A Self-Directed Learning Activity

EPIDURAL / INTRATHECAL / INTRAPLEURAL ANALGESIA

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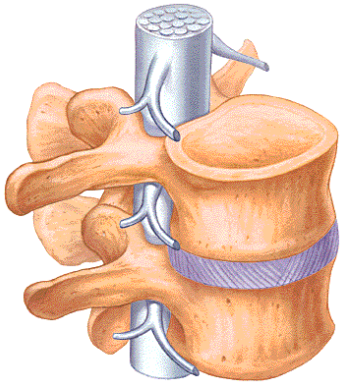
Presbyterian Healthcare, Revised by Kelly Wright, RN, BSN



The purpose of this self-directed learning activity is to provide the nurse with basic knowledge of anatomy and pathophysiology of the spine and an understanding of the care required for patients receiving epidural, intrathecal, or intrapleural analgesia.

Objectives:

1. Describe spinal cord and pleural anatomy
2. Define epidural, intrathecal, and intrapleural analgesia
3. Discuss medications commonly used to provide analgesia
4. Identify specific nursing care required to care for this patient population

Time for completion: 60 minutes (1 hour)

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Instructions

This activity is designed for nurses who provide direct patient care for patients with orders for epidural / intrathecal / or intrapleural analgesia for pain control.

The following instructions will help you proceed through this self-directed learning activity. Read all the materials in the module and complete the test at the end. Complete the criterion checklist for administration of intrapleural analgesia, Epidural / Intrathecal analgesia Administration, and Epidural / Intrathecal Catheter removal as appropriate (you may have already been checked off on these skills.

Your feedback regarding this activity is important to us. You will find an evaluation form at the end of this activity. We will use your feedback when the time comes to make revisions to this activity.

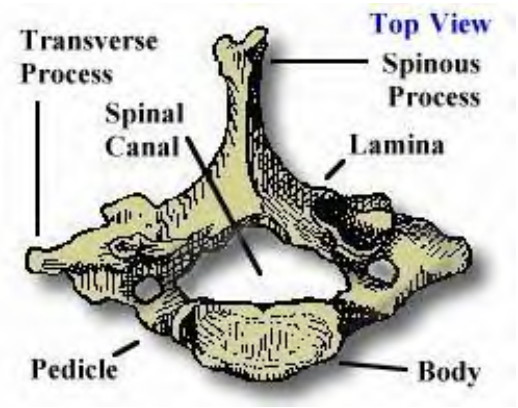
Thank-you and we hope you find this activity helpful.

1. *Complete the post test and give to your manager*
2. *Complete the criterion checklists for administration of intrapleural analgesia, Epidural/Intrathecal analgesia Administration, and Epidural/Intrathecal catheter removal and give to your manager (if you have not already been checked off on these skills.)*
3. *Complete the evaluation form and return to Corporate Education.*
4. *Record one hour continuing education time on your annual Education Record.*

EPIDURAL / INTRATHECAL / INTRAPLEURAL ANALGESIA

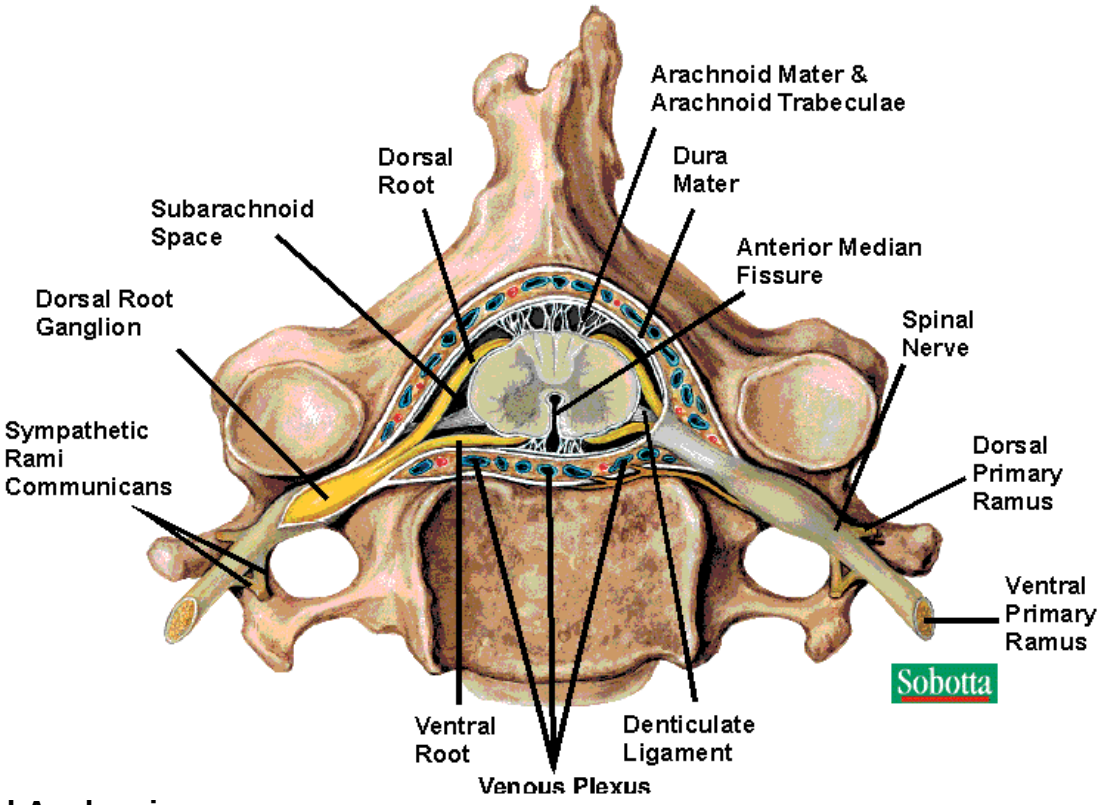
Anatomy and Physiology of the Spine

The spinal column consists of 7 cervical, 12 thoracic, 5 lumbar vertebrae, and 5 fused sacral vertebrae. Providing a framework to support the trunk, the spinal column also provides protection to the spinal cord. A continuation of the medulla oblongata, the spinal cord is 40 to 50 cm long and ends at L1 or L2 of the lumbar spine. Thirty-one pairs of spinal nerves exit between the vertebral foramen to enervate specific dermatomes.



Additional protection of the spinal cord is provided by the meninges and the cerebrospinal fluid. The three (3) layers of meninges act to suspend and maintain the shape of position of the nervous tissue of the spinal cord. The meninges that cover the spinal cord are similar to those covering the brain and form three spaces. The subdural space lies between the dura mater and the arachnoid and is a potential space. The epidural space lies between the spinal dura and the vertebral periosteum (arachnoid). The epidural space is a true space. The interior layer is the pia. Between the arachnoid and pia (subarachnoid) is the cerebrospinal fluid (CSF). Approximately 500 ml of CSF are produced in the choroid plexus of the brain each day. It is absorbed approximately at the same rate that it is produced.

Cross Section Spinal Cord and Meninges



Epidural Analgesia

Epidural Analgesia is the administration of medication via catheter inserted into the epidural space at the thoracic or lumbar level or caudal level (for pediatric patients). The medication then diffuses into the subarachnoid space and cerebrospinal fluid where it binds with opioid receptor sites.

Epidural analgesia is used for patients following thoracic, abdominal, or lower extremity surgery. It is useful for patients with known contraindications for general anesthesia, including cardiac or respiratory disease, decreasing the incidence of complications of general anesthesia for these patients. Epidural anaglesia provides effective pain relief and improved pulmonary function without sedation. Medication can be administered continually or by bolus injection. Recovery time is shorter than that for general anesthesia and effects of longer-acting anesthetics and opioids will prolong the analgesic effects without accompanying sedation.

Intrathecal Analgesia

Intrathecal Analgesia is the administration of medication via catheter inserted into the subarachnoid space and cerebrospinal fluid. The most common use of intrathecal analgesia is the one time bolus of analgesia before or during surgical procedures. Risk of central nervous system infection is of concern, so continuous infusions into the intrathecal space are not recommended. Because the medication does not have to diffuse through membranes to reach the CSF, the medications used are about 10 times more potent than those used in the epidural space.

Intrapleural Analgesia

Pleura: Composed of a visceral layer and a parietal layer, the pleura totally enclose the lung. The visceral pleura hug the contours of the lung surface, including the fissures between the lobes. The parietal pleura line the inner surface of the chest wall and the upper surface of the diaphragm, double back, around the mediastinum, and join the visceral layer at the lung root. The space between the pleural layers, the pleural cavity, is only a potential space. A thin film of serous fluid fills this cavity, lubricating the pleural surfaces to slide smoothly against each other while creating a cohesive force between layers. This compels the lungs to move synchronously with the chest wall during breathing.

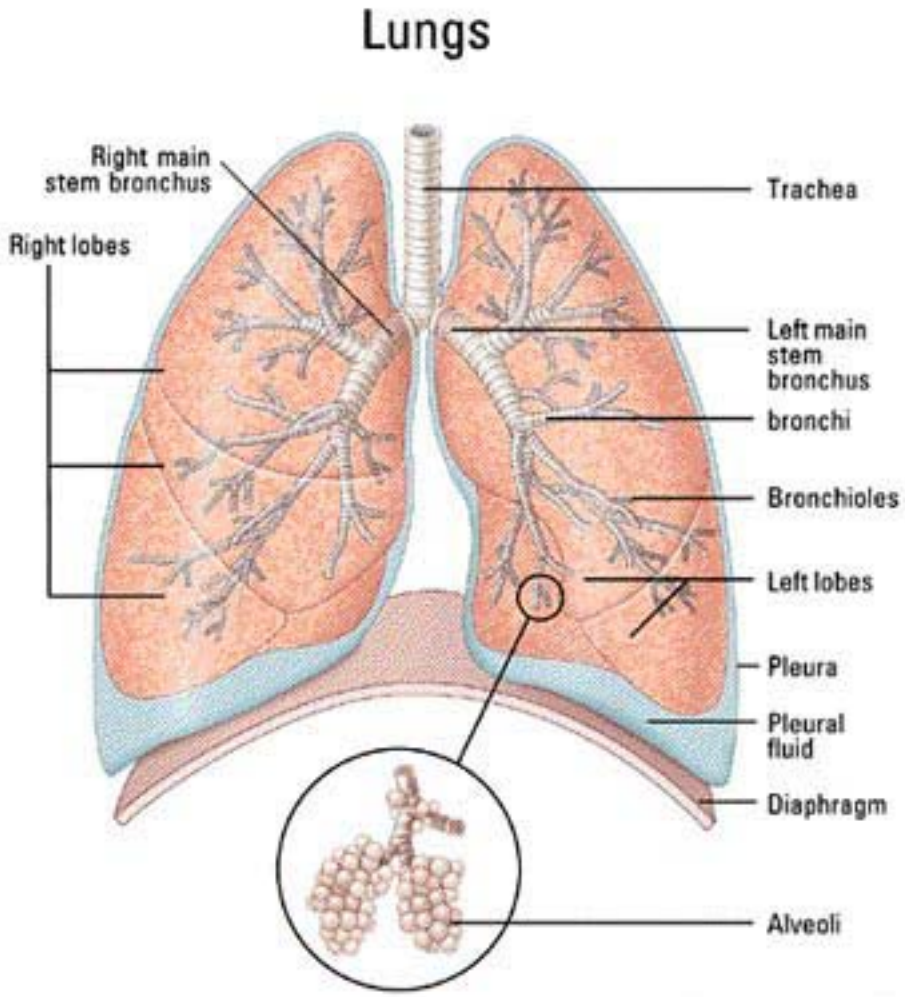


Image Source: http://www.homehealth

Intrapleural analgesia: The administration of medication via a catheter inserted between the parietal and visceral pleura of the lung. The local anesthetic then diffuses across the parietal pleura to relieve pain by blocking intercostal nerve roots. Intrapleural analgesia is used for patients following thoracic surgery or for those with multiple rib fractures who have painful and ineffective breathing. Another use for intrapleural anaglesia is to provide pain relief for patients with acute pancreatitis whose pain has not been managed by other pharmacologic interventions. The most common medications administered by this method are local anesthetics such as bupivacaine. The injection may be bolus or continuous.

Preoperative Evaluation

Patients are evaluated for epidural, intrathecal, and intrapleural analgesia by the anesthesiologist. Indications for use are based on the surgical procedure, spinal anatomy, and skin condition. Absolute contraindications for use of epidural or intrathecal analgesia include the presence of infection at the site of needle insertion, presence of coagulopathies, increased intracranial pressure, or patient refusal of the procedure. Elevated INR or PTT at the time of needle insertion greatly increase the risk of the development of epidural hematoma. Relative contraindications include hypovolemia, sepsis, or preexisting neurologic disease. Any hypovolemia must be corrected prior to needle insertion to avoid severe hypotension related to sympathetic denervation. Sepsis is thought by some to increase the risk of introduction of bacteria into the CSF. Any preexisting neurologic deficits must be carefully documented to allow for accurate postoperative assessment.

Medications

Drug choice is based on the use (operative, or postoperative), and by the drug's properties. All medications used for epidural or intrathecal analgesia must be preservative – free. Medication preservatives can be neurotoxic and may cause spinal cord injury. In addition, alcohol is potentially neurotoxic and may not be used to clean vial tops or injection ports. Alcohol packets may not be used to protect the fingers when opening vials.

The most common opioids used for epidural / intrathecal analgesia are preservative-free Morphine (Astramorph), Hydromorphone (Dilaudid), and Fentanyl. Spinal administration of these opioids provides selective blocking of opioid receptors and preserves intact sensation, motor, and sympathetic function. Spinal opioids have longer duration, so less medication is needed to achieve the desired analgesic effect. Dose, onset, peak, and duration of the most commonly used medications are listed in Table 1.

OPIOID	DOSE	ONSET	PEAK	DURATION
Morphine	4 – 8 mg	20 – 30 minutes	30 – 60 minutes	4 – 24 hours
Hydromorphone	1 – 3 mg	10 – 20 minutes	20 – 30 minutes	5 – 15 hours
Fentanyl	50 – 100 micrograms	5 – 15 minutes	10 – 20 minutes	2 – 4 hours

Table 1 Opioids Used in Epidural / Intrathecal Analgesia

Medication Administration

Verify medication orders prior to administration. Draw up preservative-free and additive-free medications using a **10 cc syringe** with filter needle. The physician may also order that the medication be diluted with preservative-free saline for a total volume of up to 10cc. Prep top of any vial with povidone. Do NOT use alcohol. All epidural medications are verified with another qualified nurse prior to administration.

A **10 cc syringe** is used for administration of any medication to prevent catheter rupture that may result from high pressures generated by smaller syringes. Aspirate, observing for clear fluid, followed by an air bubble. If blood is aspirated, do not give medication and call Anesthesia. The medication will need to be wasted per hospital policy. Observe dressing site before and after medication administration for wetness.

Patient Assessment/Care

Vital signs, sedation level, sensory and motor block level are monitored regularly for both continuous and intermittent epidural / intrathecal injections. The most common and serious complication is respiratory depression, with early respiratory depression appearing within 1 –2 hours of administration. Late respiratory depression can occur up to 6 – 12 hours following administration of an epidural opioid. Monitor respiratory rate every hour for the first 24 hours and with each increase in medication dose. After 24 hours, respiratory rates are monitored every 4 hours. Naloxone (Narcan) is kept available for use if respiratory rates fall below 9 / minute.

Pain level, sedation level, and sensory / motor block levels are documented every hour for the first 24 hours and q 4 hours thereafter. Blood pressure is monitored every hour for the first 8 hours then every 4 hours thereafter. Blood pressure should also be monitored when the patient is upright immediately prior to being ambulated. This standing blood pressure should be within 15% of their baseline reclining blood pressure.

Motor block assessment is performed for patients receiving local anesthetics by way of epidural / intrathecal or intrapleural catheter. The block level is documented based spinal level and on the patient's ability to lift their hips off the bed while supine and their ability to deep knee bend. The levels for documentation are listed in Table 2.

Anatomical Structure	Level of Block
Toes	S1
Calf	L4, L5
Thigh	L2, L3
Hip	L 1
Umbilicus	T 10
Xiphoid area but not midsternal area	T 6
Midsternal area but not little finger (Nipple line)	T 4*
Little finger and rest of hand	T 1

* Anesthesiologist is notified immediately for T4 or above block

Table 2: Motor Block Assessment

The catheter site dressing is assessed each shift and before and after administration of a bolus medication. Loose dressings can be reinforced with opsite. The appearance of fluid or moistness requires additional assessment by the anesthesiologist. All other dressings are changed by the anesthesiologist.

Catheter Site Care

- Use only povidone to cleanse vials, injection caps and to open ampoules.
- Use appropriate tubing for the pump being used.
- Mark the tubing with a label indicating “Epidural Line Only”.
- Use only preservative free medications and diluents to avoid neurological injury.
- Maintain a patient IV site for 24 hour after the last epidural / intrathecal injection.
- Observe dressing for signs of leaking or loosening each shift and with each administration of a bolus medication.
- Removal of an epidural / intrathecal catheter is within the scope of practice of the registered nurse following appropriate education and observation of technique.
- Documentation should include patient’s tolerance of the procedure and a statement noting the condition of the catheter (i.e. catheter is intact with black dot visible).

Side Effects

Respiratory depression is the most common side effect of administration of opioid intrathecal, epidural, or intrapleural analgesia. Other common side effects of administration include sedation, pruritis, nausea and vomiting, urinary retention / relaxation of bladder muscle, epidural abscess or hematoma. Interventions and Treatments are identified in Table 3.

OB Specific

Nurses in the Labor and Delivery units are allowed to remove an epidural catheter with an order and IF the patient has no risk factors for coagulopathies and with demonstrated competency of the procedure. Nurses in Labor and Delivery are not allowed to titrate epidural medications or inject into the epidural catheter.

Patient Education

Patient education includes information on the procedure for catheter insertion and the expected outcome of analgesia administration. Patients are told about the frequency of assessment and common side effects. The patient is also instructed to notify the nurse of changes in motor function or sensation, nausea, vomiting, pruritis, or increase in pain. All patient education is documented in the medical record.

Table 3

Common Side Effects and Interventions/Treatments

SIDE EFFECT	ASSESSMENT	INTERVENTION/TREATMENT
Respiratory Depression	• **Change in Level of Consciousness (LOC) always precedes a decrease in respiratory rate** (peaks approximately 1 hour after narcotic administration and 6-12 hours after narcotic administration when narcotic reaches the respiratory center in the brain). • Respiratory rate ≤ 12 for adults or ≤ 16 for pediatrics.	• Evaluate change in LOC • Evaluate respirations (quality, depth, rate) • Shut off the epidural/intrathecal analgesia – notify Anesthesiologist if patient has a DNR. • Notify Anesthesiology for orders • Administer naloxone as ordered • If receiving opioids > 1 week may be very sensitive to opioid antagonists. • Mechanical monitoring for pediatrics (pulse oximetry and/or apnea monitor) as appropriate.
Sedation	Change in LOC	• Determine sedation level using the unit specific sedation scale. Stop the epidural/intrathecal analgesia for level ≥ 5 and notify Anesthesiology for orders. • If receiving opioids > 1 week may be exquisitely sensitive to opioid antagonists. • Use pulse oximetry and/or apnea monitor for pediatric patients.
Pruritis	• Sometimes generalized but usually localized occurring around the face, trunk or legs and rarely accompanied by rash. • Rarely severe and usually self-limiting	• Treatment with nalbuphine (Nubain), ondansetron (Zofran) or antihistamines. • Keep nails short in pediatric population or use a welcome sleeve. • Apply moist towels if drug therapy is contraindicated.
Nausea and Vomiting	Commonly seen in pediatrics with initial dose and with significant dose increase	Administer antiemetic medications as ordered.
Urinary Retention/ Relaxation of bladder muscle	Assess ability to urinate and urine output	• May need to catheterize • Notify Attending MD for treatment
Epidural Abscess or Hematoma	Diffuse back pain or tenderness, parathesia (numbness, tingling), and/or bowel or bladder dysfunction and progressive weakness.	• Notify Anesthesiology for treatment as appropriate. • Notify Attending MD for treatment as appropriate.
Motor Block/ Level of Sensory Loss **(local anesthetic only)**	Rule out motor block (see Appendix A)	• Stop epidural/intrathecal anesthesia. • Notify Anesthesiology immediately for a T-4 block or above. • Initiate resuscitative measures as appropriate.

Post Test

Self Directed Learning Activity
Epidural/Intrathecal/Intrapleural Analgesia
Presbyterian Healthcare

1. Intrathecal analgesics are administered into the
   a. Subarachnoid space
   b. Epidural space
   c. Dura mater
   d. Peripheral IV

2. Cerebrospinal fluid is found in the
   a. Lumbar space
   b. Subarachnoid space
   c. Epidural space
   d. Dura mater

3. When preparing opioids for injection into the epidural space, it is important to remember
   a. Always use 10 cc syringe to administer medications
   b. Never use alcohol to cleanse injection ports
   c. Use only preservative free medications and diluents
   d. All of the above

4. The most common side effect of epidural analgesia is
   a. Nausea
   b. Vomiting
   c. Pruritis
   d. Respiratory Depression

5. Contraindications for insertion of an epidural or intrathecal cather include:
   a. Bradycardia
   b. Cardiac disease
   c. Elevated INR or PTT
   d. Hypertension

6. If your patient feels sensation in his left hip, his sensation is at which dermatome?
   a. T 10
   b. L 1
   c. S 1
   d. L 2-3

7. When observing the patient for respiratory depression, the nurse knows that
   a. respiratory depression is not a side effect of epidural analgesia
   b. respiratory depression does not occur after the initial 1 hour of therapy
   c. a change in level of consciousness always precedes a decrease in respiratory rate
   d. using pulse oximetry to monitor the patient will prevent respiratory depression

Post Test Answers

Self Directed Learning Activity
Epidural/Intrathecal/Intrapleural Analgesia
Presbyterian Healthcare

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5. Contraindications for insertion of an epidural or intrathecal catheter include:
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Epidural / Intrathecal Analgesia (Continuous / Intermittent) for Adults and Children. SPR Policy SP-TX-MU-VIII-C-1 (10/04).

Evaluation

Title of Activity: *Epidural / Intrathecal / Intrapleural Analgesia*	**Date: _____, 20___**

We are interested in your evaluation of this activity. Your feedback is important in planning future self-learning activities.

	Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**	**NA**
A. Overall					
1. I am satisfied with this self-directed learning activity.					
B. Objectives					
1. I have specific ideas I can apply to my job/ career goals.					
2. Self-directed learning activity objectives were met.					
C. The following individual objectives were met:					
1. Describe spinal cord and pleural anatomy.					
2. Define epidural, intrathecal, and intrapleural analgesia.					
3. Discuss medications commonly used to provide analgesia.					
4. Identify nursing care required to care for this patient population.					
D. Materials and Methods					
1. This SLA was easy to understand					
2. This SLA held my interest					
3. This SLA was organized and easy to use.					

E. How could this SLA be improved?
(Please comment if you selected "Disagree" or "Strongly Disagree" for any of the above sections.)

F. What aspects of this SLA were helpful?

G. What did you learn that you plan to use in your work setting?

Please return this form via interoffice mail addressed to Corporate Education and Training or fax to Greater Winston Market at 336-277-7950 or Greater Charlotte Market 704-384-5626.