

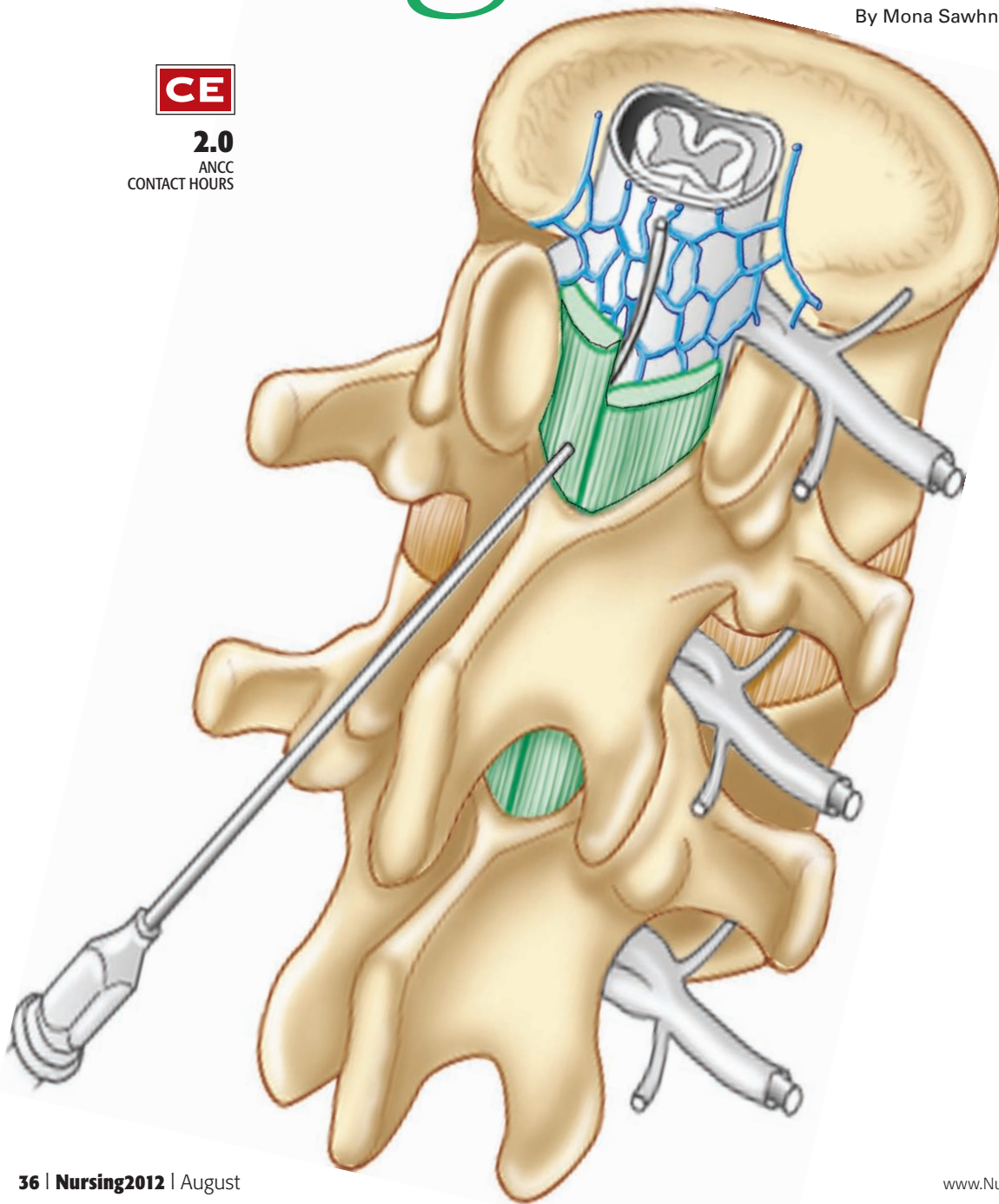
Epidural analgesia

What
nurses
need to
know

By Mona Sawhney, PhD, RN, NP

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EPIDURAL ANALGESIA is a safe and effective way to manage pain in many kinds of patients. The care and management of patients receiving epidural analgesia requires a team approach that includes anesthesiologists, healthcare providers, pharmacists, physiotherapists, and nurses. As the healthcare professionals who spend the most time with patients, nurses must be prepared to identify problems in a patient's pain management plan.

Nursing care for patients receiving epidural analgesia focuses on safely administering analgesia, achieving optimal pain control, and identifying and managing adverse reactions or complications. This article provides an overview of epidural analgesia including patient assessment.

Coming to terms

Epidural analgesia is the administration of opioids and/or local anesthetics into the epidural space. It can be used to manage pain in pediatric, adult, and older adult patients on a short-term (hours to days) or long-term (weeks to months) basis.

Short-term epidural analgesia is achieved by inserting a needle in the epidural space and injecting analgesics, or by threading a catheter through the needle and using it to administer analgesics. It's used to manage postoperative pain, procedural pain, trauma pain, or labor pain.

While epidural analgesia is used to manage pain, epidural anesthesia is used to provide anesthesia during labor and delivery and surgical procedures. Epidural anesthesia includes the loss of sensation and motor function as well as the management of pain, and involves the administration of local anesthetics and/or opioids into the epidural space at a larger dose than what's administered to achieve epidural analgesia.¹ Epidural anesthesia is beyond the scope of this article.

Long-term epidural analgesia is used to manage persistent (chronic) pain, including cancer-related pain. Long-term epidural catheters can be surgically implanted and attached to an implanted or external infusion device.² (In some cases, intrathecal pumps are used to manage chronic pain instead of epidural pumps.) An intrathecal pump delivers medications into the intrathecal space (also called the subarachnoid space), which is filled with cerebrospinal fluid (CSF).^{2,3}

Understanding the anatomy

To better understand how epidural analgesia works, review the anatomy of the epidural space and the surrounding structures. (See *Picturing the epidural space*.) The epidural space is a potential space that lies between the walls of the vertebral canal and the spinal meninges, specifically the dura mater. It extends from the foramen magnum (base of

the skull) to the sacrococcygeal ligament (sacrum), and it contains fatty (adipose) tissue throughout. Blood vessels, lymphatic vessels, and spinal nerves pass through the epidural space. The spinal nerves emerge through the intervertebral spaces along the spine. The area of skin innervated by a given spinal nerve is called a dermatome.³

The area of the body affected by epidural analgesia depends on the location of the tip of the epidural catheter in relation to the sensory nerve roots and the areas they innervate (dermatome). That's why epidural analgesia should be administered close to the spinal nerves that innervate the dermatomes that correspond with the area requiring pain relief.^{3,4} Epidural catheter insertion is beyond the scope of this article.

Pain relief is achieved by administering local anesthetics and/or opioids into the epidural space. These medications can be administered by bolus injection, continuous infusion, or patient-controlled epidural analgesia. Pain management is best achieved when local anesthetics and opioids are combined because they work synergistically to provide better pain relief with fewer adverse reactions than either drug can achieve alone.^{5,6} All medications or solutions introduced into the epidural space must be preservative-free because preservatives are toxic to the central nervous system.⁶

How local analgesics work

Local anesthetics affect spinal nerve roots by binding to sodium channels and preventing the influx of sodium ions into the nerve cells. This prevents generation of action potentials and conduction of nerve impulses, so the pain “message” can’t be transmitted along the spinal nerves.⁷

Local anesthetics prevent pain by blocking small myelinated A-delta and C nerve fibers. If larger sympathetic, sensory, and motor nerve fibers are also fully or partially blocked, the patient may experience adverse reactions. (See *How are nerves categorized?*)

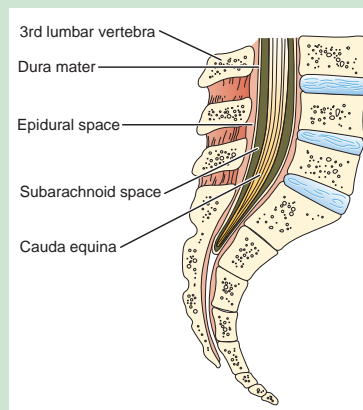
- Blocking sympathetic nerve fibers may cause bradycardia and hypotension (due to vasodilation).
- Blocking sensory nerve fibers alters sensitivity to touch and temperature.
- Blocking motor nerve fibers can cause muscle weakness or paralysis.^{7,8}

Lidocaine, mepivacaine, bupivacaine, and ropivacaine are local anesthetics that can be administered epidurally.^{3,8} Lidocaine and mepiva-

How are nerves categorized?

Nociceptors are peripheral nerves responsible for carrying noxious stimuli, including pain, to the central nervous system (specifically, the dorsal horn of the spinal cord). Pain impulses are transmitted by A-delta and C nerve fibers, primary sensory afferent nerves. A-delta fibers are myelinated, large-diameter, fast-conducting fibers that transmit well-localized sharp and prickling pain. C fibers are unmyelinated small-diameter slow-conducting fibers that transmit poorly localized dull, burning, and aching pain. When these primary afferent nociceptors are blocked, they lose their ability to conduct noxious stimuli.^{4,16}

Picturing the epidural space



caine, which have a quick onset but short duration of action (up to 2.5 hours), are often used to test epidural catheter placement or for bolus dosing. Bupivacaine and ropivacaine have a longer duration of action (4 to 7 hours) and are the drugs of choice for a continuous epidural infusion. Epinephrine may be added to the local anesthetic to extend the duration of action.^{3,8}

Sorting out opioid options

Opioids administered into the epidural space work by binding to opioid receptors in the dorsal horn of the spinal cord to block transmission of the pain message to the brain. Opioids have no effect on sympathetic, sensory, or motor nerve fibers.^{3,7,8}

The opioids most commonly used for epidural analgesia are fentanyl, hydromorphone, and morphine. The onset of action depends on the lipid (fat) solubility of the opioid. The more lipid soluble the opioid is, the faster it passes through the epidural space and CSF to bind to opioid receptors.^{3,7,8}

- Fentanyl is lipophilic (lipid soluble) and has a quick onset (5 to 15 minutes) but a short duration of action (2 to 3 hours).
- Hydromorphone is more hydrophilic (water soluble) than fentanyl but more lipophilic than morphine. The onset of action for hydromorphone ranges from 15 to 30 minutes, and duration of action is up to 18 hours.
- Morphine is hydrophilic and has a longer time to onset (30 to 60 minutes) and duration action (up to 24 hours).^{3,4,7}

Indications and contraindications

Epidural analgesia is preferred in some clinical situations. For surgical patients, epidural analgesia provides better pain management than systemic opioids, improves gastrointestinal function, reduces the risk of postoperative myocardial infarction, and may decrease the risk of postoperative mortality. Epidural analgesia may also decrease the severity of a persistent pain syndrome (such as phantom limb pain or postthoracotomy pain).^{3,6,9,10}

For labor and delivery, epidural analgesia relieves pain while minimizing sedation. For patients with cancer-related pain or a persistent pain condition, epidural local anesthetics, steroids, and/or clonidine may improve pain control.⁴

Although it's an effective analgesic technique, epidural analgesia isn't for everyone.^{1,3,11} (See *Contraindications for epidural analgesia.*) The need for anticoagulation may influence the decision to use epidural analgesia, depending on the type of anticoagulant and how long it's needed, because of the risk of spinal hematoma and subsequent neurologic dysfunction.¹²

Looking out for problems

Adverse reactions or complications of epidural analgesia can be related to the medication used or to the epidural catheter itself. Adverse reactions to opioids administered epidurally include pruritus, nausea, vomiting, urinary retention, decreased level of consciousness, and respiratory depression. Late-onset respiratory depression is a risk with hydrophilic opioids (morphine and hydromorphone).^{3,6,11,13} Urinary retention can occur with both opioids and local anesthetics, especially if they're administered in the lumbar region. There's a decreased risk of urinary retention when the epidural catheter is placed in the thoracic region.¹⁴ For this reason, a urinary catheter may be kept in place until the epidural therapy is discontinued.¹¹

Local anesthetics can cause sensory and motor deficits in dermatomes that aren't meant to be blocked. They

can also cause bradycardia and hypotension related to blocking the sympathetic nervous system.

Local anesthetic toxicity can occur with the vascular uptake or injection of local anesthetics into systemic circulation. Signs and symptoms of local anesthetic toxicity include circumoral paresthesias, tinnitus, dysgeusia, irritability, tremor, seizures, and cardiac dysrhythmias.^{3,7,8,11}

Epidural catheter-related problems, which are rare but serious, include insertion site infection, epidural abscess, epidural hematoma, and postdural puncture headache syndrome.^{7,15} Although the incidence of hematoma is estimated to be less than 1 in 150,000, this serious complication can lead to permanent spinal cord injury.^{12,15}

Nursing assessment

Closely monitor patients receiving epidural analgesia, including vital

Contraindications for epidural analgesia^{1,11}

Absolute contraindications

- Patient refusal
- Infection at the proposed insertion site
- Systemic infection
- Increased intracranial pressure
- Coagulopathy
- Allergy to local anesthetics or opioids

Relative contraindications

- Spinal deformity (such as scoliosis or spina bifida)
- Neurologic disorders (such as multiple sclerosis) because any new neurologic signs and symptoms may be ascribed to the epidural
- Previous back surgery (such as spinal fusion)

signs, pain intensity rating, sedation score, and degree of motor and sensory block.^{6,15} (See *Using the Ramsay scale to assess level of sedation.*) Assess the patient for signs and symptoms of complications associated with the use of epidural analgesia including hypotension, nausea and vomiting, urinary retention, and motor block.^{8,15}

A patient experiencing hypotension may need increased I.V. fluids, and the underlying etiology of the hypotension needs to be identified. For example, in a postoperative patient receiving epidural analgesia, hypotension may be due to sympathetic blockade.^{11,15}

Practice guidelines for the prevention, detection, and management of respiratory depression with neuraxial (epidural or spinal) opioids recommend assessing respiratory rate, depth of respiration, oxygenation (for example, by using pulse oximetry when appropriate), and level of consciousness during the entire time the infusion is used.¹³

Using the Ramsay scale to assess level of sedation^{11,17}

The Ramsay Sedation Scale is a valid and reliable tool used to assess sedation in adults. This numeric scale, which provides scores for level of wakefulness and sleep, is used in the ICU as well as with patients in other settings receiving sedating drugs or opioids. When making an assessment, first observe whether the patient is awake or asleep. If the patient is asleep, you must test the patient's rousability. A patient who scores a 2 while awake or a 4 while asleep has attained the optimal sedation level.

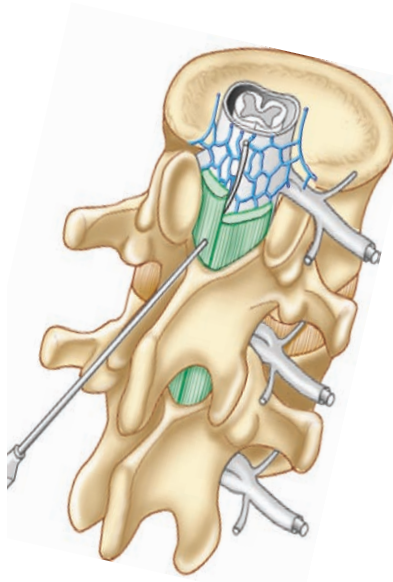
Ramsay Scale

Awake levels:	Score
Patient anxious and agitated, restless, or both	1
Patient cooperative, oriented, and tranquil	2
Patient responds to commands only	3
Asleep levels:	
Patient exhibits a brisk response to a light glabellar tap or auditory stimulus	4
Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus	5
Patient exhibits no response	6

Monitoring should be continual for the first 20 minutes after initiation, followed by monitoring at least every hour for the first 12 hours, then every 2 hours up to 24 hours, and then every 4 hours until a continuous epidural infusion with lipophilic opioids is discontinued.¹³

End-tidal CO₂ monitoring can be used with patients receiving epidural opioids who are at high risk for respiratory depression. Be prepared to administer naloxone to treat severe opioid-induced respiratory depression if indicated.¹³

For patients receiving local anesthetics, also assess for signs and symptoms of central nervous system toxicity, such as tremor, visual disturbances, tinnitus, and paresthesias.^{7,8} Assess sensory and motor function to determine the level of



Epidural analgesia is administered close to the spinal nerves innervating the dermatomes that correspond to the area needing pain relief.

analgesia and to quickly identify possible complications such as dural penetration of the catheter or epidural hematoma or abscess.^{6,15}

Important safety considerations

Be sure to keep your patients safe while they're receiving epidural analgesia. Errors in medication delivery pose the most significant risk of epidural analgesia. Epidural and I.V. medications have been mixed up several times; for instance, bupivacaine has been mistakenly administered I.V., and I.V. medications, such as vincristine, have been administered by the epidural route. Bupivacaine administered I.V. can result in seizures, cardiovascular arrest, and death. Medications intended for I.V. use administered epidurally can also be fatal. When administering epidural analgesics, performing an independent double check at the bedside to verify the patient, drug, dose and concentration, administration route, and rate of administration will help to prevent errors.¹⁸

Safe practice recommendations for epidural analgesia administration include the following:

- Have the pharmacy department prepare infusions or outsource their preparation.
- Store epidural and I.V. solutions in separate locations. When epidural solutions are used in the clinical area, keep them in a specific area that's been identified for their storage.
- Clearly label solutions with labels that state "For Epidural Use Only" in large font. Use color and design to help differentiate epidural solutions from I.V. solutions.
- Use yellow-lined tubing without injection ports for epidural administration to make it look different from I.V. tubing. Label the epidural tubing "Epidural"—this label is often included with the tubing.
- Hang epidural solutions so the label can be read.
- Monitor patients' outcomes and monitor them for adverse reactions to epidural analgesia. Be aware of the protocol to manage adverse reactions.
- Perform independent double checks at the bedside for epidural analgesia.

The epidural catheter-site dressing, which isn't routinely changed, should remain clean, dry, and intact. Notify the anesthesia provider of any abnormalities, such as drainage, that may indicate CSF or catheter dislodgment. If you suspect a complication related to the epidural analgesia infusion, stop it and contact the anesthesia provider or pain management team immediately.^{4,11} (See *Important safety considerations*.)

Discontinuing epidural analgesia

Epidural analgesia is discontinued when the patient's pain can be controlled by oral analgesics, the patient is experiencing adverse reactions that outweigh the benefits, pain isn't adequately controlled, or the patient's clinical status has changed and the risk of complications associated with maintaining epidural analgesia increases (such as the patient requiring anticoagulation).⁶

Be sure to determine the coagulation status of your patient before the epidural catheter is removed. If your patient is receiving an anticoagulant, catheter removal should be timed with the administration and type of anticoagulant prescribed (see the American Society of Regional Anesthesia and Pain Medicine Guidelines).¹²

Safety first

Understanding how epidural analgesia works and how to assess patients using it will enable you to give your patients safe and timely care. ■

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Mona Sawhney is an NP in the acute pain service at North York General Hospital in Toronto, Ontario.

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