

HPC Nursing cross sector  
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Pharmacists  
Analgesia Consensus  
Neuroaxial Opioids patient centered  
Physicians  
Interventional epidural evidence based  
**Intraspinal (Neuraxial) Analgesia**  
Best Practice vertebral column  
Waterloo Wellington HPC Protocol **Excellence**

## Community Self-Learning Package

WATERLOO WELLINGTON HPC EDUCATION COMMITTEE;  
INTRASPINAL EDUCATION TASK FORCE

**Acknowledgement to St. Mary's General Hospital Acute Pain Service  
for Sharing their Epidural Analgesia in  
Community Self Learning Package**

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# Intraspinal (Neuraxial) Analgesia

## Community Self Learning Package

### Introduction

This self-learning package has been designed as a comprehensive reference and teaching guide for the Waterloo Wellington community nurses involved in the monitoring and management of palliative care patients receiving intraspinal or neuraxial analgesia for the management of intractable cancer pain.

Cancer Care Ontario (CCO) recommends that a clear discharge plan is required as defined by protocols, that includes roles and responsibilities of care providers to ensure timely response should complications arise and appropriate patient follow-up by members of the team. (Myers et al. 2009)

### Learning Activities

By completing this self-learning module, the learner will be able to:

- Describe the anatomy and physiology of pain
- List the indications and contraindications for the use of Intraspinal / Neuraxial Analgesia for palliative care patients with intractable cancer pain
- Describe the mechanism of the pain response related to Intraspinal / Neuraxial Analgesia
- Recognize the pharmacology related to opioids and local anesthetics used in the intraspinal space
- Recognize the potential side effects and complications of Intraspinal / Neuraxial Analgesia
- Recognize and manage an emergency situation related to intraspinal analgesia
- Know when to call the physician related intraspinal analgesia
- Understand the nursing monitoring, management and documentation required for patients receiving Intraspinal / Neuraxial Analgesia for pain control
- Educate patients and families related to the care involved in this method of pain control
- Summarize and be familiar with the WW Palliative Care Intraspinal (Neuraxial) Analgesia Protocol for Nursing (see Appendix A)

### Learning Activities / Authorization

The management and monitoring of any patient receiving Intraspinal / Neuraxial Analgesia is considered an advanced nursing competency and may only be performed by an RN who has received initial authorization according to their agency's policy.

In order to meet the objectives and obtain authorization, you will be required to successfully complete the following:

- Intraspinal / Neuraxial Analgesia Community Self-Learning Package
- Demonstrate the appropriate assessment and documentation guidelines for the patient receiving Intraspinal / Neuraxial Analgesia; this will be evaluated by your agency
- Complete and pass (at least 80% correct) the written quiz

### BACKGROUND

In the Waterloo Wellington (WW) Local Health Integration Network (LHIN), there is a commitment from nursing to ensure readiness and competency in the pain management of palliative care cancer patients with intractable pain who require more complex methods of pain control. This *Intraspinal Community Self Learning Package* mirrors the 2010 *WW Ketamine Protocol for Community* with matching education. Both the Ketamine and Intraspinal protocols and education modules were developed, understanding and appreciating the interdisciplinary relationship necessary to successfully provide care to these complex patients requiring interventional pain management. "The nursing profession is committed to the provision of comfort and the prevention of pain. The administration of analgesics is within the scope of nursing practice and has long been identified as an essential nursing responsibility. The RN is widely recognized as the patient's pain manager in the home, hospital, and other care settings". (Pasero 2007, p 49)

Advances in technology over the past several years have resulted in analgesics being administered by a variety of catheter techniques. (Pasero 2007)

These documents were developed solely for the purpose of program requirements to support nursing practice for these treatments.

## WHY USE NEURAXIAL/INTRASPINAL ANALGESIA?

Approximately 14% of patients suffer from pain refractory to systemic opioid administration in combination with adjuvant drug therapy using the World Health Organization (WHO) principles. Conventional medical management can produce side effects (nausea and vomiting, constipation, over-sedation, confusion, and pruritus, etc) which are more distressing than the pain itself. (Coyne et al. 2005)

Other research reports 95% of patients with cancer pain will receive relief with widely available oral or parental opioids and adjuvant medications. (Hawley et al. 2009)

Whatever the actual percentage, there is a small group of patients who do not receive relief from conventional opioid therapy and appropriately should be considered for interventional pain management.

Although it is considered a standard therapy for patients with intractable cancer pain, there are variations in practice related to expense, educational needs of health care providers and lack of anesthesia and other technical support in palliative care settings.

Despite infrequent system need, patients who require intraspinal analgesia most often experience extreme suffering in their journey towards pain relief. They are often transferred from distant locations to access a specialized team.

It is recognized that the initiation of a technical and intensive/ invasive medical intervention seems to conflict with the non-interventional hospice philosophy. However patients who receive intraspinal analgesia agree that their pain had been significantly reduced and were glad to have access to it even if complications occurred. In Canada, the option of receiving intraspinal analgesia via catheter technique for pain management is limited. "Despite established efficacy, safety and cost effectiveness, this is considered an extraordinary measure". (Hawley et al. 2009, p 371)

## DEFINITIONS

"The term **intraspinal** refers to the spaces or potential spaces surrounding the spinal cord or the nerve roots that constitute the cauda equina. Most often, the term is used when referring to the epidural and intrathecal spaces, each of which offers a route of administration for medications. The word **neuraxial** also is used to describe the group of spaces into which analgesic drugs can be administered. The word **spinal** is used interchangeably with the word **intrathecal** when referring to route of administration". (Pasero & McCaffery 2011)

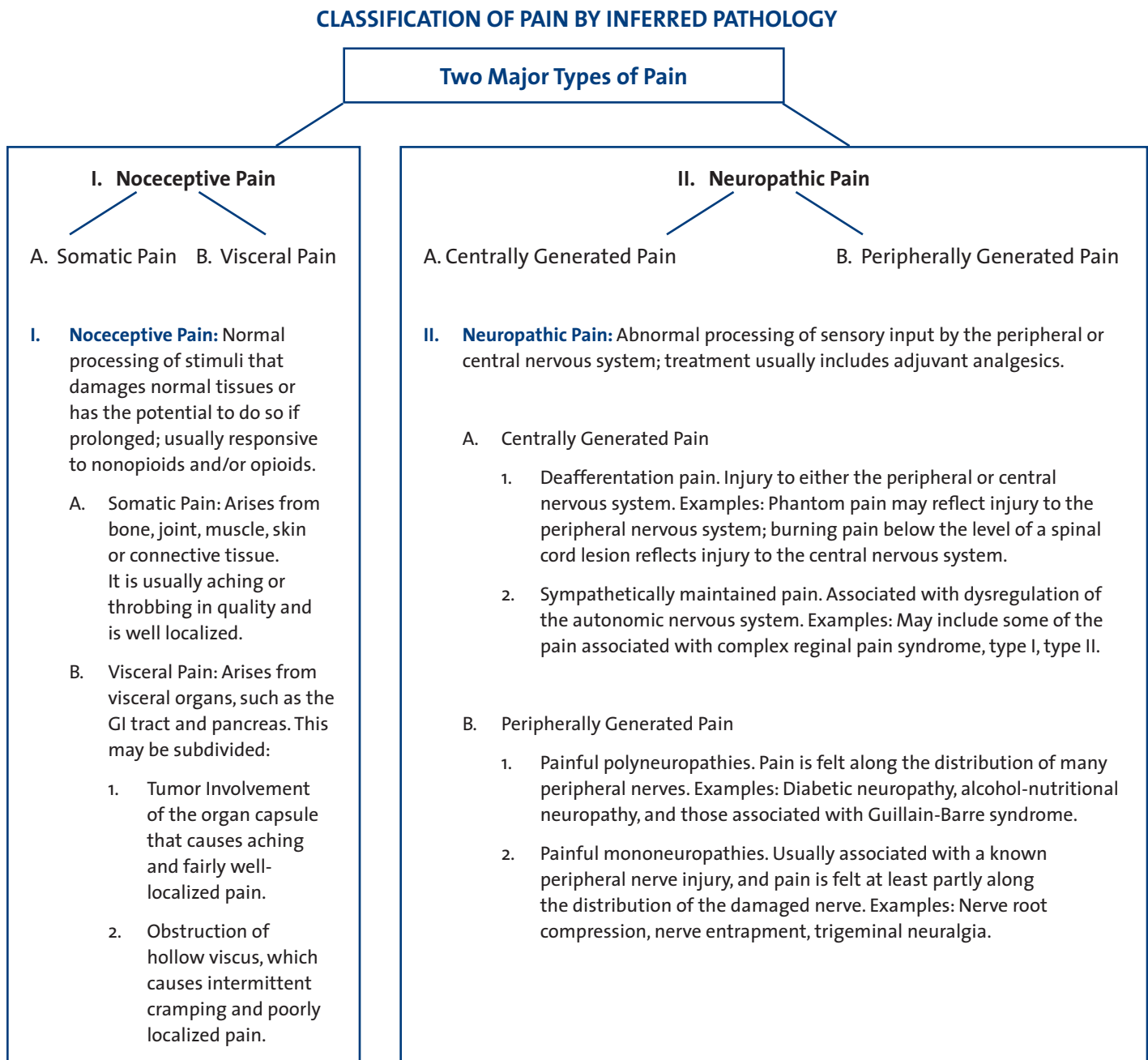
**For the purposes of this learning package, Intraspinal will be used as the term to describe either Neuraxial or Intraspinal Analgesia.**

Indications for intraspinal analgesia:

- Pain unresponsive to the usual routes of analgesia
- Dose limiting side effects

Contraindications would include:

- Active systemic or local infection at catheter site or site of implantation
- Anticoagulant therapy, bleeding disorders
- Increased intracranial pressure
- Spinal pathology
- Drug allergy

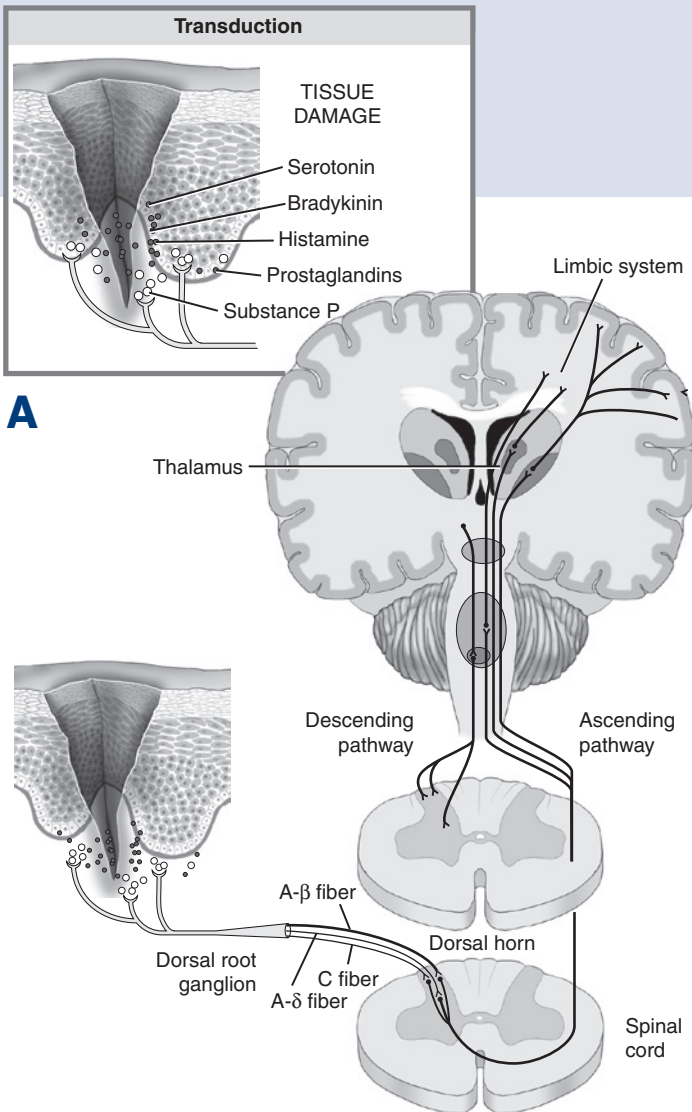


**Figure 1** A method of classifying pain is by inferred pathophysiology: I, Nociceptive pain, stimuli from somatic and visceral structures; II, Neuropathic pain, stimuli abnormally processed by the nervous system.

Pasero, C. & McCaffery, M. *Pain assessment and pharmacological management*, p.2, St. Louis, Mosby. Data from Max MB, & Portenoy, R. K. (2003). Methodological challenges for clinical trials of cancer pain treatments. In C.R. Chapman, & K.M Foley (Eds), *Current and emerging issues in cancer pain: Research and practice*, New York, Raven Press: Portenoy, R.K. (1996). Neuropathic pain. In R.K. Portenoy, & R.M. Kanner (Eds). *Pain management: Theory and practice*, Philadelphia, FA Davis. @2011, Pasero C, McCaffery M. May be duplicated for use in clinical practice.

# Nociception

- The neural processing of noxious stimuli



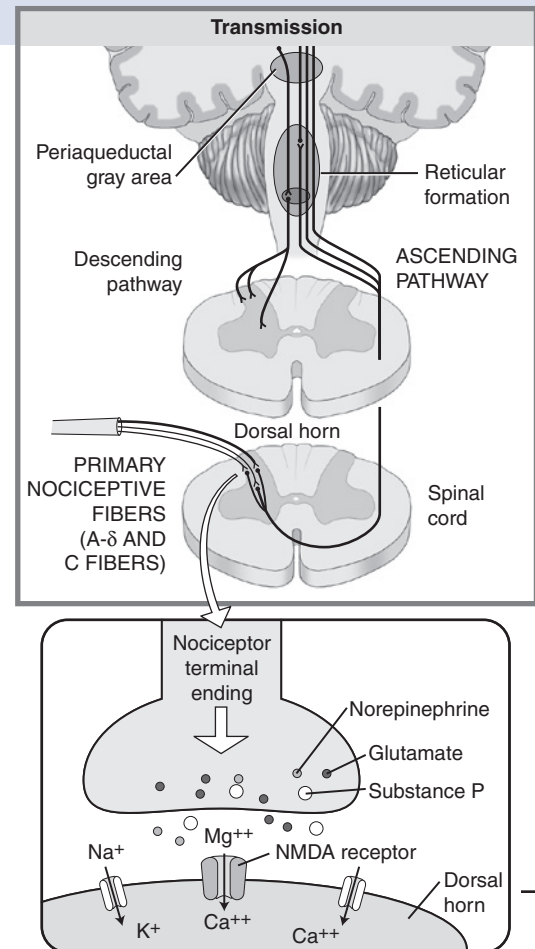
## A: Transduction

- Conversion of one energy form to another.
- Starts at the periphery when noxious stimulus causes tissue damage.
- Primary nociceptive fibers (afferents) are activated.
- Numerous excitatory substances are related and facilitate the further activation of nociceptors. These substances are collectively labeled an “inflammatory soup” and include:
  - Prostaglandins
  - Bradykinin
  - Substance P
  - Serotonin
  - Histamine
- Ion transfers (e.g.,  $Ca^{++}$ ,  $Na^+$ ,  $K^+$ ) generate an action potential

- Described in four processes:

- Transduction (A)
- Transmission (B)
- Perception (C)
- Modulation (D)

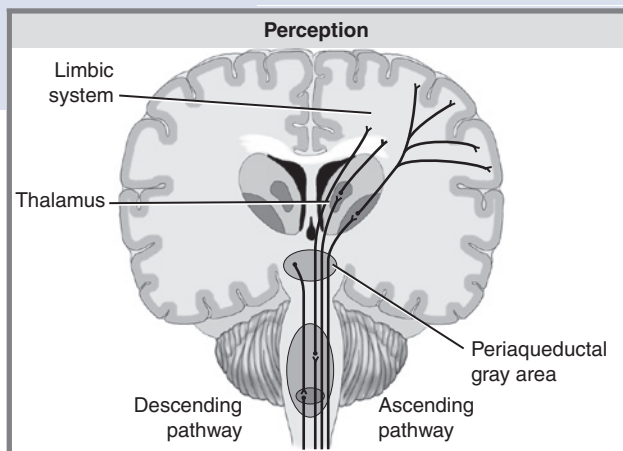
## B



## B: Transmission

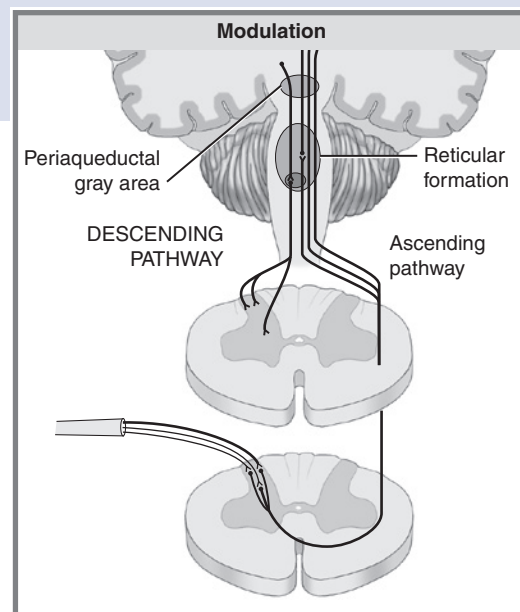
- Primary afferents continue the impulse via A-delta and C fibers (nerve axons) from the periphery to the spinal cord
  - A delta: Larger, myelinated, fast conduction: “first pain” (withdrawal)
  - C fibers: Smaller, unmyelinated, slow conduction: “second pain”
  - A-beta ( $\beta$ ) fibers respond to touch, vibration, and movement; largest of the fibers, myelinated, fast conductin; A- fibers do not normally transmit pain
- Afferent information passes through the dorsal root ganglia to the spinal cord where it synapses in the dorsal horn and connects to the “second order” neuron (see INSET below)
- The stimulus is continued from the spinal cord via multiple ascending pathways to the brainstem and higher cortical levels.



**C**

### C: Perception

- End result of the neural activity of pain transmission
- Conscious awareness of pain
- Requires a network of cortical and subcortical gray matter
- Includes processes that influence movement, emotions, and drives related pain

**D**

### D: Modulation

- Inhibitory mechanisms
- Local and descending processes occur in multiple sites from the periphery to the cortex, most importantly in the spinal cord
- Involves the release of numerous neurochemicals which include:
  - Endogenous opioids
  - Serotonin
  - Norepinephrine

### B: Inset

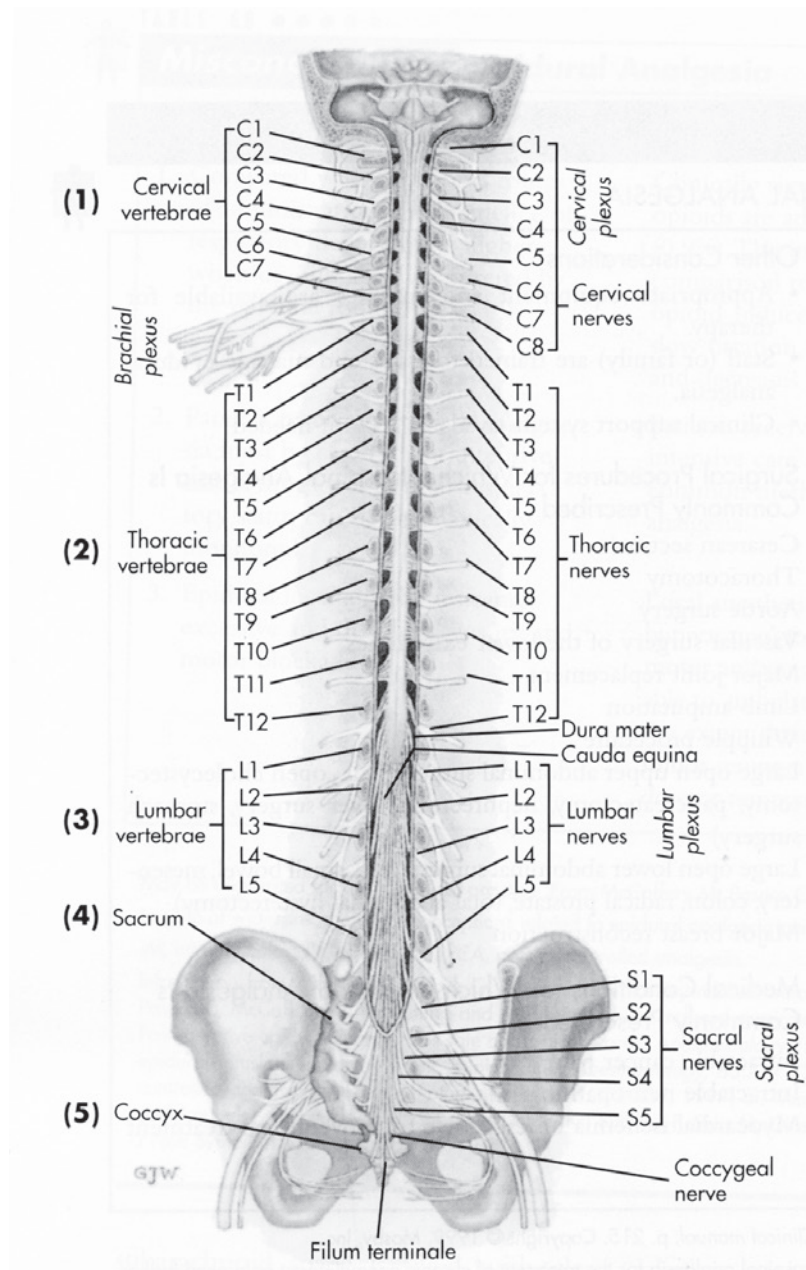
In the dorsal horn, incoming information is extensively modulated through complex neurophysiologic and neurochemical mechanisms. The primary A and C afferents release a variety of transmitters, among the most important of which are excitatory amino acids, such as glutamate, neurokinins, and substance P. Glutamate binds to the N-methyl-D-aspartate (NMDA) receptor and promotes pain transmission. Note that dorsal horn modulation involves both local, segmental systems and descending systems.

**Figure 2** Nociception: “normal” pain transmission.

Pasero, C. & McCaffery, M. Pain assessment and pharmacologic management, pp. 4-5. St Louis, Mosby. © 2001, Pasero C. & McCaffery M. May be duplicated for use in clinical practice.

## ANATOMY & PHYSIOLOGY

- The vertebral column is the bony outer structure protecting the spinal cord. It consists of 26 vertebrae. These vertebrae are divided into 7 cervical, 12 thoracic, 5 lumbar, 1 sacral and 1 coccygeal.
- The spinal cord is located within the vertebral column and it extends from the brain to the 1st or 2nd lumbar space.
- At each vertebral level there are nerve roots that come off the spinal cord bilaterally and which transmit both sensory and motor function.
- There are 31 pairs of spinal nerves, consisting of motor, sensory and sympathetic nerve fibres.



**Figure 2** Vertebral Column (McCaffery & Pasero, 1999, p 216)

The Spinal Cord and brain is surrounded by 3 layers of meninges, or membranous coverings, these include:

### Dura Mater

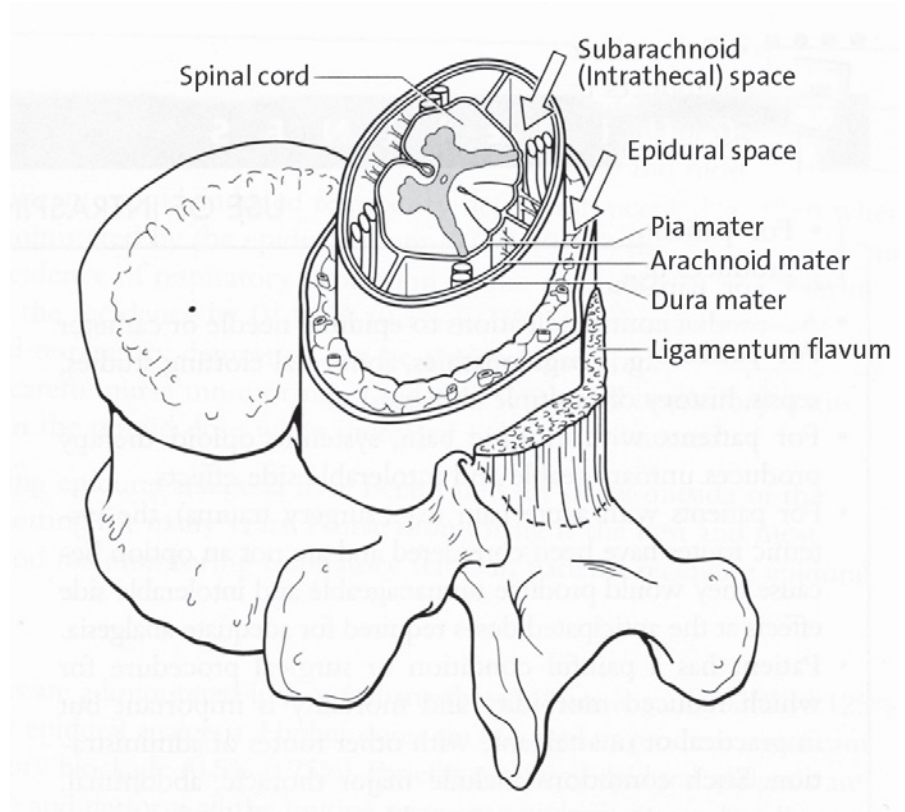
- Strong, tough outer layer consisting of dense fibrous connective tissue that extends from the foramen magnum to the 2nd sacral vertebrae.

### Arachnoid Mater

- Middle layer, thin and transparent.
- Separated from the pia mater by the cerebrospinal fluid (CSF) filled subarachnoid space, thus the subarachnoid space is between the pia and the arachnoid mater.
- CSF circulates around both the spinal cord and the brain.
- Injection of opioids into the subarachnoid or “intrathecal space” constitutes spinal analgesia/ anesthesia and the analgesic dose necessary to achieve pain relief is only 1/10th of that needed in the epidural space (although absorption can vary from patient to patient).

### Pia Mater

- Innermost layer, adheres directly to the spinal cord.
- Contains many blood vessels to nourish the spinal cord.

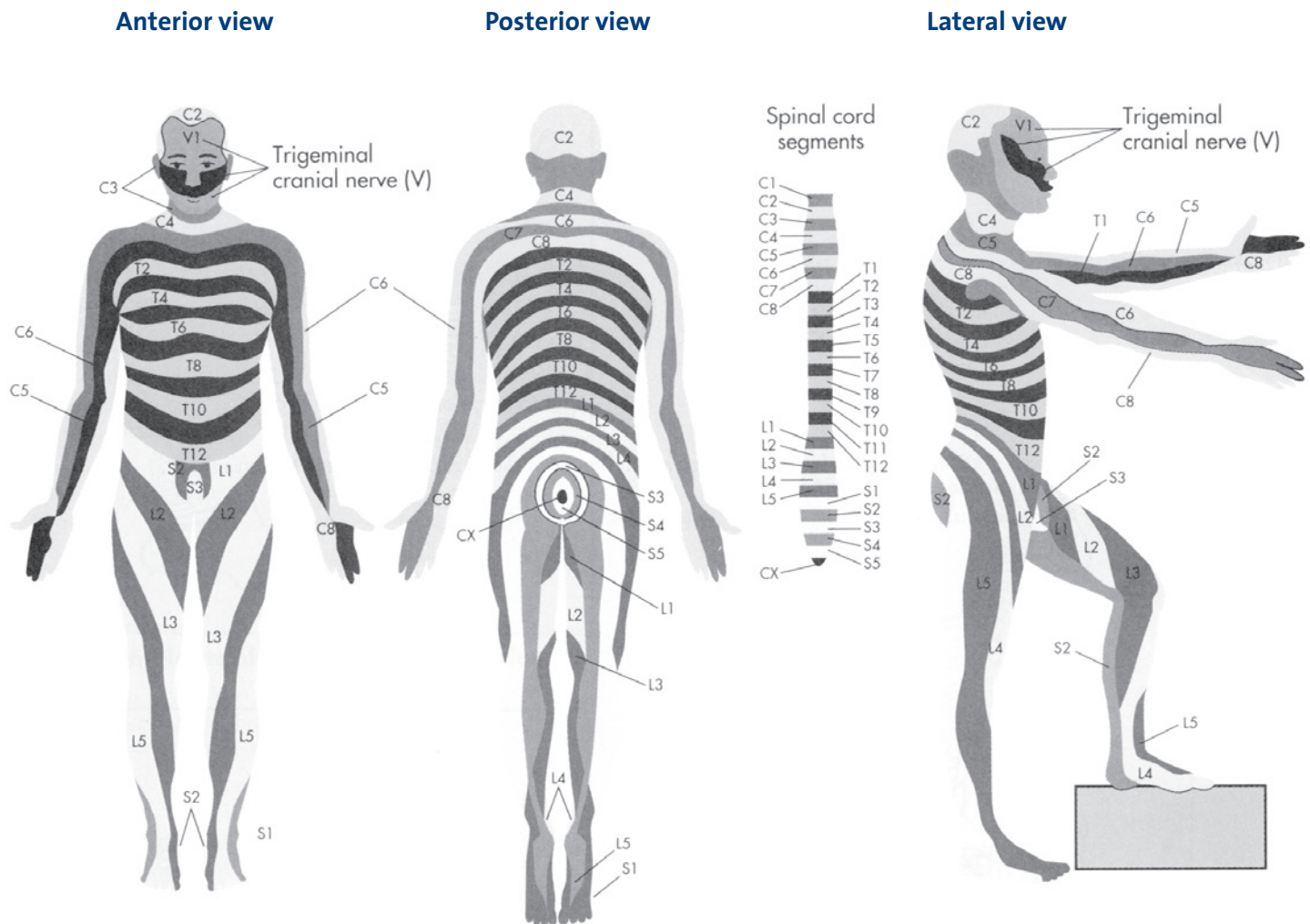


**Figure 3** Spinal Anatomy (McCaffery & Pasero, 1999, p 216)

## Distribution of Spinal Nerves

There are about 31 pairs of spinal nerves, containing motor, sensory and sympathetic nerve fibers from the spinal cord.

- The spinal nerves exit between the vertebrae bilaterally and segmentally.
- The skin surface on the body can be divided into areas or dermatomes, which are supplied by a spinal nerve corresponding to a spinal cord segment (i.e. the L3 dermatome overlies the knees and the inner aspect of the thigh - see Figure 4).
- Sensations from the body are carried into the dorsal (sensory) nerve root; information travels out from the spinal cord via the ventral (motor) nerve root.
- Sensory fibers of spinal nerves transmit pain, stretch, pressure, touch and temperature sensations.



**Figure 4** Dermatomes (Pasero & McCaffery 2011, p 408)

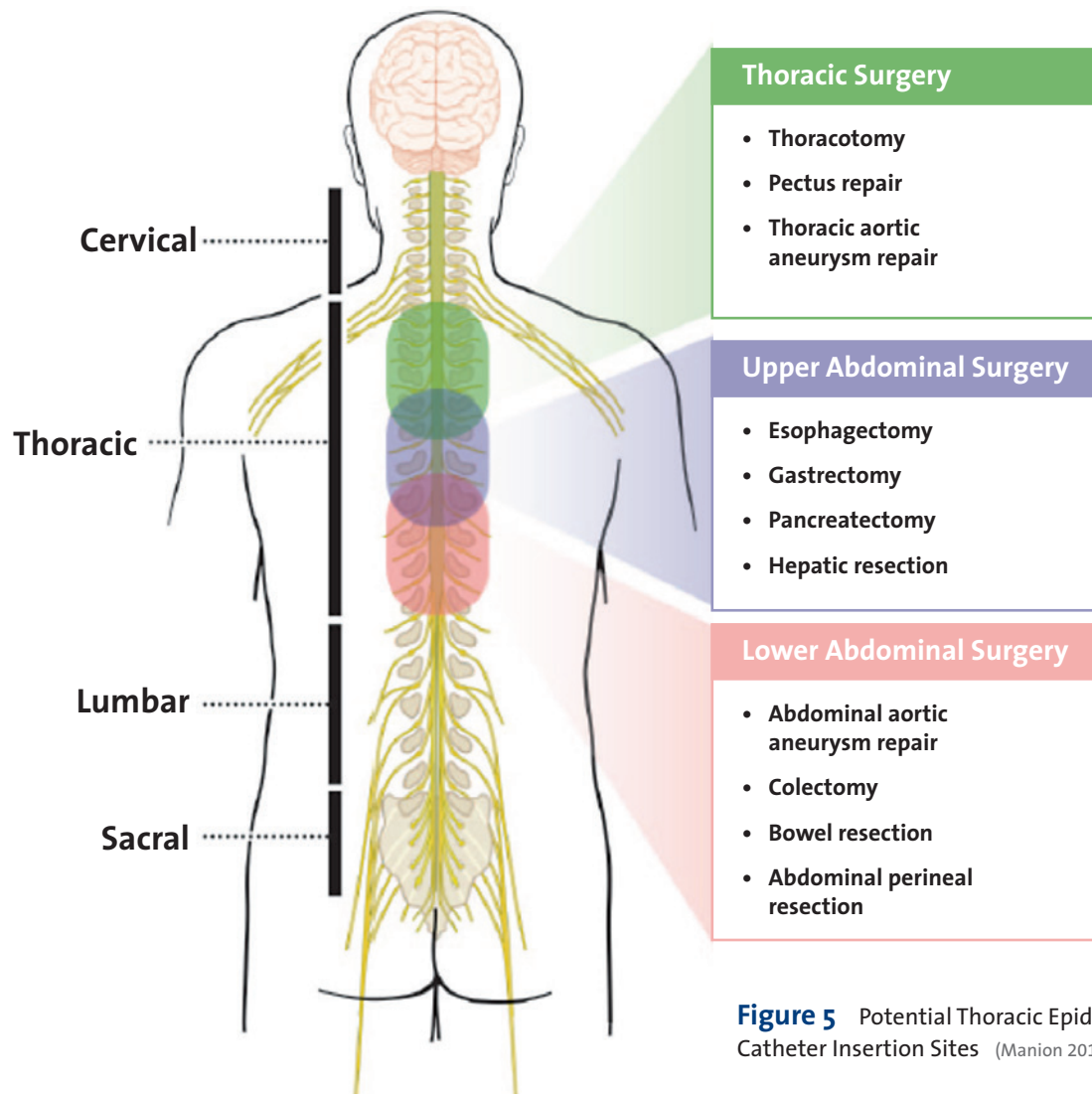
## Why are spinal nerves and dermatomes so important in pain assessment?

- Spinal nerve origins and their related dermatome help you assess the patient for effects of anesthetic agents.

### Epidural

- Insertion is performed at the level which corresponds to the area to be relieved of pain (see examples of Figures 5).

## POTENTIAL SITES OF THORACIC EPIDURAL CATHETER INSERTION (Upper Body)



Schematic of the adult spine. Regions of the spine that can be used to insert thoracic epidural catheters in a variety of surgeries are shown. The top oval in the thoracic spine represents the region for insertion for patients undergoing thoracic surgical procedures. The middle shaded oval depicts the area of insertion for patients undergoing upper abdominal surgery. The lower shaded oval represents the area of insertion for patients undergoing lower abdominal surgery.

### Intrathecal (Pasero & McCaffery 2011)

- The intrathecal catheter is placed as close as possible to the dermatomes that, when blocked, will produce the most effective spread of analgesia for the site of nociceptive input (eg, surgical site, site of injury or tumour location).

## COMPARISON OF THE INTRASPINAL SPACES

Epidural	Intrathecal
<ul style="list-style-type: none"> <li>• Insertion technically more challenging</li> <li>• Catheter obstruction, fibrosis, loss of analgesic efficacy with prolonged epidural infusions</li> <li>• Increased risk of infection as a result of more frequent system refills related to larger drug dose and volume</li> <li>• Useful for focal analgesia</li> <li>• Ability to deliver large amounts of local anesthetic due to extreme opioid intolerance</li> </ul>	<ul style="list-style-type: none"> <li>• Superior analgesia in the following settings: <ul style="list-style-type: none"> <li>• Presence of epidural pathology (metastases, vertebral compression)</li> <li>• Large painful region, multiple location or location distant from catheter tip</li> <li>• Poor response to high dose epidural therapy</li> </ul> </li> <li>• Decreased catheter problems (migration, tip occlusion)</li> <li>• Decreased dose requirements</li> <li>• Decreased side effects</li> </ul>

**Table 1** (Burton et al. 2004, Christo et al. 2008, Reisfield 2004)



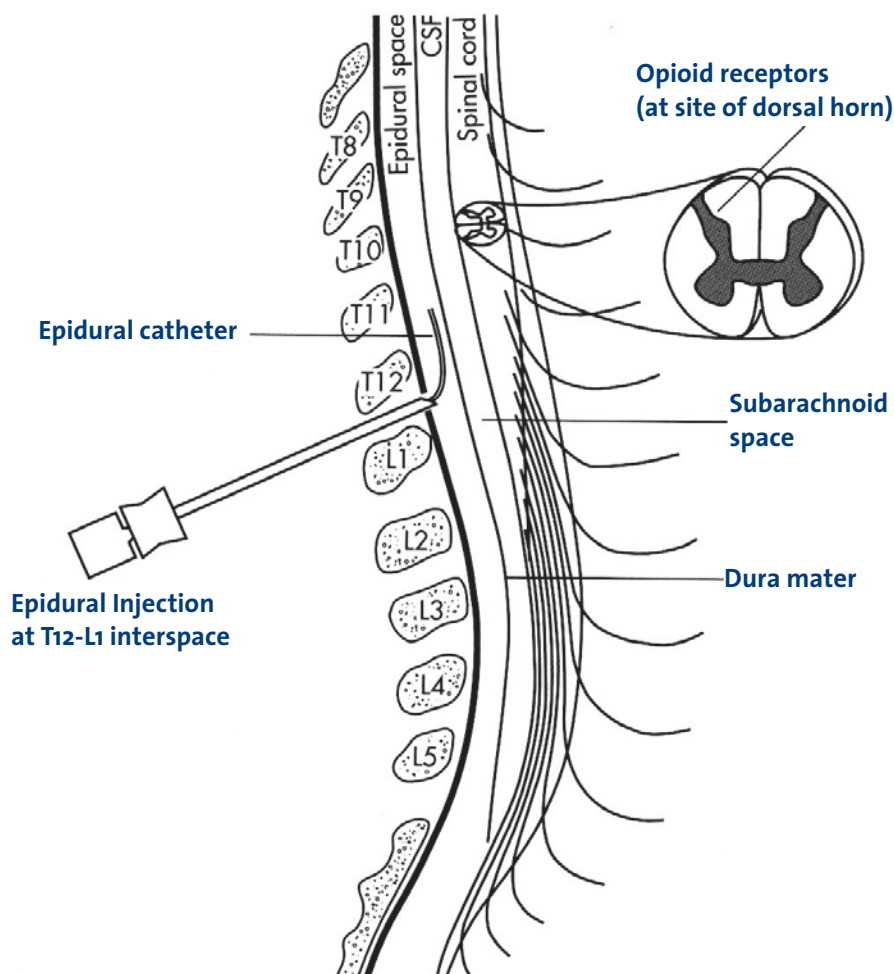
## INTRASPINAL PHARMACOLOGY

(American Society of Pain Management Nurses ASPMN 2002)

### Intraspinal Opioids

- When medication instilled into the epidural space diffuses through the dura mater, the rate of diffusion depends on the lipid solubility of the medicine.
- Highly lipid-soluble medications (eg fentanyl) diffuse through the dura and bind at the spinal cord at a rapid rate and produce a narrow segment of analgesia.
- Highly water-soluble medication (eg morphine) diffuse through the dura slowly and acts at the spinal cord. The water-soluble medications shows affinity to water-based CSF and spreads with the CSF flow.
- Rostral spread describes how water-soluble medicine spreads with the flow of the CSF.
- All opioids in the intraspinal space bind with the opiate receptors at dorsal horn (substantia gelatinosa) of the spinal cord.
- When an exogenous opioid binds at the opiate receptors at the dorsal horn, analgesia occurs.

## EPIDURAL OPIOID DELIVERY



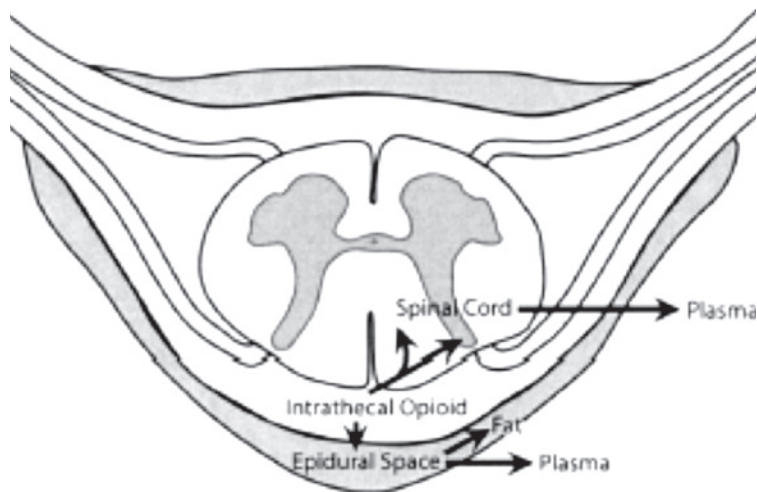
### Opioid are “taken-up” in 3 ways:

(SMGH Self Learning Package 2004)

- 1 **Fat** – the fatty tissue of the epidural space is one of the three main competitors for lipid soluble opioids & plays an important role in how much opioid diffuses in the CSF & attaches to opioid receptors.
- 2 **Meninges** – penetration through the dura membrane can take longer since its tough, fibrous structure is a significant barrier to the absorption of opioids into the spinal cord.
- 3 **Epidural Vascular system** – systemic absorption of drugs from the epidural space can be fairly significant depending on their chemical properties. Lipid soluble opioids can be absorbed into the blood and will circulate to opiate receptors in the brain resulting in similar side effects as parental opioids.

**Figure 6** Epidural Needle and Catheter Placement (Pasero & McCaffery 2011, p 409)

## INTRATHECAL OPIOID DELIVERY



The fate of opioids after intrathecal administration is complex. Simultaneously, intrathecal opioids. (Rathmell et al. 2005)

- 1 Travel cephalad (towards the head) within the CSF.
- 2 Enter the spinal cord, where they may bind to nonspecific sites within the white matter or specific opioid receptors in the dorsal horn.
- 3 Traverse the dura mater to enter the epidural space where they bind to epidural fat. From the spinal cord and epidural space, opioids enter the plasma compartment through vascular uptake.

**Figure 7** Disposition of Opioid after Intrathecal administration (Rathmell et al. 2005, p S31)

## Summary of Characteristics of Selected Intraspinal Opioids

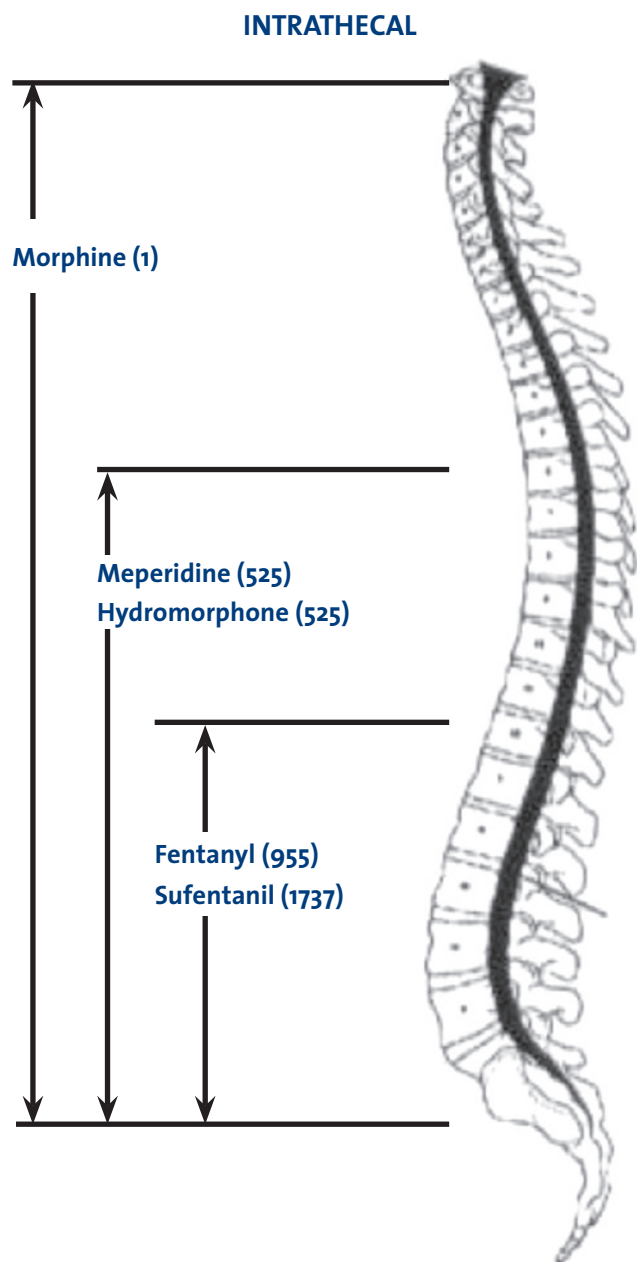
(Pasero & McCaffery 2011)

Analgesic	Onset (mins)	Peak (mins)	Duration (hrs)	Half-Life (hrs)	Solubility	Dermatomal Spread	Comments
Morphine	30-60 EA 30-60 IA	90-120 EA 60 IA	up to 24 EA	2-3	hydrophilic	wide	standard for comparison; can be administered by all intraspinal methods of delivery; ideal for single bolus dose but with risk of late respiratory depression (6-12hrs); wide rostral spread; drug of choice if lumbar placement
Hydro-morphine	15-30 EA	40-60 EA IA	6-7; up to 18 EA	2-3	more lipid soluble (10X) than morphine	less than morphine; more than fentanyl	similar to morphine in analgesia & adverse effects; can be administered by all intraspinal delivery methods

**Table 2** IA = Intraspinal Analgesia EA = Epidural Analgesia (Pasero 2011, p 418, Table 15-3)



## Spread of Intraspinal Analgesia



Medications delivered to the intrathecal & epidural spaces behave differently!

The intrathecal space has direct communication with the spinal cord. Intrathecal dosing is 1/10th (0.1) the epidural dose.

**Figure 9** Spread of Analgesia of Intrathecal (Rathmell 2005, p5-32)

## OPIOID CONVERSION TABLE: Equianalgesic Potency

Route	Morphine Sulphate mg	Hydromorphone mg	Fentanyl microgram
Oral	300	60	2
Parenteral	100	20	1
Epidural	10	2	0.1
Intrathecal	1	0.25	0.01

**Table 3**

(Intrathecal Drug Therapy for Long-Term Pain Management, by V. Ghafoor et al. 2007, American Journal Health-System Pharmacy, 64, p 2457)

## Side Effects of Intraspinal Opioids

Opioid adverse effects by the intraspinal routes are the same as by other routes of administration and include nausea, vomiting, pruritus, sedation and respiratory depression, among others.

# LOCAL ANESTHETICS IN THE INTRASPINAL SPACE

(Pasero & McCaffery 2011)

- Bupivacaine (Marcaine) and Ropivacaine (Naropin) are most commonly used.
- Local anesthetics are lipid soluble.
- Lipid solubility determines its ability to cross membranes and access receptors.
- Analgesia and anesthesia are dose related.
- The sites of action of intraspinal local anesthetics are in the spinal cord and at the level of the spinal nerve roots, and they block both afferent and efferent signals to and from the spinal cord.
- They bind to sodium channels in nerve fibres and reduce action potential and subsequent nerve transmission of noxious stimuli.
- Also inhibit various potassium and calcium channels and other ion-gated channels, such as substance P receptors.

## Epidural local anesthetics

- Carried in the CSF to the dorsal root ganglion of the spinal nerve fibres immediately adjacent to their site of administration.
- This results in segmental analgesia, which is influenced by the location of catheter placement as well as dose and volume of the local anesthetic.

## Intrathecal local anesthetics

- Act faster than when administered epidurally as delivery occurs near the spinal cord and spinal nerve roots where action takes place.
- Since smaller amounts of local anesthetic is used intrathecally, duration of action is shorter.

## Mechanism of Action

- The size of a nerve fibre influences its sensitivity to local anesthetics.
- There are 3 categories of nerve fibres:
  - 1 A fibres are myelinated somatic nerves and are further divided into the following:
    - i alpha
    - ii beta
    - iii gamma
    - iv delta fastest conducting & carry pain impulses
  - 2 B fibres are myelinated autonomic nerves
  - 3 C fibres are unmyelinated nerves carry pain impulses

**Local anesthetics block nerve conduction in small nerve fibres faster and at lower concentrations than in large fibers. Therefore, it is possible to give very low doses intraspinally to block the impulses of A delta and C fibres without blocking the larger fibres that affect sensory and motor function.**

## Catheter Placement

- The catheter is placed as close as possible to the dermatomes that, when blocked, will produce the most effective spread of analgesia for the site of nociceptive input (eg surgical site, site of injury, tumour location) .

## Side Effects of Intraspinal Local Anesthetics

- Hypotension
  - These local anesthetics produce a sympathetic blockade resulting in vasodilation which can lead to hypotension, bradycardia (particularly when blockade higher than T5)
  - The occurrence is higher with larger dermatomal spread
  - This side effect may be treated with intravenous fluid
- Urinary Retention
  - Anesthetics in combination with opioids can cause relaxation of detrusor (bladder) muscle
  - The effects of motor and sensory blockade can interfere with perception of a full bladder
- Motor Block may be caused by many factors including:
  - Location of catheter (lower placement results in lower dermatomal block)
  - Dose of local anesthetic

**Recommendation: Assess ability to weight bear prior to ambulation, for comparator in motor and functional assessment.**

## Intraspinal Opioids & Local Anesthetics

Low (“subanesthetic”) doses of local anesthetics are combined with intraspinal opioids for the treatment of acute or persistent pain because the two work synergistically to provide better analgesia at lower doses than would be possible with either drug alone. In combination, the two agents allow a reduction in the doses of both the local anesthetic and the opioid, which results in a lower incidence of adverse effects of both agents.

(Pasero & McCaffery 2011)

## Intraspinal Medication Properties (Myers et al. 2009)

- 1 Must be preservative free
- 2 Alcohol and acetone should be avoided to prepare or cleanse the site
- 3 Cleansing agents containing alcohol must dry prior to procedure

## DRUG DELIVERY AND CANCER CARE ONTARIO GUIDELINES

There are three types of intraspinal delivery systems (Figure 10):

- 1 Externalized system;
- 2 Partially externalized system; and
- 3 Totally internalized implanted system.

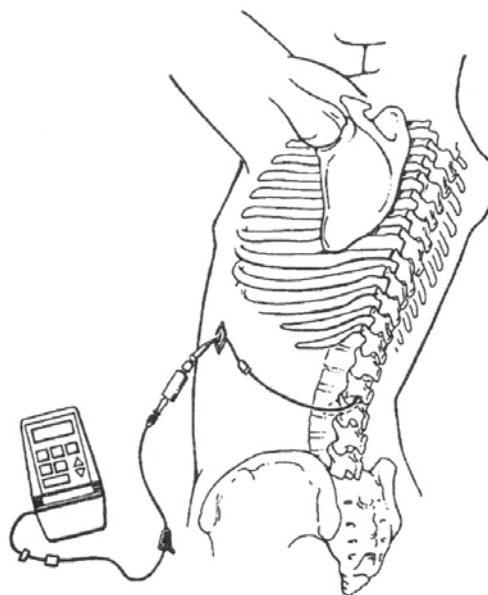
### 1 Externalized System

The external end of the catheter is percutaneous. The catheter may or may not be tunnelled subcutaneously.

It is usually indicated for short-term use (hours to days) because of risk for infection and often for epidural use only.

Injection is through a continuous infusion and less commonly by intermittent injections. The catheter is connected to an externalized electronic infusion pump.

### 1 External catheter and ambulatory infusion pump



**Figure 10** Intraspinal Delivery Systems for persistent pain, (McCaffery & Pasero 2011, p 410)

## 2 Partially Externalized System

The external end of the catheter is connected to a subcutaneous access port implanted through a small skin incision. The port is secured by suture loops, and the incision is then closed. Injection is made by placing a non-coring needle through the skin into the access port.

It is usually indicated for a longer term use (weeks to years).

The types of access port include the Port-a-Cath epidural port system (Pharmacia Deltec) with a silicone open-tip catheter and an implanted subcutaneous port.

Injection is through a continuous infusion and less commonly by intermittent injections.

The catheter is connected to an externalized electronic infusion pump.

### 2 Implantable port and an ambulatory infusion pump

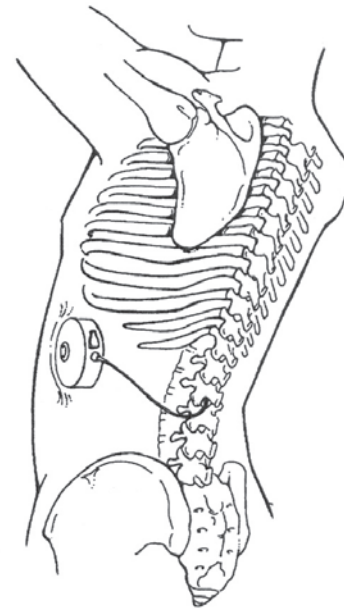


**Figure 10** Intraspinal Delivery Systems for persistent pain, (McCaffery & Pasero 2011, p 410)

## 3 Totally Implanted System

The catheter and the delivery system are completely implanted, thus having a lower risk for infection. A surgical procedure is required. It is usually indicated for long-term use (life expectancy > 6 to 12 months).

### 3 Implantable pump



**Figure 10** Intraspinal Delivery Systems for persistent pain (McCaffery & Pasero 2011, p 410)

Working with your local pharmacist is critical to success in managing an intraspinal infusion in the community. Optimally, bag changes should be scheduled to coincide with dressing changes and tubing changes.

ISMP (Institute for Safe Medical Practices) Recommendations for pump selection to be used for intraspinal drug delivery: <http://www.ismp-canada.org/dangerousabbreviations.htm>

- Use pumps that look different than pumps used for IV infusions.
- Clearly label pump as either intrathecal or epidural.
- Use smart pump technology with administering intraspinal medications.
- Use yellow tubing without injection ports for intraspinal infusions to set its appearance apart.
- Always trace a tube or catheter from the patient to the point of origin before connecting any new device or infusion or adjusting an infusion rate.
- Consider placing IV pumps and intraspinal pumps on opposite sides of the patient's bed to better separate the two infusion systems (if possible, supplies for IV and intraspinal delivery should be kept in separate parts of the home).
- Pumps used to infuse analgesics should be approved for that purpose. (McCaffery & Pasero 2011)

## BREAK THROUGH PAIN AND BOLUSING

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Patient Controlled Analgesia (PCA) (Pasero & McCaffery 2011)

PCA is an interactive method of pain management that permits patients to treat their pain by self-administering doses of analgesics. Typically, a special infusion pump is used to deliver PCA. PCA refers to the bolus dose the patient controls when pressing a button on or attached to the pump.

PCA can be delivered by 2 modes:

- PCA bolus doses with a continuous infusion (basal rate)
- PCA bolus dose alone

Additional pump information can be found within the Waterloo Wellington Pain Management Infusion Pump Information at <http://www.hpccconnection.ca/painpump>.

The PCA approach describes that only the patient can feel the pain and only the patient knows how much analgesia will relieve it. By allowing patients to determine dosing, PCA addresses the significant variations in analgesic requirements between individuals.

### PCA by Proxy (Pasero 2007)

PCA by proxy is the unauthorized administration of a PCA dose by another person. This has the potential to produce significant harm because it circumvents an important safeguard of PCA, ie, the excessively sedated patient will drop the PCA button, thereby preventing further opioid administration and subsequent respiratory depression.

### Authorized Agent-Controlled Analgesia

(McCaffery & Pasero 2011)

When patients are unable or not motivated to self-administer analgesics, another individual may be authorized to manage the patient's pain using the PCA technology.

A family member may be designated to be the person's primary pain manager; is taught and has the responsibility of assessing and pressing the PCA button.

### Patient Controlled Epidural Analgesia (PCEA)

The patient (or designated caregiver) receiving epidural analgesia may deliver their own bolus by pressing the bolus button on the infusion pump.

### Patient Controlled Intrathecal Analgesia (PCIA)

The patient (or designated caregiver) receiving intrathecal analgesia may deliver their own bolus by pressing the bolus button on the infusion pump.

### Clinician Bolus

In an acute episode requiring an immediate dose/bolus, the pump lock out setting may have to be over-ridden. This is referred to as a clinician bolus, and must be done under the direction of the anesthesiologist or most responsible physician (and requires a pump code to over-ride the settings).

### Complications of Intraspinal Infusion Therapy

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Complications of intraspinal analgesia can be avoided or assessed early with careful monitoring and physical assessments. Below are listed complications listed according to the type of infusion.

#### Epidural (Ghafoor et al. 2007)

- Catheter dysfunction
- Adverse drug side effects
- Increase likelihood of technical complications with line use over one month
- Dural fibrosis
- Epidural hematoma

#### Intrathecal (Christo & Mazloomdoost 2008; Ghafoor et al. 2007)

- Intrathecal granuloma
- Post op subarachnoid hemorrhage
- Catheter tip inflammatory masses
- Overdose

#### Both Epidural & Intrathecal (Ghafoor et al. 2007)

- Catheter displacement or migration
- Local anesthetic toxicity
- Infection

## EPIDURAL HEMATOMA

(Pasero & McCaffery 2011; Weetman 2006)

Epidural Hematomas are rare and may occur as a result of:

- Result of epidural vessel puncture
- Concurrent anticoagulation therapy, is a primary risk factor for spinal-epidural hematoma
- Being an increased risk factor in patients with clotting dysfunction

Early detection and management are crucial to minimize the effects of spinal cord compression. Permanent neurological damage can occur in as little as 6-8 hours.

### Cardinal signs of epidural hematoma

(Pasero & McCaffery 2011)

- Increased diffuse back pain or tenderness.
- Pain or paresthesia on injection.
- Bowel or bladder dysfunction.
- Sensor or motor deficit develops as hematoma increases in size.

Patient recovery without neurological injury from a major bleeding complication related to neuraxial analgesia depends on early recognition and aggressive treatment.

The American Society of Regional Anesthesia (ASRA) and Pain Medicine published recommendations for management of neuraxial anesthesia and analgesia during anticoagulation therapy with the goal of reducing bleeding complications

(McCaffery & Pasero 2011, See Table 15-8: Guideline on Anticoagulation)

## A safe rule of thumb for the nurse:

Prior to giving any anticoagulant, there must be discussion between the anesthesiologist or most responsible physician who inserted the intraspinal catheter and the palliative care physician, as well as risk and benefit explained to the patient.

It would be optimal if this decision making were documented in the patient's chart.

Before giving the first dose of anticoagulant, confirm that this discussion has occurred.

Remember that the list of anticoagulants is growing. As well as the new low molecular weight heparins (LMWH's), there are novel oral anticoagulants now on the market. It is imperative that nurses use references if they do not recognize a medication.

**Table 15-8: Overview of the American Society of Regional Anesthesia and Pain Medicine's Consensus Guideline on Neuraxial Anesthesia and Anticoagulation**

AGENT	RECOMMENDATION
<b>Antiplatelet medications</b>	<ul style="list-style-type: none"> <li>No contraindication with NSAIDs; COX-2 selective NSAIDs have no effect on platelet aggregation and should be considered in patients who require anti-inflammatory therapy in the presence of anticoagulation.</li> <li>Discontinue ticlopidine 14 days and clopidogrel 7 days in advance.</li> <li>GP IIb/IIIa inhibitors exert a profound effect on platelet aggregation and are contraindicated within 4 weeks of surgery; time to normal platelet aggregation is as long as 48 hours depending on agent; avoid neuraxial technique until platelet function recovers.</li> </ul>
<b>Unfractionated heparin SC</b>	<ul style="list-style-type: none"> <li>No contraindication during SC mini-dose.</li> <li>Consider delaying heparin until after block if technical difficulty is anticipated.</li> </ul>
<b>Unfractionated heparin IV</b>	<ul style="list-style-type: none"> <li>Combining neuraxial techniques with intraoperative heparinization is acceptable.</li> <li>Heparinize 1 hour after neuraxial technique.</li> <li>Remove catheter 2 to 4 hours after last heparin dose.</li> <li>Reheparinization should occur 1 hour after catheter removal.</li> <li>No mandatory delay if traumatic.</li> </ul>
<b>Preoperative LMWH</b>	<ul style="list-style-type: none"> <li>Patients receiving LMWH can be assumed to have altered coagulation.</li> <li>At least 12 hours should elapse following standard doses and 24 hours after higher doses before neuraxial technique is attempted.</li> </ul>
<b>LMWH, twice-daily dosing</b>	<ul style="list-style-type: none"> <li>The first dose of LMWH should be administered no earlier than 24 hours after surgery and only if adequate hemostasis is present.</li> <li>Indwelling catheters should be removed the night before initiation of LMWH therapy.</li> <li>Remove neuraxial catheter 2 hours before the first LMWH dose.</li> </ul>
<b>LMWH, single-daily dosing</b>	<ul style="list-style-type: none"> <li>The first dose of LMWH should be administered no earlier than 6 hours after surgery.</li> <li>The second dose should be administered no earlier than 24 hours after the first dose.</li> <li>Neuraxial catheter may be safely maintained.</li> <li>Catheter should be removed in a minimum of 10 to 12 hours after the last dose of LMWH and 2 to 4 hours prior to the next dose.</li> <li>Postpone LMWH 24 hours if traumatic.</li> </ul>
<b>Warfarin</b>	<ul style="list-style-type: none"> <li>Stop oral anticoagulants prior to neuraxial technique (ideally 4 to 5 days prior).</li> <li>Document normal INR after discontinuation of oral anticoagulants (prior to neuraxial technique).</li> <li>Remove catheter when INR is 1.5 or lower (initiation of therapy).</li> <li>Neurologic testing of sensory and motor function should be routinely performed during epidural analgesia for patients receiving oral anticoagulants.</li> <li>Withhold or reduce dose of warfarin in INR higher than 3 in patients with indwelling neuraxial catheters.</li> <li>ASRA makes no recommendation for removal of catheters in patients with therapeutic levels of anticoagulation during neuraxial catheter infusion.</li> </ul>
<b>Thrombolysis</b>	<ul style="list-style-type: none"> <li>No data on safety interval for performance of neuraxial technique or catheter removal.</li> <li>Avoid neuraxial technique in patients receiving or who are likely to receive fibrinolytic and thrombolytic drugs.</li> <li>Guidelines detailing original contraindications for thromboembolytic drugs suggest avoidance of these drugs for 10 days following puncture of noncompressible vessels.</li> <li>Neurologic monitoring at least every 2 hours is recommended in patients who have received neuraxial block at or near the time of fibrinolytic and thrombolytic therapy.</li> <li>Following fibrinogen level (one of the last clotting factors to recover) may be helpful in determining optimal time for catheter removal.</li> </ul>
<b>Herbal therapy</b>	<ul style="list-style-type: none"> <li>No evidence for mandatory discontinuation prior to neuraxial technique.</li> <li>Be aware of potential drug interactions.</li> </ul>

(Pasero & McCaffery 2011)



## TEMPORARY CATHETER DISPLACEMENT

(Pasero & McCaffery 2011)

Displacement of temporary catheters during intraspinal drug delivery is a relatively common occurrence and is often caused by patients accidentally pulling catheters out during activity.

Proper taping of the catheter and teaching patients to avoid tugging on the catheter helps to minimize the incidence of displacement.

Cover the insertion site with a bandaid /sterile dressing.

Call anesthesia/ refer to pump failure orders.

In temporary catheter infusions, disconnection between the intraspinal catheter and the pump tubing can also occur. DO NOT RECONNECT. Wrap the free end of the intraspinal catheter with sterile gauze and call the physician, do not clamp. Plan to use a new infusion set up including tubing. An extra infusion bag and complete supplies should be stored in the home.

Catheter displacement can result in analgesic gaps and should be attended to promptly.

### Indications of a Displaced intraspinal catheter include:

- Inadequate pain relief (eg previously comfortable patient reports loss of pain control)
- No decrease in pain with increase in opioid dose
- Leaking at the insertion site

### Indications of an intrathecal migration of an epidural catheter include:

- Unexplained increase in opioid-induced adverse effects (eg previously alert patient is excessively sedated or nauseated)
- Sensory and/or motor block (possible if solution contains local anesthetic)

### Indications of an intravascular migration:

- Inadequate pain relief (eg previously comfortable patient reports loss of pain control)
- Unexplained increase in opioid-induced adverse effects (eg previously alert patient is excessively sedated or nauseated)
- Signs and symptoms of local anesthetic toxicity

## COMPLICATIONS

### Local anesthetic toxicity (Pasero & McCaffery, 2011; Weetman 2006)

Toxic effects usually result from excessive plasma concentrations. The toxicity can result from vascular uptake or injection of infusion of local anesthetic directly into the systemic circulation. This may occur as a result of inadvertent intravascular administration or overdose. Special consideration should be given older adults who may be at higher risk for toxicity from accumulation because of a decreased ability to clear local anesthetics.

### Signs and symptoms of local anesthetic toxicity (in order of severity as plasma concentration rises):

- Light headedness
- Circumoral numbness (surrounding the mouth) & numbness of tongue
- Tinnitus, metallic taste, visual disturbances
- Muscular twitching
- Drowsiness
- Unconsciousness
- Seizures
- Coma
- Respiratory arrest
- Cardiovascular depression and arrest

### Infection (Pasero & McCaffery 2011)

Intraspinal infection (epidural abscess, arachnoiditis, or bacterial meningitis) is a rare but serious complication. Infection is more common when catheters are left in place for a prolonged time. The incidence of infection is higher in externalized systems vs totally implanted systems. Predisposing factors to intraspinal infection include immunocompromised state, diabetes, HIV infection, malignancy, steroid use, difficult insertion, and longer catheterization time.

### Signs and symptoms of infection

Skin infection signs at the intraspinal catheter entry site, implanted port or pump site might include:

- Inflammation, edema, drainage, warmth at catheter entry site, implanted port or pump site, and/or
- Patient reports soreness around intraspinal catheter entry site, implanted port, or pump site

## Epidural or intraspinal space infection

Assessment of an intraspinal space infection requires the highest standard of assessment. Symptoms of this type of infection might include one or more of the following:

- Constant diffuse back pain or tenderness
- Pain or paresthesia during bolus injection
- Decreased pain relief despite no decrease in analgesic
- Sensory and/or motor deficit (particularly unexplained changes since last assessment)
- Bowel and bladder dysfunction may or may not be present
- Skin infection of intraspinal catheter entry site may or may not be present
- Fever may or may not be present

### Signs of acute bacterial infection

- Fever
- Headache
- Nuchal rigidity (a resistance to the flexion of the neck)
- Brudzinski's and Kernig's signs
- Altered mental status
- Convulsions

## MONITORING - ASSESSMENT of patient receiving analgesia by catheter technique

(Pasero et al. 2008)

The following tools, guidelines and documentations should be incorporated into the monitoring and assessment of all patients receiving intraspinal analgesia:

- Pain Assessment
- Edmonton Symptom Assessment System (ESAS)
- Vital Signs (TPR & BP)
- Sedation score (Pasero Opioid-induced Sedation Scale)
- Sensory & motor assessment (ice, dermatomes, Bromage Motor Scale, ability to navigate stairs)
- Side effects: especially nausea, vomiting, pruritis, and urinary retention
- Complications
- Insertion site
- Dressing
- Catheter & tubing connections
- Infusion device (independent double check, include the patient and family)
- Protection from an infectious environment
- Documentation

### Pain Assessment

The pain assessment should always include a full scope of the pain syndrome: the OPQRSTUV acronym is known widely and described fully in guidelines such as the RNAO BPG for Pain Assessment and Management (2002: 2013).

- O Onset:** When did it begin? How long does it last?  
How often does it occur?
- P Provoking or palliating factors:** What brings it on?  
What makes it better? What makes it worse?
- Q Quality of pain:** What words does the person use to describe the pain?
- R Region and radiation:** Where is the pain and does it extend from the site?
- S Severity with rest and movement**
- T Timing/ Treatment:** Is the pain constant? Does it come and go? What medications and treatments are you currently using? How effective are these?
- U Understanding/ impact on you:** What does this pain mean to you?
- V Values:** What is your goal for this pain?

## Vital Signs

(Pasero & McCaffery 2011)

In Palliative Care, vital signs are often discontinued as part of the care plan. However, when intraspinal analgesia is being delivered, vital signs are critical to assessment and monitoring for these and more reasons:

- Changes may indicate side effects or complications.
- Because local anesthetics block nerve fibres, they affect the sympathetic nervous system and cause vasodilation. Mild hypotension is common. Some patients receiving intraspinal local anesthetics experience significant hypotension and bradycardia, especially when rising from a prone position or after large dose increases or boluses.
- A comprehensive assessment of respiratory status goes hand in hand with sedation assessment and constitutes more than counting a patient's respiratory rate over a 30-60 sec period. A proper respiratory assessment requires the nurse to watch the rise and fall of the patient's chest to determine rate, depth, and regularity of respirations.

## Pasero Opioid- Induced Sedation Scale (POSS)

(Pasero & McCaffery 2011, p 510)

- The importance of monitoring sedation to prevent clinically significant respiratory depression cannot be overemphasized.
- "No patient has succumbed to (opioid-induced) respiratory depression while awake".
- Critical thinking regarding goals of care and patient status should guide your use of the sedation scale.

**S = Sleep, easy to arouse**

**1 = Awake and alert**

**2 = Slightly drowsy, easily aroused**

**3 = Frequently drowsy, arousable, drifts off to sleep during conversation**

**4 = Somnolent, minimal or no response to verbal or physical stimulation**

## Sedation Score

**1 = Awake and alert**

**2 = Slightly drowsy, easily aroused**

**3 = Frequently drowsy, arousable, drifts off to sleep during conversation**

**4 = Somnolent, minimal or no response to verbal or physical stimulation**

## Intervention

Requires no action

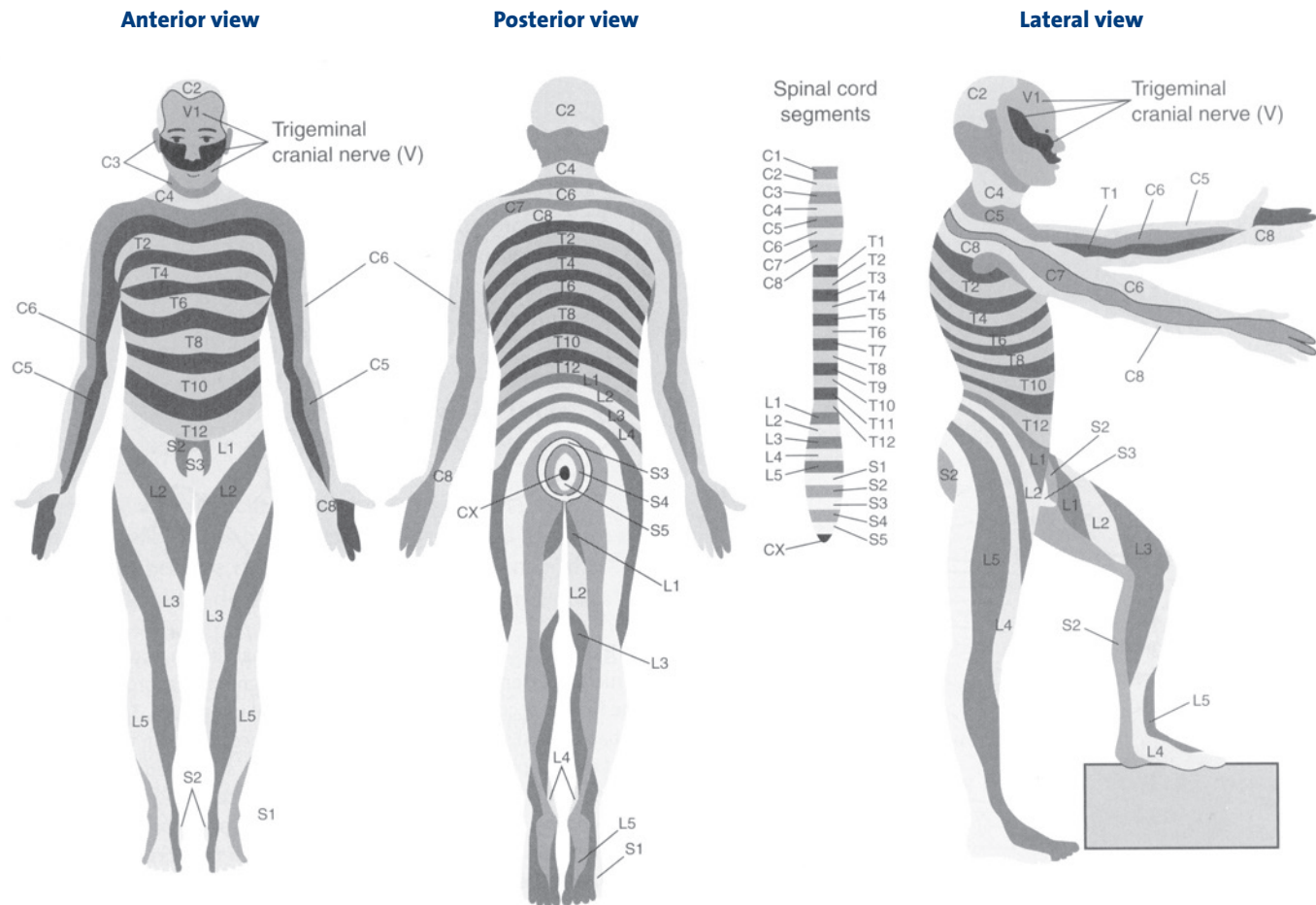
Requires no action

Hold dose  
Stimulate the patient and call physician for reassessment of opioid dose

Hold all opioids and sedating drugs  
Call physician immediately  
**This is an emergency situation!**

## Sensory Assessment

Sensory assessments are completed by assessing dermatomes.



**Figure 11** (Dermatomes, Pasero & McCaffery 2011, p 408)

Sensory testing should assess that the block is:

- Covering the site of pain
- Not too high
- Not too dense, causing unnecessary motor blockade

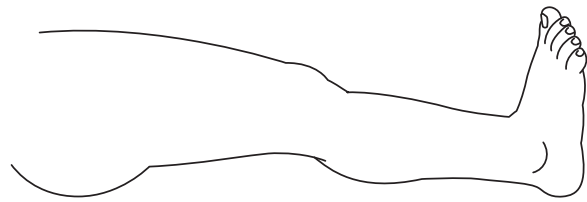
## Procedure for sensory testing

- Start by applying an ice cube (ideally in a latex glove so the patient does not get wet) to an area that is known NOT to be anesthetized, this will establish a baseline for comparison.
- Next, apply the ice cube to the chest/torso area and move from side to side in a downward pattern, alternately placement of the ice on the baseline area and the area being assessed (moving back and forth will help the patient give a more accurate report of the different sensations felt between the area blocked and the unaffected areas).
- The patient should be able to identify the level at which he/she can no longer identify the cold sensation, document that level on the flow sheet.
- If the patient has difficulty discerning the cold sensation, use a sharp/dull instrument to check level of sensation.
- Some patients will not have a block, others may only have some or have a unilateral block and still be pain free.

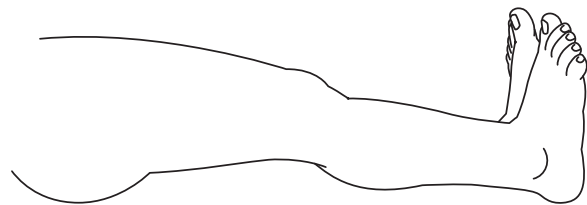
## Motor Assessment

- Monitor the patient's motor strength using the Bromage Motor Scale which assesses the patient's ability to move their toes, feet and legs and document on the flow sheet.
- The amount of local anesthetic solution used should not produce significant loss of motor function and the patient should have full use of all extremities.
- Report to the physician if the patient has any new lower extremity weakness.

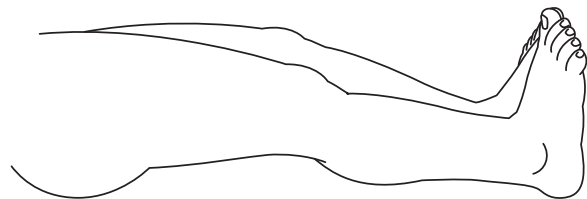
## Bromage Motor Scale



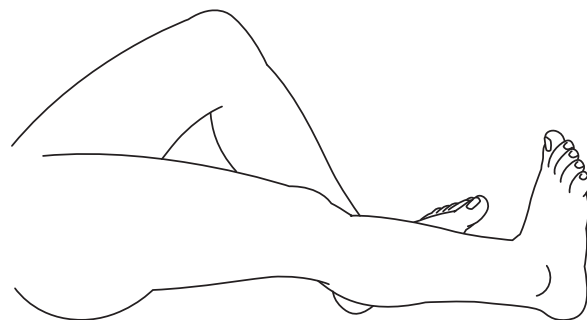
**3 Bromage - complete** (unable to move legs or feet)



**2 Bromage - almost complete**  
(unable to flex knees, still able to flex feet)



**1 Bromage - partial block**  
(just able to flex knees, still able to fully flex feet)



**0 Bromage - no block** (full flexion of knees possible)

Figure 12

## Accessing, de-accessing, and site maintenance care

(Hamilton reference to Intrathecal Project Committee, Hamilton, Ontario, 2010. And then Intrathecal Analgesia for Palliative of Intractable pain resource package.)

### De-accessing intraspinal subcutaneous port

- 1 Turn off pump.
- 2 Wash hands and don clean gloves.
- 3 Secure the non-coring needle accessed in the port with one hand. Lift and remove the transparent, occlusive dressing towards the needle with the other hand to prevent accidental dislodgement of the non-coring needle.
- 4 Stabilize the port with one hand and pull the non-coring needle straight out with a smooth action.  
**Caution:** needle stick potential if needle rebounds.
- 5 Discard non-coring needle in sharps container.
- 6 Apply dead end cap to infusion tubing.
- 7 Assess the site/skin for any signs of infection, bleeding, leaking, allergy or skin breakdown.
- 8 Apply sterile gauze with mild pressure if bleeding present
- 9 Remove gloves and wash hands.



Figure 13 De-accessing Intraspinal Subcutaneous Port



## Accessing intraspinal subcutaneous port

(Hamilton 2010)

- 1 Ensure the patient is in optimum position to allow the insertion of the non-coring needle at a 90 degree angle.
- 2 Don surgical mask.
- 3 Prepare work area using sterile technique.
- 4 Check solution using independent double check with the patient or family member.
- 5 Prime the non-coring needle, tubing, and filter with medication.

### Reducing the risk of device misconnections

(Block et al. 2012)

“Device misconnections leading to wrong route medication administration have attracted worldwide attention in patient safety”.

“The ISMP reports numerous misconnection errors involving peripheral and central venous infusion routes, neuraxial (epidural and intrathecal) routes, enteral feeds and bladder irrigation systems”.

Wrong route medication errors persist despite efforts to mitigate them and have catastrophic consequences, including death in various clinical settings.

‘The universal presence of Luer connection systems in functionally different types of medical equipment is the leading common root cause of misconnection/wrong route administration incidents’.

In summary, it is imperative to take care and hang the correct container to the correct route.

- 6 Wash hands.
- 7 Don sterile gloves.
- 8 Cleanse the port site using chlorhexidine 3 times using a spiral action starting at the centre of the port and moving outward, ensuring complete coverage of the area that will be under the dressing.

Straight alcohol or acetone should never be used for site preparation or cleansing due to potential effects as a neurotoxin.

Using chlorhexidine with alcohol as a skin disinfectant was shown to decrease epidural infection rates. It is important to permit the disinfectant to dry completely.

For this reason, all alcohol and acetone should be removed from the location where care of the intraspinal catheter will occur.

- 9 Allow time for the antiseptic to dry completely.
- 10 With the non-dominant hand secure the sides of the port, locating all the edges and ensuring the port dome is facing upward.
- 11 Using the dominant hand, insert the non-coring needle into the port at 90 degree angle ensuring you hear the “click” of the non-coring needle hitting the back of the port.
- 12 Secure the transparent, occlusive dressing over the needle and port eliminating as much excess air as possible from under the dressing.
- 13 Remove gloves and wash hands.
- 14 Label dressing appropriately epidural or intrathecal and Do Not Flush and indicate non-coring needle size and date of change.



**Figure 14** Example of Dressing over intrathecal port and non-coring needle including label

- 15 Secure tubing to body with tape.



**Figure 15** Example of Dressing over intrathecal port and non-coring needle including labels

- 16 Review pump program using independent double check with patient or family member

The above figures with examples were of a patient who had an allergy to the transparent occlusive dressing to cover the non-coring needle. A perimeter of foam dressing was used to minimize skin breakdown (as the patient had had good success with this in the past).

## Mis-programming analgesic infusion pumps

(Pasero & McCaffery 2011)

**The administration of the wrong dose as a result of incorrect pump programming was by far the most common error.**

To help prevent this type of error, staff must be trained in the proper use of analgesic infusion devices, both through initial training and annual competency checks.

Institution policy and procedure should mandate that all analgesic infusion device programming be independently double checked at specific times:

- Before the initiation of analgesic infusion therapy
- At the time of any adjustments in prescription
- During nursing hand off communication processes
- Transfer from one location of care to another

An independent double check consists of having another clinician (or in the community setting, patient or family member) compare the analgesic solution's drug and concentration and the pump's programmed prescription against the patient's written prescription to ensure accuracy without prompting from the person administering the analgesic or anyone else.

Distractions during programming and double checks are identified as being factors contributing to errors.



**Figure 16** Independent double check

- 17 Start pump.
- 18 Observe for 15mins to assess for high pressure alarm.
- 19 Educate the patient and family on when to call for help.

## TROUBLE SHOOTING

### High Pressure Alarm

- Ensure that all clamps are open.
- May result from incorrect placement of the non-coring needle into the subcutaneous dome.
- May result from occlusion in the intraspinal catheter.
- May result from occluded filter.
- Catheters may be flushed **ONLY** upon the direction of the anesthesiologist or most responsible physician and will require preservative free saline.

### Equipment/ pumps & infusion sets

(CCO 2009; Pasero et al. 2008; ISMP)

It is important to recognize that each type of delivery system requires its own specific process of care. General standards and principles recommended to be applied to care planning with the goal to maximize safety and reduce risk of harm should include:

- 1 To maintain a closed system and reduce infection, intraspinal catheters will **NOT** be aspirated or flushed unless instructed by the anesthesiologist or most responsible physician.
- 2 All medications infused into the intraspinal space must be preservative free.
- 3 Continuous infusions should be administered via pump with anti-free-flow protection.
- 4 Select an infusion pump with smart pump technology (drug library, preprogram maximum infusion rates) that looks different than other pumps used in your agency. Avoid dual-channel pumps.
- 5 Create barriers by using different container (cassettes vs bags).
- 6 Use yellow striped tubing without injection ports which include a 0.2 micron filter.
- 7 Non-coring (Huber) needles should not have a side port.
- 8 Consider positioning epidural or intrathecal infusions on the opposite side of the bed if an IV is infusing as well. IV's infusing to keep vein open (TKVO) should be changed to a saline lock.
- 9 Prior to making a connection, trace tubing to point of origin.
- 10 Store enough supplies and medications in the home should an unintentional disconnection occur and for scheduled bag changes.
- 11 Nurses should be educated re: troubleshooting the pump, changing the batteries and tubing.
- 12 Ensure pump failure orders are in place and accessible for unexpected events.

### Labelling with neon/bold sticker

- Containers should be clearly labelled.
- Medication labels should be visible whether the container is hanging or in a pouch.
- Label the pump- epidural or intrathecal only.
- Label the tubing.
- Label dressing appropriately epidural or intrathecal and Do Not Flush.

### Storage

- 1 Intrathecal medications should have overwraps to differentiate them from other medications.
- 2 It is recommended to separate intraspinal medications from any other IV solutions (including those that are locked up).



**Figure 17** Example of organization of supplies

- 3 All alcohol and acetone should be removed from the location where care of the intraspinal catheter will occur.
- 4 All normal saline flushes should be removed from the location where care of the intraspinal catheter will occur (only medications that are preservative free should be used in the intraspinal space).
- 5 Keep an extra bag of intraspinal infusion solution in the home.



## DOCUMENTATION

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(Pasero & McCaffery 2011)

Documentation is a means of communicating pain assessments, interventions to manage the pain and the patient's response.

Use of a flow sheet helps to centralize and standardize documentation, avoid duplication of documentation, save time, meet substance control requirements and provide an overall picture of the patient's pain experience during treatment.

A sample flowchart for use in documentation is provided on the following page for your reference.

### When to call the physician:

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- Uncontrolled pain (intensity score > at rest)
- Uncontrolled nausea, pruritus, or other side effect
- Significant decrease in BP or HR not related to other causes (compared to baseline)
- Respiratory rate <8/min or a sedation scale of 3 or 4
- Headache that worsens with sitting or standing
- Excessive pain or tenderness at port site
- Signs and symptoms of meningitis/infection
- Signs and symptoms of local anesthetic toxicity
- Signs and symptoms of epidural hematoma
- Persistent numbness or tingling in the lower legs
- Persistent motor block

Clear directions indicating the primary and secondary persons most responsible should complications arise should be clearly documented on a contact information sheet of health care providers.

### Patient safety

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(CCO 2009)

Patients should have a Medic Alert emblem that alerts healthcare professionals to the presence of an intraspinal device in emergency situations.

To promote communication related to the intraspinal and infusion with other team members in an emergent situation, a copy of the procedure note from the inserting anesthesiologist, or most responsible physician the most recent prescription and a contact information sheet of the health care providers involved in the care of the patient are beneficial. These can be stored with the infusion pump in the carrying pouch.

### Patient education

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(CCO 2009)

Patients and families should be taught what intraspinal pain management is.

Patients and families should be educated when and who to call should a problem occur.

If able, patients and families should be taught how to perform an independent double check when bringing all intrathecal solution bags into the home and as described earlier.

Patients with an externalized or partially externalized system should not immerse in water (bathtub). The site is to be dry at all times. Any leakage should be reported to the nurse.

## Intraspinal Infusion Flow Sheet

[illegible]

## REFERENCES

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- American Society of Pain Management Nurses. *Core Curriculum for Pain Management Nursing*. (2002). W.B. Saunders Company. Philadelphia, PA.
- Block, M., Horn, R. & Schlesinger, M. (2012). *Reducing Risk of Epidural – Intravenous Misconnections*.  
<http://www.apsf.org/newsletters/html/2012/winter/16epidural.htm>
- Burton, A., Ramjagopal, A., Shah, H., Mendoza, T., Cleeland, C., Hassenbusch, S., & Arens, J. (2004). *Epidural and intrathecal analgesia is effective in treating refractory cancer pain*. *Pain Medicines*, 5(3), 239-247.
- Christo, P., & Mazloomdoost, D. (2008). *Interventional pain treatments for cancer pain*. *Annals of the New York Academy of Sciences*, 1138, 299-328.
- Coyne, P., Smith, T., Laird, J., Hansen, L., & Drake, D. (2005). *Effectively starting and titrating intrathecal analgesic therapy in patients with refractory cancer pain*. *Clinical Journal of Oncology Nursing*, 9(5), 581-583.
- Ghafoor, V., Epshteyn, M., Carlson, G., Terhaar, D., Charry, O., & Phelps, P. (2007). *Intrathecal drug therapy for long-term pain management*. *American Journal of Health-System Pharmacy*, 64, 2447-2461.
- Hawley, P., Beddard-Huber, E., Grose, C., McDonald, W., Lobb, D. & Malysh, L. (2009). *Intrathecal infusions for intractable cancer pain: A qualitative study of the impact on a case series of patients and caregivers*. *Pain Research & Management*, 14 (5), 371-379.
- (Hamilton) Intrathecal Project Working Group. (2010). *Intrathecal Analgesia for Palliation of Intractable Pain Resource Package*.
- Home Page for ISMP Canada: <http://www.ismp-canada.org/dangerousabbreviations.htm>
- Institute for Safe Medication Practices. (2008). *Epidural-IV route mix-ups: Reducing the risk of deadly errors*.  
From the July 3, 2008 issue, 1-4.
- Kim, J. (2004). *St. Mary's General Hospital Epidural Analgesia - Nursing Self Learning Package*.
- Manion, Smith C. & Brennan, Timothy J. (2011). *Thoracic Epidural Analgesia and Acute Pain Management*. *Anesthesiology*, 115, 1, Fig 1, 181-188.
- McCaffery, M., & Pasero, C. (1999). *Pain: Clinical Manual*, (2nd edition). Mosby: St. Louis.
- Myers, J., Chan, V., Jarvis, V., Walker-Dilks, & the Palliative Care Clinical Program. (2009a, May 5). *Intraspinal techniques for pain management in cancer patients: Guidelines recommendations*. Evidentiary Base Series #18-1: Section 1.  
Retrieved from <http://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=44121>
- Pasero, C., et al MS, RN-BC, FAAN *Registered Nurse Management and Monitoring of Analgesia by Catheter Techniques: Position Statement*. *Pain Management Nursing*, Vol 8, No 2 June (2007): pp 48-54.
- Pasero, C., Eksterowicz, N., Primeau, M., & Cowley, C. (2008). The registered nurse's role in the management of analgesia by catheter techniques. *Journal of PeriAnesthesia Nursing*, 23(1), 53-56.
- Pasero, C. & McCaffery, M. (2011). *Pain Assessment and Pharmacologic Management*. Mosby Elsevier. St. Louis, Missouri.
- Rathmell, James P., MD, Lair, Timothy R., MD., Nauman, Bushra *The Role of Intrathecal Drugs in the Treatment of Acute Pain*. *Anesthesia & Analgesia* 2005;101:S31, S32
- Registered Nurses Association of Ontario (RNAO) (2002, Revised 2007). *Nursing Best Practice Guideline assessment & management of pain*.
- Reisfield, G., & Wilson, G. (2004). Intrathecal drug therapy for pain #98. *Journal of Palliative Medicine*, 7(1), 76.
- Sudgen, A. & Cox, F. (2006). How to access epidural blockade. *Nursing Times*, 102, 11, 26-27.
- Weetman, A. (2006). Use of epidural analgesia in post-operative pain management. *Nursing Standard*, 20, 44, 54-64.

## FIGURE LISTING

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- Figure 1** Noiception (Pasero & McCaffery 2011)
- Figure 2** Vertebral Column (McCaffery & Pasero 1999)
- Figure 3** Spinal Anatomy (Pasero & McCaffery 2011)
- Figure 4** Dermatomes (Pasero & McCaffery 2011)
- Figure 5** Potential Thoracic Epidural Catheter Insertion Sites (Manion 2011)
- Figure 6** Epidural Needle and Catheter Placement (Pasero & McCaffery 2011)
- Figure 7** Disposition of Opioid after Intrathecal administration (Rathmell et al. 2005)
- Figure 8** SMGH Self Learning Package, 2004
- Figure 9** Spread of Analgesia of Intrathecal Opioid after lumbar administration (Rathmell et al. 2005)
- Figure 10** Intraspinal Delivery Systems for persistent pain, (McCaffery & Pasero 1999)
- Figure 11** Dermatomes (Pasero & McCaffery 2011)
- Figure 12** Bromage Motor Scale, SMGH Self Learning Package
- Figure 13** De-accessing Intraspinal Subcutaneous Port
- Figure 14** Example of Dressing over intrathecal port and non-coring needle including label
- Figure 15** Example of Dressing over intrathecal port and non-coring needle including labels
- Figure 16** Independent double check
- Figure 17** Example of organization of supplies

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The Waterloo Wellington (WW) Palliative Care Nursing Intraspinal Protocol

Background

Pain is a common symptom in advanced stages of cancer. With appropriate assessment and management, pain can be managed 90-95% of the time using oral and parenteral opioids and adjuvant medications. Patients who do not respond to the usual pharmacological methods of pain control may be candidates for intraspinal (neuraxial) therapy where opioid and local anesthetics are delivered into the epidural or intrathecal space. (Hawley et al. 2009)

Indications for intraspinal analgesia include intractable severe pain despite aggressive pharmacological interventions as well as dose-limiting side effects experienced from conventional administration routes including oral, rectal, subcutaneous, and intravenous therapies.

New adaptation of the analgesic ladder

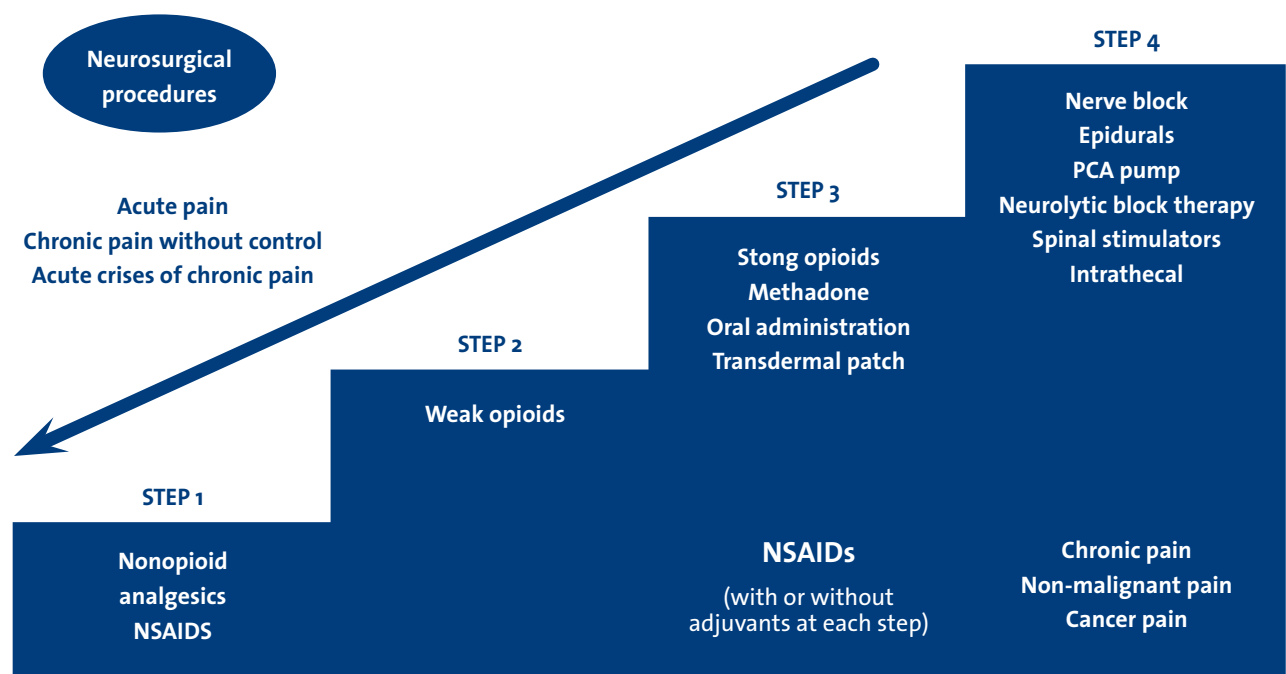


Figure 1 (Pasero & McCaffery 2011)

Planning for these few cases is critical to success, as lack of appropriate equipment, supplies, and clinical expertise to support nursing and medical personnel are potential barriers to providing a successful intraspinal program in the community. (Myers, Chan, Jarvis, Walker-Dilks & the Palliative Care Clinical Program, 2009b)

Registered Nurses are widely recognized as the patient's pain manager in the home, hospital, and other care settings. Pasero, Eksterowicz, Primeau, & Cowley 2007. The provision of comfort has long been considered a fundamental nursing responsibility. "For many years, nurses have played a critical role in ensuring the safe and effective administration of analgesia". (Pasero, Eksterowicz, Primeau and Cowley 2007, p. 53) Registered nurses who have proper education and additional training may manage and monitor any patient in any setting receiving analgesia by catheter technique .

## Recommendations and Guiding Principles

### PATIENT SELECTION AND ELIGIBILITY

#### Indications for intraspinal analgesia

- 1 Intractable severe pain despite aggressive pharmacologic interventions by conventional administration routes (oral, rectal, transdermal, subcutaneous, and intravenous) (See Figure 1)
- 2 Dose-limiting side effects experienced from conventional administration routes

#### Contraindications

- 1 Active systemic or local infection at the site of catheter insertion or pump implantation
- 2 Bleeding diathesis at the time of procedure
- 3 Increased intracranial pressure
- 4 Spinal pathology that may prevent successful placement (e.g., hardware) or lead to adverse effects (i.e., severe spinal stenosis)
- 5 Allergy
- 6 Failed trial

### Additional Considerations

- 1 Careful consideration must be given to patient selection (social, geographical, as well as medical considerations)
- 2 The availability of appropriate equipment, supplies, expertise, and 24-hour coverage for clinical support
- 3 The expectation that intraspinal analgesia would improve a patient's quality of life and level of function
- 4 Informed consent has been given by patient or substitute decision maker
- 5 Availability of home care nursing and medical support for intraspinal catheter care
- 6 Patient general medical condition is amenable to intraspinal analgesia
- 7 For a fully implanted system, a screening trial is recommended; for intraspinal analgesia using an external pump, a trial is not necessary

### Key Safety and Risk Management for Implementation Considerations:

- 1 Long-term intraspinal analgesic treatment can be provided by epidural analgesia or intrathecal (subarachnoid) analgesia. For both routes of administration, there are basically three types of intraspinal delivery systems: externalized system, partially externalized system, and totally internalized implanted system.
- 2 Planned length of use should be a determining factor for choosing the method of delivery. NB: Discussion re prognosis should be considered for use of other technology such as the implantable pump vs. using an ambulatory pump.
- 3 Medication must be preservative free.
- 4 Straight alcohol or acetone should never be used for site preparation or cleansing. Disinfectants containing alcohol may be used, but must be allowed to dry prior to use.
- 5 Patients require admission for intraspinal placement, and the facility must have health personnel who are competent in the care of patients with intraspinal analgesia and policy and procedures that are available and approved.
- 6 While in hospital post-procedure, routine monitoring of patients is required for all key clinical indicators including vital signs, pain, sensory and motor functioning, and complications and side effects. Routine monitoring of insertion site is also required.

- 7 Criteria for admission to community care is dependent on CCAC Client Service Manager's review and approval. This is required as defined by protocols, that includes roles and responsibilities of care providers to ensure timely response should complications arise and appropriate patient follow-up by members of the team. Rationale: In WW, patients receiving intraspinal analgesia likely will have had their catheters or devices inserted in a tertiary care centre (London, Hamilton, Toronto). At this time, WW does not provide interventional pain services and anesthesia support will come from a tertiary centre. To support local nursing teams, the involvement of a local palliative care physician is optimal to facilitate patient care locally should the patient become too unstable to travel and require local hospitalization.
- 8 The care team should consist of interventional pain physicians, nurses, palliative care physicians, pharmacists, and primary care providers.
- 9 All members of the team should have appropriate and specialized training in accordance with professional college/ association standards and certification. Additionally, community nurses should successfully complete the **Waterloo Wellington Palliative Care Intraspinal (Neuraxial) Analgesia Community Self-Learning Package**.
- 10 Patients and family members should be fully informed in all aspects of intrathecal pain management care. This includes knowing whom and when to call for support, should complications arise.
- 11 Strict aseptic conditions must be maintained in all aspects of intraspinal analgesia administration.
- 12 All equipment should be compatible with epidural and intrathecal use (pump, tubing, catheter, solution bag, dressing, etc), must be appropriately labeled, and should be dated at time of equipment change.
- 13 Patients should have a Medic Alert emblem that alerts healthcare professionals to the presence of an intraspinal device in emergency situations.

This Protocol follows the recommendations put forth from the Guideline supported by Cancer Care Ontario: Intraspinal techniques for pain management in cancer patients: a systematic review (Myers, Chan, Jarvis) in 2010. Further, the modified WHO Ladder, adapted to reflect a Step 4 for interventional pain management is foundational to this protocol and interventional pain management in general.

## The WW Palliative Care Intraspinal (Neuraxial) Protocol is targeted for:

- 1 Nurses involved in the delivery of intraspinal analgesia for cancer patients.
- 2 Nurses involved in the care of cancer patients who are eligible for intraspinal analgesic intervention and who would make referrals to the appropriate care team.

## Roles & Responsibilities

There are a range of key clinical activities in the administration of intraspinal analgesia. Outside of catheter insertion by the interventional pain physician, and medication preparation by the pharmacist, the role and responsibilities of each team member must be clarified and agreed upon, preferably prior to catheter insertion. The roles and responsibilities include but are not limited to:

- Patient selection
- Inpatient admission and discharge planning
- Ongoing assessment and medication management
- Monitoring for side effects and complications
- Care of the catheter site
- Equipment maintenance
- Patient and family education
- A plan for ongoing mentorship and communication between tertiary palliative care and the local palliative care providers.

[as recommended in the Intraspinal Techniques for Pain Management in Cancer Patients: Guidelines and Recommendations.] (Myers et al. 2009)

## Nursing Education Requirements

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It is recommended that each nurse have verified their competency related to managing intraspinal medication administration.

Competency can be verified through the completion of the WW Palliative Care Intraspinal (Neuraxial) Analgesia Community Self-Learning Package. Organizations are responsible for ensuring each nurse has reviewed this protocol prior to caring for a client receiving intraspinal pain management and has successfully completed the Self Learning Package.

Institution Recommendations (American Society for Pain Management Nursing):

- Ensure implementation of multidisciplinary policies and procedures related to administration of analgesia by catheter techniques.
  - Ensure the registered nurse's (RN's) role is consistent with provincial nurse practice laws and established institutional policies and procedures.
  - Ensure practitioner has access to a formulary containing documented safe drugs for delivery by catheter techniques.
- Provide a means for documentation of all aspects of therapy.
  - Provide initial and ongoing RN education related to administration of analgesia by catheter techniques to ensure competency.
- Systematically evaluate safety and effectiveness of the administration of analgesia by catheter techniques.

(Pasero et al. 2007)

## Interventional Pain Physician

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Upon identification of a patient appropriate for intraspinal analgesia returning to a home community, the interventional pain physician has likely been communicating with the local palliative care team in planning for a discharge back to either community or hospital, depending on each individual case.

In discharge back to home community (WW), the following considerations should be addressed and documented:

- Local policies and procedures for intraspinal analgesia including documentation of catheter position, procedures, and administration of initial dosing and outcome;
  - The individual medication plan, including analgesic dosage parameters and mechanisms for monitoring side effects and toxicity;
- Communication and contact information, clarification of shared care with tertiary site, and transfer of care.

## Local Palliative Care Clinical Team Roles and Responsibilities

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### PALLIATIVE CARE PHYSICIAN

Upon receiving a patient with intraspinal analgesia, the palliative care physician should be communicating with the interventional pain physician in planning discharge back to either community or hospital, depending on each individual case.

In discharge back to home community (WW), the following considerations should be addressed and documented:

- The individual medication plan, including analgesic dosage parameters and mechanisms for monitoring side effects and toxicity;
- On call support from the referring tertiary site, and
- Confirmation with local team of current orders and care plan.

### CARE COORDINATOR

Coordination and resource allocation to support this WW Intraspinal Protocol.

(Myers J, Chan V, Jarvis V & Walker-Dilks C. 2010)

### PHARMACIST

- Ensure all medication labels prominently identify the route of administration.
- Use dedicated infusion pumps for intraspinal infusion. Pre-programme the pump with hard and soft limits.
- Establish parameters and drug libraries with anesthesiology.
- Collaborate with the team re: issues around discharge planning and continuity of care.
- Patient and family teaching.
- Support the nursing teams in management of drug delivery.
- Coordination of medication and supply orders and prescription changes in the community.
- Consult with the anesthesiologist and palliative care physician prior to initiating any anticoagulant therapy.

(ISMP 2005 and 2008)



## REGISTERED NURSE

- Prior to discharge from the acute care setting, create a home environment that promotes the recommendations for safe medication handling.
  - Complete initial and ongoing institution-established educational requirements related to administration of analgesia by catheter techniques.
- Follow institutional policies and procedures related to administration of analgesia by catheter techniques (including patient assessment, care of the catheter site, dressing changes, equipment maintenance, management of complications, and the ability of problem solve and trouble shoot).
  - Implement Independent double checks of medications.
  - Ensure that the pharmacist has consulted with the anesthesiologist and palliative care physician prior to initiating any anticoagulant therapy.
  - Coordination of medication and supply orders and prescription changes in the community.
- Communicate regarding patient status.
- Document therapies according to institutional policies and procedures.
  - Establish system safeguards that reduce potential risk for substitution errors with other look alike premixed solution( separate room dedicated to Intraspinal care).
- Participate in quality improvement activities related to administration of analgesia by catheter techniques as required by institution.
- Ensure back up plan in place for pump failure in the home.

(Myers J, Chan V, Jarvis V and Walker-Dilks C. 2010, ISMP 2005 and 2008, Pasero et al. 2007)

## Nursing Education Requirement-Recommendations

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Nursing Education for care and maintenance of intraspinal analgesia should include:

- Institutional policies and procedures
- Related anatomy and physiology
- Related pharmacology
- Comprehensive patient assessment
- Use and interpretation of monitoring modalities
- Use and troubleshooting of infusion devices
- Side-effect management
- Complications and emergency situation recognition and management
- Patient/family education

(Pasero et al. 2007)

## Patient Controlled Intrathecal Analgesia (PCIA)

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PCIA cannot be fully addressed in this protocol, except to suggest managing uncontrolled pain should be ordered in consultation with the interventional pain physician and palliative care physician using an individual approach to patient/proxy controlled bolusing. The proposed PCIA dose is often administered in clinic with close monitoring for toxicity such as weakness, over sedation, hypotension or nausea. Close follow up is recommended to assess for effect and tolerability.

(Brogan et al. 2011)

## References

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- American Society for Pain Management Nursing. Retrieved from [http://www.aspmn.org/Organization/position\\_papers.htm](http://www.aspmn.org/Organization/position_papers.htm) on May 5, 2014.
- Block, M., Horn, R. & Schlesinger, M. (2012). Reducing Risk of Epidural – Intravenous Misconnections. <http://www.apsf.org/newsletters/html/2012/winter/16epidural.htm>. Retrieved April 18, 2012.
- Brogan, S. & Winter, N. (2011). Review Article. Patient Controlled Intrathecal Analgesia for the Management of Breakthrough Cancer Pain: A Retrospective Review and Commentary. *Pain Medicine*, 12, 1758-1768.
- Coyne, P. S. (2005). Effectively starting and titrating intrathecal analgesic therapy in patients with refractory cancer pain. *Clinical Journal of Oncology Nursing*, 9 (5), 581-583
- Hawley, P. Beddard-Huber, E. Grosse, C., McDonald, W., Lobb, D., Malysh, I. (2009). Intrathecal infusions for intractable cancer pain: A qualitative study of the impact on a case series of patient and caregivers. *Pain Research & Management*, 14, 5, 371-379.
- Institute for Safe Medication Practices. (2005). Tunneled Intrathecal Catheter Mistaken as Central Venous Line Access. From the October 30, Vol 5 issue 8. Retrieved from <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2005-08Intrathecal.pdf>
- Institute for Safe Medication Practices. (2008). Epidural-IV route mix-ups: Reducing the risk of deadly errors. From the July 3, 2008 issue, 1-4. Retrieved from <http://www.ismp.org/Newsletters/acutecare/articles/20080703.asp>
- Myers, J., Chan, V., Jarvis, V. & Walker-Dilks, C. (2010). Intraspinal techniques for pain management in cancer patients: a systematic review. Retrieved from <https://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=44119>. *Supportive Cancer Care*, 18, 137 -149.
- Myers, J., Chan, V., Jarvis, V., Walker-Dilks, & the Palliative Care Clinical Program. (2009a, May 5). Intraspinal techniques for pain management in cancer patients: Guidelines recommendations. Evidentiary Base Series #18-1: Section 1. Retrieved from <http://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=44121>
- Myers, J., Chan, V., Jarvis, V., Walker-Dilks, & the Palliative Care Clinical Program. (2009b, May 5). Intraspinal techniques for pain management in cancer patients: Evidentiary base. Evidentiary Base Series #18-1: Section 2. Retrieved from <http://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=44119>
- Pasero, C. & McCaffery, M. (2011). *Pain Assessment and Pharmacologic Management*. Elsevier, Mosby, St. Louis Missouri
- Pasero, C., Eksterowicz, N. Primeau, M., & Cowley, C. (2007). Registered Nurse Management and monitoring of analgesia by catheter techniques. *Pain Management Nursing*, 8 (2), 48-54.
- Vargas-Schaffer, G. (2010). Is the WHO analgesic ladder still valid? *Canadian Family Physician*, 56, 514- 517.



