points or extension/flexion of extremity

Lower Extremity Blocks:  
**Femoral, Sciatic, Popliteal-Fossa**

**Indications**:
- **Femoral**: for surgery of the anterior thigh, knee or repair of the quadricep tendon
- **Sciatic**: for any surgery below the knee – major foot & ankle reconstruction, TKR & BKA or AKA
- **Popliteal-Fossa**: extension of the sciatic block for surgical procedures below the knee such as foot/ankle, achilles tendon surgery or short saphenous vein stripping

**Expected Side Effects**:
- May have complete motor & sensory motor block to toes
  - Assess ability to lift/move leg (falls risk)
- Femoral block can be combined with a sciatic nerve block to block the entire lower extremity
- Popliteal-Fossa preserves hamstring function allowing for early ambulation but patients should be cautioned against weight bearing on a blocked lower extremity

**Precautions**:
- Patients may still feel deep pressure continue to assess for compartment syndrome
- Assess ability to lift/move leg prior to any ambulation
- Assess for foot drop
- At risk for heel breakdown, pressure ulcer or necrosis, provide and protect the affected limb with frequent positioning in anatomical alignment

Other Blocks:

**Transversus abdominis plane block (TAP)** indicated for lower abdominal surgeries i.e. bowel surgery, caesarean section, appendectomy, hernia repair, umbilical surgery & gynaecological surgeries. It is usually a single injection that can be unilateral or bilateral. It is particularly useful for patients when an epidural is contraindicated or refused.

**Paravertebral block** indicated for thorocotomy, nephrectomy, breast surgery or unilateral rib fractures. Spinal nerves are blocked just as they exit the vertebral canal and results in a unilateral sensory block. The catheter will be positioned along the spine and can look very similar to an epidural, as with all blocks, ensure that that the catheter and pump are clearly identified and labelled as a nerve block. An advantage of a paravertebral block is that it is not in the epidural space; therefore coagulation status of patients is not as critical and has less risk of complications.
The incidence of complications with peripheral nerve blocks is very low (Dahl & Raeder, 2003). The potential complications are:

- **Inadvertent intravascular injection**
  - Local anaesthetic toxicity due to intravascular injection (see Appendix 4 for signs and symptoms)

- **Potential damage to the numb area**:
  - The patient does not feel pain in the affected limb and may not be able to protect the limb from injury
  - Use caution if using heat or ice
  - Provide assistance for ambulation for lower extremity blocks
  - Provide the use of a sling for upper extremity blocks
  - Provide assistance with repositioning and place the affected limb in anatomical position

- **Infection** – observe for increased temperature, swelling, redness at site, increased pain.

- **Nerve damage**, extremely rare, becomes noticeable once the block has receded. The intensity and duration of symptoms vary with the degree of injury. Can present as light, intermittent tingling and numbness lasting a few weeks to a persistent, painful paresthesia, with sensory loss and/or motor weakness lasting for several months to years.

- **Hematoma formation**
  - Can occur if the needle punctures a vessel. Provide direct pressure to puncture site if occurs.

- The effects of the LA can spread to adjacent tissues and extend the sensory and motor block to other unintended muscle groups

- **Brachial Plexus Block & Thoracic Paravertebral Block**: Small possibility of **pneumothorax** (0.5%-5%), if occurs, symptoms can occur within minutes, but most often take several hours to develop.

(Wheeler, 2009; Turjanica, 2007; Brown, 2007; Kraft, 2009; Mukhtar, 2009)
INSERTION SITES FOR A FEW COMMON PERIPHERAL BLOCKS

Sciatic Nerve Block

Popliteal-Fossa Nerve Block

Femoral Nerve Block
MANAGING INEFFECTIVE ANALGESIA

- Provide breakthrough analgesia as indicated on the pre printed orders.
- Evaluate level of sensory block by assessing sensation to ice.
- Assess catheter insertion site and integrity of the system.
- Increase infusion rate as indicated on the pre printed orders.
- Optimize additional multi-modal medication as ordered (e.g. Tylenol, NSAID’s, etc.). Use non-pharmacological interventions such as positioning, distraction and relaxation.
- Notify APS or Anaesthesia for further orders once you have reached maximum parameters indicated on the pre printed orders.

NOTIFY APS or Anaesthesia.

- Low blood pressure and/or decrease pulse - parameters indicated on the pre printed orders.
- Progressive motor and/or sensory block.
- Inadequate analgesia.
- Signs and symptoms of Local Anaesthetic Toxicity - see appendix 4

DISCONTINUING THERAPY

- Once an order to discontinue therapy has been received, an RN can remove catheter. It is ideal to remove catheter after full limb sensation has returned.
  - NOTE when removing a lumbar plexus or Psoas nerve block catheter it is important to time removal appropriately if on anticoagulants:
    - Remove catheter 2 hours prior to next dose of unfractionated subcutaneous heparin.
    - If patient on once a day LMWH such as Dalteparin or Enoxaparin, removal must be 22 hours after last dose (2 hours prior to the next dose of Dalteparin or Enoxaparin).
- Position patient with limb extended.
- Use procedural gloves and pull gently on the catheter. If resistance met, stop procedure, tape catheter in place and notify APS or Anaesthesia.
- If radiating pain is experienced during removal of catheter, it may indicate that the catheter is intertwined with a nerve or nerve root, stop procedure and tape catheter in place and notify APS or Anaesthesia. Rarely, may require surgical removal (Boezaart, 2007).
- Inspect and ensure catheter is intact upon removal.
- Apply band aid to site for 24 hours.
- Document removal.
Pain Definitions, Physiology & Assessment

“Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.” (International Association for the Study of Pain, 1992).

“Pain is whatever the experiencing person says it is, existing whenever he says it does.” (McCaffery, 1968).

Pain is the number one reason people seek medication attention (Goldman, 2009). We also know:

- The pain experience is unique & personal
  - Severity and our response varies even with the same stimulus (Greener, 2009)
- ~75% of post operative patients report moderate to severe pain and as many as 58-91% of hospitalized patients report significant pain (Cadden, 2007)
- More than 70% of cancer patients have pain and 30% die in uncontrolled pain (Goldman, 2003)
- 1 in 5 Canadians suffer from chronic pain (Schopflocher, et al., 2010)
- Chronic pain costs Canadians more than $6 billion/year; more than heart disease, cancer and HIV combined (Schopflocher, et al., 2010)
- ~80% of long term care facility residents experience daily pain & 25-50% of community dwelling elders experience significant pain (D’Arcy, 2009)
- A survey of Canadian Universities report that veterinarians get 5 times more training than doctors (for people) and 3 times more training than nurses in pain management (Watt-Watson, et al., 2008)

There are significant harmful effects of under treated acute pain
### Adverse effects of unrelieved pain

<table>
<thead>
<tr>
<th>Category</th>
<th>Effects</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular</strong></td>
<td>Tachycardia, hypertension, ↑ peripheral vascular resistance, ↑ myocardial O2 consumption, myocardial ischemia, altered regional blood flow, DVT, pulmonary embolism</td>
<td>Unstable angina</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Myocardial infarction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DVT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE</td>
</tr>
<tr>
<td><strong>Respiratory</strong></td>
<td>↓ lung volumes, atelectasis, ↓ cough, sputum retention, infection, hypoxemia</td>
<td>Atelectasis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pneumonia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hypoxemia</td>
</tr>
<tr>
<td><strong>Gastrointestinal/Genitourinary</strong></td>
<td>↓ gastric and bowel motility, ↑ risk of bacterial transgression of bowel wall Urinary retention</td>
<td>Constipation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anorexia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ileus</td>
</tr>
<tr>
<td><strong>Neuroendocrine/Metabolic</strong></td>
<td>Altered release of multiple hormones (glucagon, GH, vasopressin, insulin, catecholamines, etc)</td>
<td>Hyperglycemia, Wt loss, Impaired wound healing, Impaired immune function</td>
</tr>
<tr>
<td><strong>Musculoskeletal</strong></td>
<td>Muscle spasm, immobility (↑ risk of DVT) impaired muscle mobility &amp; function</td>
<td>Immobility, Weakness, Fatigue, Muscle wasting</td>
</tr>
<tr>
<td><strong>Psychological</strong></td>
<td>Anxiety, fear, helplessness</td>
<td>↑ pain, sleep deprivation, suffering</td>
</tr>
<tr>
<td><strong>Central Nervous</strong></td>
<td>Central sensitization</td>
<td>Chronic (persistent) pain</td>
</tr>
</tbody>
</table>

### Incidence of Chronic Pain After Surgery

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>Incidence of chronic pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amputation</td>
<td>30-85%</td>
</tr>
<tr>
<td>Thoracotomy</td>
<td>5-67%</td>
</tr>
<tr>
<td>CABG</td>
<td>30-50%</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>11-57%</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>3-56%</td>
</tr>
<tr>
<td>Inguinal hernia repair</td>
<td>0-63%</td>
</tr>
<tr>
<td>Vasectomy</td>
<td>0-37%</td>
</tr>
<tr>
<td>Dental surgery</td>
<td>5-13%</td>
</tr>
</tbody>
</table>

*From: Macintyre and Schug (2007)*

**Undertreated acute pain can lead to chronic pain**

*From: Macintyre and Schug (2007)*
Nociception

This is the process for pain to become a conscious experience. There are 4 steps involved in the process:

1. **Transduction** – is the conversion of a stimulus (mechanical, chemical or thermal) into an electrical impulse

2. **Transmission** – the impulses are carried from the site of injury to the dorsal horn by:
   - **Aβ fibers**: large, myelinated, fast fibers - transmit *fine touch; pressure; vibration*
   - **Aδ fibers**: small, myelinated, slow fibers – transmit *crude touch; cold; fast & sharp pain*
   - **C fibers**: small, unmyelinated, very slow fibers – transmit *temperature; dull, aching or burning pain*

Glutamate is the main neurotransmitter that delivers the pain signal from the peripheral nociceptors to the dorsal horn neurons in the spinal cord. The pain signal then follows up the spinothalamic tract to the thalamus.

3. **Perception** – the thalamus acts as a relay station for processing the pain information. Pain is believed to become a conscious experience in a number of areas of the brain.
   - Reticular system is believed to be responsible for autonomic responses to pain----warning!
   - Somatosensory cortex localizes and characterizes pain
   - Limbic system is responsible for the emotional and behavioural responses to pain

4. **Modulation** – the cortex signals the descending pathway to *modulate* (change or inhibit) the pain impulse. These descending fibres release substances (endogenous opioids, serotonin (5HT) and norepinephrine) that bind to the opioid receptors and prevent the release of the neurotransmitters such as glutamate or substance P, thereby obstructing the pain signal from being transmitted. Some people have well defined modulation pathways, while others have less ability to modulate, which is one of the reasons pain is so subjective.

(Pasero & McCaffery, 2011)
Pain Classification: Pain can be classified by time duration or inferred pathophysiology.

Inferred Pathophysiology

- Nociceptive (Acute) which is the activation of the nociceptive system by tissue injury (AMA, 2010)
- Neuropathic pain which is identified as damage to or dysfunction of the peripheral or central nervous system (AMA, 2010)

Look at the table below. Your patient’s description of their pain will help determine the type and possible cause of their pain. This will help to establish a treatment plan.

<table>
<thead>
<tr>
<th>Location</th>
<th>Descriptors</th>
<th>Examples</th>
</tr>
</thead>
</table>
| **Somatic**  
Skin & mucosa  
Upper GI tract & anus  
Muscles, joints and bones | Sharp, constant, throbbing, gnawing, aching, stinging – Well localized | Pressure sores, ulcers, surgical pain, sprained ankle, fractures, burns, metastasis |
| **Visceral**  
Thoracic & Abdominal Organs & GI tract | Deep, cramping, squeezing, aching, sometimes felt as pressure  
Can radiate/refer Diffuse pain, NOT well localized | Pancreatitis, bowel obstruction, menstrual pain, abdominal colic |
| **Neuropathic Pain**  
Central & Peripheral nervous systems | Burning, shooting, tingling, electric, pins & needles, itchy  
May be referred to area the nerve would normally supply | Herpes zoster (shingles), diabetic neuralgia, post stroke pain (central pain), phantom limb pain, sciatica, tumour infiltration into nerves |

*Both nociceptive and neuropathic pain can become chronic pain.*

Pain classified by **time duration**:

- Acute pain
- Chronic pain is classified as pain that persists beyond the usual course of injury (Jackman & Mallett, 2008).

There are some distinct differences between acute and chronic pain:

<table>
<thead>
<tr>
<th>Characteristics of Acute &amp; Chronic Non-Cancer Related Pain</th>
<th>Acute Pain</th>
<th>Chronic Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Hours to weeks</td>
<td>Months to years- Persists beyond the usual course of injury</td>
</tr>
<tr>
<td>Obvious Pathology</td>
<td>Yes</td>
<td>Commonly none - May spread beyond the original point of injury</td>
</tr>
<tr>
<td>Prognosis</td>
<td>Predictable</td>
<td>Unpredictable</td>
</tr>
<tr>
<td>Biological Purpose</td>
<td>Yes</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Nerve Conduction</td>
<td>Rapid</td>
<td>Slow</td>
</tr>
<tr>
<td>Autonomic Nervous System</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Involvement</td>
<td>Depression, anxiety, sleeplessness, hopelessness</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Associated problems</td>
<td>Uncommon</td>
<td></td>
</tr>
<tr>
<td>Social Effects</td>
<td>Few</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>Multimodal; adjuvants 1st line treatment, behavioural-cognitive therapies significant</td>
<td></td>
</tr>
</tbody>
</table>

**ASSESSMENT**

Assessment, knowledge and treatment of your patients' pain are important to their overall recovery and wellbeing. Assess your patients' pain at least once a shift and every 2 to 4 hours if your patient has had surgery or a painful intervention. The following is a mnemonic to help you systematically and consistently assess your patient.

- **Onset or other symptoms** – Is the onset gradual or sudden? When did it start? Are you having other symptoms, such as night sweats, fever, chills, or weakness?
- **Provoker or Palliate** - What makes the pain worse? What makes it better?
- **Quality** – Listen for descriptors to help identify type of pain, acute or neuropathic pain, i.e. sharp, shooting, or aching etc.?
- **Region & Radiation** – Where is the pain? Examine the site to look for swelling, inflammation or deformity. Does it radiate to other parts of the body?
- **Severity** – Use a standardized scale. Does the pain interfere with activities?
- **Timing** – Is the pain constant or intermittent? How often does it occur and how long does it last? Does it usually occur at a particular time of day?

McLafferty & Farley, 2008

**Unidimensional Pain Intensity Scales:**

Pain intensity scales are quick and easy to use and provide rapid feedback about the effectiveness of interventions and they are proven valid and reliable measures for pain intensity. Pain is a multidimensional experience that includes sensory, emotional, psychological and cultural components that can not be captured in a unidimensional pain scale alone (Wurhman & Cooney, 2011). Pain intensity scales should be used in conjunction with a comprehensive pain assessment and to determine changes in intensity and effect of treatment.

- **Numeric Pain Scale**
  - Most commonly used in FHA
  - Patients are asked to rate their pain on a scale from 0-10
  - Found to be reliable and easy to understand

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain</td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td>Worst Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Verbal Descriptors**
  - The patient is asked to pick a category:
    - None
    - Mild
    - Moderate
    - Severe
    - Excruciating
  - Requires comprehension of the meaning of the descriptors

- **Faces**
  - Great for children up to 12 years old
  - Used successfully for people with moderate to severe dementia
  - Use once the person demonstrates inability to use numeric pain scale
  - Patient is asked to pick the face that best represents their pain severity

Adapted from Ashburn MA, Staats PS. Management of chronic pain. Lancet. 1999 353; 1865-186
Some patients may be unable to tell you they have pain. Patients who may be unable to respond to an established pain assessment may include young children and infants, those with cognitive impairment, patients with dysphasia/aphasia or those that are critically ill. An alternative approach to assess for the presence of pain is to consider the Hierarchy of Importance of Pain Measures.

1. **Attempt to obtain self-report.** Patients with mild to moderate cognitive impairment have been shown to be able to answer simple questions about their pain. Older patients may prefer to use other terms for pain such as ache, sore or hurt. Additionally, critically ill ventilated patients that are awake and oriented, may be able to point to a scale or squeeze their eyes tightly to indicate the presence of pain. The finger span scale has been used in critically ill children which is demonstrated by holding your index finger to your thumb to illustrate ‘no pain’, then spread the thumb and index finger further apart slowly to demonstrate ‘tiny’ or ‘medium’ or ‘worst’.

2. **Consider painful or potentially painful underlying conditions or procedures.** When pain is indicated, ‘assume pain is present’ and provide treatment for pain. For example, if a cognitively impaired patient has been admitted for a fractured hip and is unable to self report pain, knowing a fractured hip is painful, it is appropriate to administer analgesia, especially in anticipation of physiotherapy, ADL’s etc.

3. **Observe behaviours,** patient behaviours may provide ‘clues’ as to whether your patient is experiencing pain. Behaviours such as restlessness, ↓ movement, facial expressions, irritability, rigidity, moaning, or a change in usual behaviour may indicate the presence of pain. Often a family member who knows the patient may be able to provide information about usual behaviour in the presence of pain. There are validated assessment tools that are available such as the Pain Assessment in Advanced Dementia Scale (PAINAD) or Behavioural Pain Scale (BPS).

4. **Evaluate physiological indicators** of pain such as tachycardia, altered BP, diaphoresis, crying, and anorexia. Keep in mind, physiological indicators are the least sensitive indicator and may indicate conditions other than pain.

5. **Conduct an analgesic trial,** which is the administration of low dose analgesic when pain is suspected, then observe for any changes in behaviour. An improvement in behaviour may indicate a positive analgesic trial, the purpose of the trial is to confirm the presence of pain and provide the foundation to develop a treatment plan.

Pasero, C., (2009)

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**KEY PRINCIPLES TO MANAGE PAIN**

- The goal is to reduce the pain to an acceptable level as defined by the patient that allows them to participate in physiotherapy & ADL’s, deep breathe and cough etc.
- Involve the patient, family and other disciplines in goal setting and developing analgesic strategies
- *A thorough assessment is important* – assess for type(s) of pain, know what you are treating
- Do not delay treating pain, especially if severe
- *A multi-modal (or balanced) approach* is recommended (pharmacological and non-pharmacological) that act by different mechanism targeting areas all along the pain pathway
- Prevention is better than treatment – give meds regularly
- Titrate opioids to effect
The patient should understand the importance of good pain management. Many patients do not realize there are significant consequences of prolonged, unrelieved pain which can significantly impede their recovery and lead to complications.

Assist your patient to set a realistic pain goal. For most acute pain patients, a pain goal of 3 or less is realistic. This level allows the patient to mobilize, breathe deeply and cough freely.

The patient should know how you will be communicating with them. Teach your patient how to use the pain scale and to expect frequent pain assessments.

Encourage your patients to contact you if their pain level is unacceptable so you can intervene. Up to 60% of patients will wait to be asked before requesting analgesia (Bell & Duffy, 2009)
**APPENDIX 1: PCA, EPIDURAL, NERVE BLOCK & SPINAL BOLUS ASSESSMENT**

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th>PCA</th>
<th>EPIDURAL</th>
<th>NERVE BLOCK</th>
<th>SPINAL BOLUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedation scale &amp; respiratory: rate, rhythm &amp; quality</td>
<td>q2h X 24 hrs, then q4h with VS (includes PCA history &amp; pain scale)</td>
<td>q1h X 12hrs; then q2h X 12 hours; then q4h with VS <strong>Continue monitoring for 24 hours after infusion with MORphine or HYDROMorphine stopped.</strong></td>
<td>q4h</td>
<td>♦ MORphine or HYDROMorphine bolus q1h X 12 hrs and then 2h x 12 hrs ♦ Fentanyl bolus: q1h X 2 hrs</td>
</tr>
<tr>
<td>BP &amp; pulse</td>
<td>q4h</td>
<td>q30 min X 2 hrs (in PACU); q1h X 1 after any increase in infusion; then q4h</td>
<td>q4h</td>
<td>q4h</td>
</tr>
<tr>
<td>Motor Block and assess for any changes in sensation to abdomen/legs</td>
<td>N/A</td>
<td>q4h (motor function and CWMS to affected limb)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Dermatome &amp; assess for local anaesthetic toxicity</td>
<td>N/A</td>
<td>q8h</td>
<td>q8h</td>
<td>N/A</td>
</tr>
<tr>
<td>Post removal assessment</td>
<td>Continue with routine vital signs or as ordered</td>
<td>Continue with routine vital signs Assess q4h X 24 hrs for potential signs of an epidural hematoma. • hip/dorsi/planter flexion and extension • monitor for changes in sensation to abdomen &amp; legs and/or new onset back pain. ** Notify anaesthesiologist ASAP for any changes</td>
<td>Check site 30 minutes post removal Continue with routine vital signs or as ordered</td>
<td>Continue with routine vital signs or as ordered</td>
</tr>
<tr>
<td>Pain scale</td>
<td>q4h while awake and more frequently if pain not well controlled and/or above patient’s pain goal</td>
<td>♦ Maintain IV access (Saline locked or infusion) for duration of therapy ♦ Assess system integrity q shift ♦ Assess insertion site/dressing q shift ♦ Ensure resuscitation equipment is readily available and in working order If sedation greater than 3 and/or respiratory rate less than 10 stop infusion: give NALOXONE and contact Anaesthesiology/APS stat.</td>
<td>♦ Maintain IV access (Saline locked or infusion) for duration of therapy ♦ Assess system integrity q shift ♦ Assess insertion site/dressing q shift ♦ Ensure resuscitation equipment is readily available and in working order If sedation greater than 3 and/or respiratory rate less than 10 stop infusion: give NALOXONE and contact Anaesthesiology/APS stat.</td>
<td></td>
</tr>
<tr>
<td>Additional considerations for all modalities</td>
<td>♦ Maintain IV access (Saline locked or infusion) for duration of therapy ♦ Assess system integrity q shift ♦ Assess insertion site/dressing q shift ♦ Ensure resuscitation equipment is readily available and in working order If sedation greater than 3 and/or respiratory rate less than 10 stop infusion: give NALOXONE and contact Anaesthesiology/APS stat.</td>
<td>♦ Postural BP, pulse &amp; ensure full motor control of lower limbs prior to first ambulation ♦ See APS orders for epidural removal Post epidural boluses with local anaesthetic, monitor VS: ♦ q5min X 3 ♦ q15min X 1 ♦ q30min X 1</td>
<td>♦ Maintain IV access (Saline locked or infusion) for duration of therapy ♦ Assess system integrity q shift ♦ Assess insertion site/dressing q shift ♦ Ensure resuscitation equipment is readily available and in working order If sedation greater than 3 and/or respiratory rate less than 10 stop infusion: give NALOXONE and contact Anaesthesiology/APS stat.</td>
<td></td>
</tr>
</tbody>
</table>

**Specific considerations**
- ♦ Maintain IV access (Saline locked or infusion) for duration of therapy
- ♦ Assess system integrity q shift
- ♦ Assess insertion site/dressing q shift
- ♦ Ensure resuscitation equipment is readily available and in working order If sedation greater than 3 and/or respiratory rate less than 10 stop infusion: give NALOXONE and contact Anaesthesiology/APS stat.

- ♦ Postural BP, pulse & ensure full motor control of lower limbs prior to first ambulation
- ♦ See APS orders for epidural removal Post epidural boluses with local anaesthetic, monitor VS:
  - ♦ q5min X 3
  - ♦ q15min X 1
  - ♦ q30min X 1

- ♦ Ensure infusion pump is clearly labelled as regional nerve block.
- ♦ Need order to remove catheter
- ♦ For lower extremity blocks, assess pt’s ability to dorsi/plantar flex foot & perform straight leg raise before ambulation
APPENDIX 2: SEDATION SCALE, DERMATOME ASSESSMENT & MOTOR BLOCK

Increased SEDATION is an indicator of impending respiratory compromise (Pasero, 2009). Your sedation assessment is very important to the overall success pain management.

<table>
<thead>
<tr>
<th>Pasero Opioid-induced Sedation Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Awake and alert</td>
</tr>
<tr>
<td>Acceptable; no action necessary; may increase opioid dose as per orders</td>
</tr>
<tr>
<td>2 Slightly drowsy, easily aroused</td>
</tr>
<tr>
<td>Acceptable; no action necessary; may increase opioid dose as per orders</td>
</tr>
<tr>
<td>3 Frequently drowsy, rousable but drifts off to sleep during conversation</td>
</tr>
<tr>
<td>Unacceptable; stop any basal or ongoing opioid infusions; monitor respiratory status and sedation closely until sedation level is stable at 2 or less and respiratory status is satisfactory; Decrease future opioid dose by 25-50%. Contact anaesthesiologist/APS if sedation level persists or respiratory rate drops below 10.</td>
</tr>
<tr>
<td>4 Somnolent, minimal or no response</td>
</tr>
<tr>
<td>Unacceptable; stop opioid. Administer NALOXONE as ordered and notify anaesthesiologist/APS</td>
</tr>
</tbody>
</table>

DERMATOME ASSESSMENT

You are looking for a “change in temperature sensation” (sensory block) which will indicate where the epidural is in effect.

- Use ice (inside a glove or baggie)
- Gently touch the patient’s face with the ice to demonstrate the coldness
- Start at the upper anterior chest and work downwards until the patient states that it does NOT feel as cold – this is the top dermatome level
- Continue downwards until the patients states it feels cold again: - the level above this is the bottom dermatome level
- Repeat procedure on the other side of the body

<table>
<thead>
<tr>
<th>Motor Block Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>
### APPENDIX 3: POTENTIAL OPIOID RELATED COMPLICATIONS

<table>
<thead>
<tr>
<th>Complication</th>
<th>Rationale</th>
<th>Intervention</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **Respiratory Depression**          | • Increased SEDATION is an indicator of impending respiratory compromise  
• Less opioid is required to produce sedation than respiratory depression, therefore patients will be sedated before they will show signs of respiratory depression  
• Use a sedation scale if administering opioids (Pasero, C., 2009)                                                                 | • Assess and record sedation scale  
• Assess rate, rhythm, and quality of respirations  
• Ensure safety equipment at bedside  
• If RR less than 10 and/or sedation scale greater than 2 - STOP PCA or Epidural infusion and:  
  o Administer O₂ as necessary  
  o If apneic, call code blue  
  o **Give NALOXONE** as ordered STAT  
  o Call anaesthetist STAT and identify call as respiratory depression  
  o Continue to monitor                                                                 | • Note: the duration of the opioid is GREATER than NALOXONE  
• The onset of naloxone is 30 sec – 2 min and wears off in 30 min  
• Close monitoring is essential due to the risk of re-narcotization  
• If patients’ VS stable, try to use small, incremental doses of naloxone to reverse respiratory depression and to prevent rebound pain |
| **Nausea and Vomiting**             | • Very common side effect and most disturbing to patients                                                                                                                                               | • Provide antiemetic promptly and regularly  
• Antiemetics can be found on the pre printed orders  
• If attempts to control nausea and vomiting are unresolved, contact APS or anaesthesia                                                                 | • Less nausea & vomiting with epidural administration  
• Nausea can be as distressing as pain |
| **Pruritus**                        | • Some opioids cause the release of histamine from the mast cells, resulting in local or generalized itching                                                                                         | • Orders to initiate treatment are found on the pre printed orders                                                                                                                                                             | • Pruritus does not always require treatment  
• Assess your patient for itching and if it is disturbing, initiate treatment |
| **Urinary Retention**               | • Opioids increase smooth muscle tone                                                                                                                                                                   | • Assess for urinary retention  
• Perform in & out catheter prn                                                                                                                                                                                               |                                                                                                                                                                  |
| **Decreased gastric motility (constipation)** | • Opioids delay gastric emptying, slow bowel emptying and decrease peristalsis                                                                                                                         | • Assess and record bowel movements on your nurses’ notes or daily flow sheet  
• Assess for bowel sounds  
• Provide bowel protocol as ordered  
• If none ordered, inform physician and obtain orders                                                                                                               | • Most common opioid side effect  
• Can progress to severe GI dysfunction including ileus, fecal impaction or obstruction |
<table>
<thead>
<tr>
<th>Complication</th>
<th>Rationale</th>
<th>Interventions</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension</td>
<td>• Caused by the local anaesthetic blocking the sympathetic nerve fibres causing vasodilatation</td>
<td>• Lower patients head of bed, provide O₂ if necessary&lt;br&gt;• Assess volume status&lt;br&gt;• Notify anaesthesia, anticipate IV fluid bolus, and/or blood&lt;br&gt;• Stop epidural if necessary – if resistive to the above interventions, the anaesthetist may give ephedrine to cause vasoconstriction&lt;br&gt;• VS must be monitored Q5min until stable – only a physician or critical care nurse may give ephedrine&lt;br&gt;• The physician needs to remain until patient stable&lt;br&gt;• Ensure other possible causes of hypotension (fluid status, bleeding etc) are assessed&lt;br&gt;• Keep accurate intake and output&lt;br&gt;• Assess lab work such as haemoglobin regularly post op</td>
<td>• Ensure other possible causes of hypotension (fluid status, bleeding etc) are assessed&lt;br&gt;• Keep accurate intake and output&lt;br&gt;• Assess lab work such as haemoglobin regularly post op</td>
</tr>
<tr>
<td>High Block</td>
<td>• A high block is one that has ascended to T₂, (axilla) and is an undesired level of sensory and/or motor anaesthesia</td>
<td>• Assess your patients’ ability to cough, deep breathe and maintain their airway. If no difficulty noted, may need to decrease the epidural infusion and have the patient sit upright until block recedes, if unsure, notify APS or anaesthesia&lt;br&gt;• Monitor patient closely for respiratory compromise, and ability to maintain their airway, if any difficulty noted, TURN OFF infusion, provide O₂ as necessary and notify APS or anaesthesia</td>
<td>• Some patients may experience bradycardia with high block, treated usually with atropine</td>
</tr>
<tr>
<td>Urinary Retention</td>
<td>• Occurs due to a blockade of sensory fibers that innervate the bladder</td>
<td>• Monitor and assess for urinary retention&lt;br&gt;• Catheterize if necessary</td>
<td>More common with lumbar epidurals. Patients with higher epidurals (above T₁₀) typically do not require a urinary catheter just because of the epidural infusion&lt;br&gt;• Patients may lose the ability to sense if their bladder is full</td>
</tr>
<tr>
<td>Nausea</td>
<td>• A result of parasympathetic over activity</td>
<td>• Provide antiemetic promptly and regularly as per pre printed orders&lt;br&gt;• Orders to initiate treatment are found on the pre printed order set</td>
<td>• Nausea can be as distressing as pain</td>
</tr>
<tr>
<td>Local Anaesthetic</td>
<td>• More likely with epidural administration than spinal because of the highly vascular nature of the epidural space&lt;br&gt;• Occurs when the LA is absorbed and circulated systemically</td>
<td>• Occurs when a local anaesthetic is given systemically (i.e. IV).&lt;br&gt;<strong>Early signs:</strong> perioral numbness, tinnitus, and dizziness&lt;br&gt;<strong>Stop the epidural infusion immediately and notify APS or Anaesthesia</strong>&lt;br&gt;<strong>Later signs:</strong> hypotension, bradycardia, heart block, blurred vision, shaking, excitement, confusion, sedation convulsions and loss of consciousness&lt;br&gt;Provide resuscitative measures as needed, call anaesthesia STAT, call code if needed</td>
<td>• Rarely, but can occur as a result of an epidural catheter migrating into a blood vessel in the epidural space</td>
</tr>
</tbody>
</table>

**APPENDIX 4: POTENTIAL COMPLICATIONS RELATED TO LOCAL ANAESTHETICS**
References


Nurses. Chapter 9, p. 245-268.


Visser, L. (2001). Epidural anaesthesia. Update in Anaesthesia, 13 (11),


