

# Spinal/Epidural Anesthesia (Neuraxial): Assessment in PACU

## Site Applicability

PHC: SPH, MSJ Post Anesthetic Care Units (PACU)

PHSA: BC Cancer Surgical Suites/Post Anesthetic Care Units (PACU)

## Skill Level:

**Specialized:** PACU RN's; Surgical Suite RN's (BC Cancer)

## Need to Know

- Spinal and epidural anesthesia are common anesthetic techniques used either alone or in combination with sedation or general anesthesia. Spinal anesthesia is performed by injecting local anesthetic and narcotic directly into the intrathecal or subarachnoid space at the level of L2 or lower. The duration and level of dermatome blockade can be adjusted by the type of local anesthetic, the baricity of the anesthetic and the patient position.
- Baricity refers specifically to the density of a substance compared to human cerebral spinal fluid. Baricity effects the spread of medication in the intrathecal space. Solutions are either hypobaric, isobaric or hyperbaric. The more hyperbaric a solution is the more dense and dependant on gravitational pull, settling in the most dependant areas of the intrathecal space in relation to the patients position. Hypobaric solutions will rise in relation to gravitational pull. The baricity of local anesthetics allows predictability and preferential control of the block by choice of solution and patient positioning.
- The desired effect of spinal anesthesia is to block transmission of afferent nerve signals from peripheral nociceptors. This creates both complete sensory and motor block with high reliability. This is typically given as a one-time dose and is completely reversible over time. The duration of spinal anesthesia can vary greatly among patients.
- For epidural catheterization a 17 or 18 gauge needle is inserted at a thoracic or lumbar interspace. The needle is carefully positioned in the epidural space without penetrating the dura and entering the subarachnoid space. The epidural space is a potential space and cerebral spinal fluid cannot be aspirated. A thin catheter is threaded through the needle and secured to the patient's back with adhesive tape. The catheter can then be used to administer intermittent or continuous local anesthesia and/or narcotic as well as patient controlled administration.

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- The medication is injected into the epidural space and then penetrates the dura mater through a process of diffusion into the subarachnoid space. The volume and amount of medication required to create analgesia and anesthesia and the onset of effect is greater with an epidural than a spinal. An epidural will often not affect motor fibers as frequently as sensory fibers and will therefore have less of an effect on motor block.
- Assessment following spinal and epidural anesthesia focuses on the effect of both the local anesthetic and the narcotic. In the PACU setting, local anesthesia and opioid medications delivered by the neuraxial route can significantly affect the cardiovascular, central nervous, respiratory and urinary systems.

## Equipment & Supplies:

1. Ice pack
2. Dermatome Chart

## Procedure

### Steps

STEPS	RATIONALE
<b>1.</b> Perform post-anesthesia assessment, surgical site assessment and vital signs as per PACU protocol  Record initial assessment and on going assessment as per PACU routine (Q15 min x 8, Q30 min x 4 and then Q1H and PRN until discharge).	
<b>2.</b> Assess sedation level: Pasero opioid-induced sedation scale (POSS) 1 = Awake and alert 2 = Slightly drowsy, easily roused 3 = Frequently drowsy, rousable 4 = Somnolent, difficult to rouse 5 = Normal sleep, easy to rouse  Surgical Suite RN's (BC Cancer): Use POSS or Modified Aldrete as per unit protocol	Preservative free opioid analgesia is often given with both spinal and epidural anesthesia.  With spinal and/or epidural anesthesia the effects of the opioid can last up to 18 hours following administration and requires ongoing assessment.

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<p><b>3. Assess for presence of sympathetic block:</b></p> <ul style="list-style-type: none"> <li>• Blood pressure +/- 20% of baseline</li> <li>• Heart rate +/- 20% of baseline</li> <li>• Orthostatic hypotension</li> </ul>	<p>Sympathetic nerve fibres are the most sensitive to local anesthesia, meaning they are blocked more quickly and take more time to recover than motor and sensory nerve fibres.</p> <ul style="list-style-type: none"> <li>• The most common side effect on the cardiovascular system is a decrease in mean arterial pressure (MAP). Sympathetic blockade produces venous dilation below the level of the block, venous dilation leads to decreased venous return to the heart (preload), leading to a decrease in cardiac output.</li> <li>• Heart rate often decreases with spinal anesthesia and may be attributed to the sympathetic block of the preganglionic cardiac accelerator fibers (thoracic level 1 to 4). This also inhibits compensatory tachycardia.</li> <li>• Venous circulation is dependant on both the level of the block and the patient's position. Gravity can be a primary factor regulating venous return to the heart in the presence of sympathetic blockade.</li> </ul> <p>In general the higher the level of spinal anesthesia, the greater the risk for decreases in MAP and HR.</p>
<p><b>4. Assess pain intensity:</b></p> <ul style="list-style-type: none"> <li>• Ask patient to rate their pain using a numeric scale of 0 to 10 with 0 being no pain and 10 being the worse pain.</li> <li>• For patients that feel more comfortable using verbal descriptors to rate pain i.e. no, mild, moderate, lots, intolerable, etc. use appropriate number rating associated with verbal descriptor.</li> <li>• For non verbal patients use faces pain scale.</li> </ul>	<p>See <a href="#">Appendix A: Self Reporting Pain Intensity Scales</a>.</p>

**5. Assess level of sensory block:**

The progression of the neuraxial anesthetic block is monitored closely by assessing the loss of sensation along dermatome levels. Temperature discrimination is one of the first nerve functions lost and one of the last nerve functions regained as the local anesthetic regresses. For this reason we use cold sensitivity as an assessment tool to map the extent of the sensory block.

- Using an ice pack starting at the face ensure patient can feel the temperature of the ice.
- Next move to the shoulders and lateral aspect of the torso until the patient can no longer feel the icy cold sensation.
- Next moving from the legs upward place the ice along the dermatome paths until the patient can no longer feel the icy cold sensation.
- Always do the assessment bilateral and compare as each side is supplied by a different spinal root.

Dermatomes are used in the assessment of the progression and extent of a neuraxial anesthetic. Nerve roots exiting the spinal cord innervate the skin in contiguous sensory bands or stripes approximately 1 to 2 inches wide. Each dermatome corresponds to a specific nerve root and has been investigated, mapped and standardized in such a manner as to portray the idealized person.

Anatomic relationships of representative dermatomes:

- Neck: C3
- Clavicles: C5
- Nipples: T4
- Xiphoid Process: T6
- Navel: T10
- Groin: L1
- Knees: L4
- Dorsum of Foot: L5
- Lateral Ankles: S1

See [Appendix B: Dermatome Chart](#)

<p><b>6. Assess movement:</b></p> <p>Test motor function by asking the patient to move their feet and to bend their knees. Movement to lower limbs documentation includes:</p> <p><b>0</b> = No residual motor block, free movement</p> <p><b>1</b> = Partial block, just able to flex knee</p> <p><b>2</b> = Almost complete block, able to move feet</p> <p><b>3</b> = Complete block, unable to move legs/feet</p> <p>(Bromage Scale)</p>	<p>Prior to discharge from PACU return of lower extremity motor movement is required at a minimum of a Bromage score of 1.</p> <p><b>BC Cancer:</b> Prior to discharge home, patient able to ambulate independently and return of lower extremity motor movement is required at a minimum of a Bromage score of 0.</p>
<p><b>7. Assess the epidural/spinal insertion site:</b></p> <p>Assess on admission or start of shift, prior to initiation of epidural infusion and PRN.</p> <ul style="list-style-type: none"> <li>• Site free of redness, swelling, or leakage.</li> <li>• If epidural insitu for continuous infusion: <ul style="list-style-type: none"> <li>○ Insertion site dressing intact.</li> <li>○ Catheter appropriately secured along the patient's back using an occlusive dressing. .</li> </ul> </li> </ul>	
<p><b>8. Assess for any other side effects:</b></p> <p>Assess on admission, Q1H and PRN. Side effects can include but are not limited to pruritus, urinary retention, postural lightheadedness/dizziness or headache.</p>	

### Complications/Troubleshooting:

Problem	Interventions
1. Inadequate analgesia/pain relief (epidural)	<ul style="list-style-type: none"> <li>Assess epidural tubing and connection for any displacement, obstruction or disconnection.</li> <li>Complete assessment of sensory level block, if inadequate for surgical procedure patient may require more local anesthetic either via top-up or clinician bolus. (Only anesthesiology can deliver a top-up dose, if the primary anesthesiologist is unable to deliver the dose check with peri-operative anesthesiologist or acute pain service anesthesiologist.) MSJ: primary anesthesiologist or anesthesia on call.</li> <li>Ensure adjunct analgesia medications ordered such as acetaminophen, naproxen are given to the patient.</li> <li>Deliver breakthrough IV prn analgesia orders for PACU.</li> <li>Titrate infusion according to orders, encourage and reinforce PCEA if ordered.</li> <li>If pain control remains unmanaged notify anesthesia.</li> </ul>
2. Respiratory rate less than 6 breaths per minute and/or sedation score of 4	<ul style="list-style-type: none"> <li>Stop epidural infusion if running.</li> <li>Support airway, maintain SpO<sub>2</sub> greater than 92% with supplemental oxygen or bag-mask ventilation as necessary.</li> <li>Notify anesthesia.</li> </ul>
3. Hypotension and/or bradycardia (a drop in heart rate or blood pressure more than 20% of baseline)	<ul style="list-style-type: none"> <li>Assess patient for symptoms of inadequate perfusion (dizziness, decreased LOC, chest pain, dyspnea, low urine output, etc.)</li> <li>Decrease or stop infusion (if running) depending on severity of symptoms.</li> <li>Notify anesthesia.</li> <li>Position patient supine.</li> <li>Provide supplemental oxygen via nasal prongs to keep SpO<sub>2</sub> greater than 92%.</li> <li>Anticipate IV fluid bolus and/or support medication such as IV ephedrine or IV phenylephrine.</li> </ul>

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<p><b>4.</b> Sensory and or motor block increases with supplemental assessments</p>	<ul style="list-style-type: none"> <li>• Stop epidural infusion if running.</li> <li>• Notify anesthesia.</li> <li>• Support airway and ventilation as necessary.</li> </ul>
<p><b>5.</b> Pruritis</p>	<ul style="list-style-type: none"> <li>• Encourage patient to avoid scratching and provide cool compress or lotion for mild itching.</li> <li>• Administer IV diphenhydramine (antihistamine) as per epidural PPO or consult with anesthesia for order for IV diphenhydramine.</li> <li>• For spinal anesthesia/analgesia review for naloxone order, (this is a fragmented dose usually 0.04 mg to 0.1 mg IV aimed at reversing the side effect (pruritis) and not the analgesia effect)</li> <li>• For continuous epidural infusions, if pruritis continues despite above attempts review with anesthesia, removal or change of opioid from epidural infusion may be necessary.</li> </ul>
<p><b>6.</b> Urinary Retention</p>	<ul style="list-style-type: none"> <li>• Bladder distention is assessed on admission, at least every hour and as needed. Assess for visual distention and palpate for firmness. Use ultrasonic bladder scanner when available.</li> <li>• If bladder is distended or firm use a bladder scanner to determine the potential volume in patient's bladder. A volume of 400 mL or greater with no bladder sensation validate the need for intermittent catheterization.</li> <li>• For PHC: Intermittent catheterization is a registered nurse initiated activity, see <a href="#">B-00-12-10099</a> - Urinary Catheterization</li> <li>• <b>BC Cancer:</b> requires a physician order for intermittent catheterization.</li> </ul>

## 7. Local anesthetic systemic toxicity

Local anesthetics are amphiphilic and have an affinity for both lipid and water environments allowing the medication to enter many cellular compartments in the body. In certain body tissues such as the heart and brain an interruption of cellular function can be detrimental. Inadvertent vascular administration of local anesthesia can contribute to toxic levels of the medication.

Signs and symptoms of toxicity.

### Central Nervous System

### Cardiovascular System

Circumoral tingling	Vasodilation (hypotension)
ringing in the ears	Bradycardia
Metallic taste	Decreased myocardial contractility
Blurred visions (or double vision)	Progression of atrioventricular block
Drowsiness	Ventricular arrhythmias
Confusion	Cardiac arrest
Seizure activity	
Obtunded	
Respiratory arrest	

- Stop epidural infusion (if applicable).
- Treat and stabilize any life threatening conditions, call code blue if necessary.
- Notify anesthesia (if not already done).
- Support airway and ventilation as necessary.
- Continuously monitor ECG, oxygen saturation and monitor blood pressure.
- Treat hypotension and arrhythmias with support medications. Avoid calcium channel blockers, beta blockers, vasopressin and further local anesthetic.
- Give IV Intralipid 20% as ordered (1.5 mL/kg) bolus dose followed by an infusion.

NOTE: For further information on local anesthetic toxicity Refer to specific DST [Local Anesthetic Systemic Toxicity Management](#)



# **8. Catheter migration (epidural)**

An epidural catheter is carefully placed in the epidural space and does not penetrate through the dura into the intrathecal space. The epidural catheter is secured by adhesive tape and can easily shift when dressing is not secure and transferring from operating room table to stretcher. Signs and symptoms of catheter migration:

- Alteration in pain control.
- Sudden motor function loss in legs may progress to weakness in arms.
- Increased area of sensory block progression both proximally and distally.
- Increasing sympathetic block (decrease blood pressure and heart rate).
- Systemic toxicity.
- Dyspnea.

- Stop epidural infusion (if applicable).
- Notify anesthesia.
- Support airway and ventilation as necessary.
- Support heart rate, blood pressure as necessary.
- Advanced airway and mechanical ventilation may be necessary for a motor block that extends to C3-5. (The phrenic nerve innervates the diaphragm and originates at the cervical nerve 3 to 5).
- Local anesthesia delivered intrathecally reverses over time and has no antidote to quicken the reversal.

<p><b>9. Spinal or epidural hematoma</b></p> <p>Spinal hematoma is rare but can occur and is more likely to occur in patients with coagulation disorders or concurrently receiving anticoagulation medications. Accumulation of even a small quantity of blood may compress neural structures and produce ischemia since the spinal space is non-expandable. Neural ischemia and cord compression results in:</p> <ul style="list-style-type: none"> <li>• Radicular pain. (pain radiating along the dermatome of a nerve root due to inflammation or other irritation of the nerve root at it's connection to the spinal column)</li> <li>• Loss of sensation.</li> <li>• Loss of motor function.</li> <li>• Loss of bladder control.</li> <li>• Loss of bowel control.</li> </ul>	<ul style="list-style-type: none"> <li>• Notify anesthesia immediately.</li> </ul> <p>Prompt surgical treatment with a laminectomy to evacuate blood is essential to avoid permanent damage. Due to the concealed nature of the bleeding diagnosis via CT scan is priority to surgical intervention.</p>
<p><b>10. Catheter disconnects from filter or connector (epidural)</b></p>	<ul style="list-style-type: none"> <li>• Stop infusion.</li> <li>• Wrap the catheter end in sterile gauze.</li> <li>• Notify anesthesia.</li> </ul>
<p><b>11. Catheter inadvertently removed or broken (epidural)</b></p>	<ul style="list-style-type: none"> <li>• Stop infusion.</li> <li>• Place sterile dressing over catheter insertion site.</li> <li>• Save catheter for anesthesiology to inspect.</li> <li>• Notify anesthesia.</li> </ul>
<p><b>12. Epidural dressing dislodged/removed</b></p>	<ul style="list-style-type: none"> <li>• Place sterile transparent dressing (e.g. Tegaderm) over insertion site.</li> <li>• Monitor patient for signs of catheter migration.</li> <li>• Notify anesthesia.</li> </ul>

**Documentation:**

Document assessments and interventions using:

Cerner Sites: Interactive View I&O → Pain Management → Pain Modalities

PHC Downtime use: PA015 – PACU Patient Record and NF219 24 Hour Pain Management Flow Sheet

BC Cancer – Regional Brachytherapy PACU Clinical Record

**Patient/Family Teaching:**

- Surgical Suite RN's (BC Cancer): Provide patient with verbal/written discharge teaching.
- Alleviate fear regarding abnormal sensation and inability to move legs. Reassure that the sensations and motor block will resolve over time. (proprioception is inhibited, often patient's will report their legs being in the same position as they were prior to receiving the spinal anesthetic)
- Explain the purpose of dermatome assessment and the frequency of the assessments.
- With continuous and patient controlled epidural anesthesia (PCEA) provide specific teaching on how it works and using the PCEA pain control button.
- Mobilization precautions e.g. avoid abrupt changes in position, protection of catheter insertion site, have a nurse with you especially when getting up for the first time.

**Related Documents and Resources:**

1. [B-00-13-10003](#) - Epidural Analgesia
2. [B-00-13-10018](#) – PACU: Post Anesthetic Patient in Phase 1: Patient Care
3. [BC-11-13-40083](#) - PACU: Discharge Criteria

**References:**

1. DeFazio Quinn, D.M. & Schick, L. (Eds.). (2004). *PeriAnesthesia Nursing Core Curriculum: Preoperative, Phase I and Phase II PACU Nursing*. St. Louis, MO: American Society of Perianesthesia Nurses.
2. Johnson RL, Kopp SL, Burkle CM, et al. Neuraxial vs general anaesthesia for total hip and total knee arthroplasty: A systematic review of comparative-effectiveness research. *Br J Anaesth* 2016; 116:163.
3. Knoerl, D.V., McNulty, P., Estes, C. & Conley, K. (2001). Evaluation of Orthostatic Blood Pressure Testing as a Discharge Criterion From PACU After Spinal Anesthesia. *Journal of PeriAnesthesia*

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4. Kreger, C. (2001). Getting to the root of pain: Spinal anesthesia and analgesia. *Nursing, 31(6).* 37-41. National Association of PeriAnesthesia Nurses of Canada (2017). *Standards for Practice* (4th ed.). Oakville, Ont: Author
5. Russell, R.A., Burke, K. & Gattis, K. (2013). Implementing a Regional Anesthesia Block Nurse Team in the Perianesthesia Care Unit Increases Patient Safety and Perioperative Efficiency. *Journal of PeriAnesthesia Nursing, 28(1),* 3-10.

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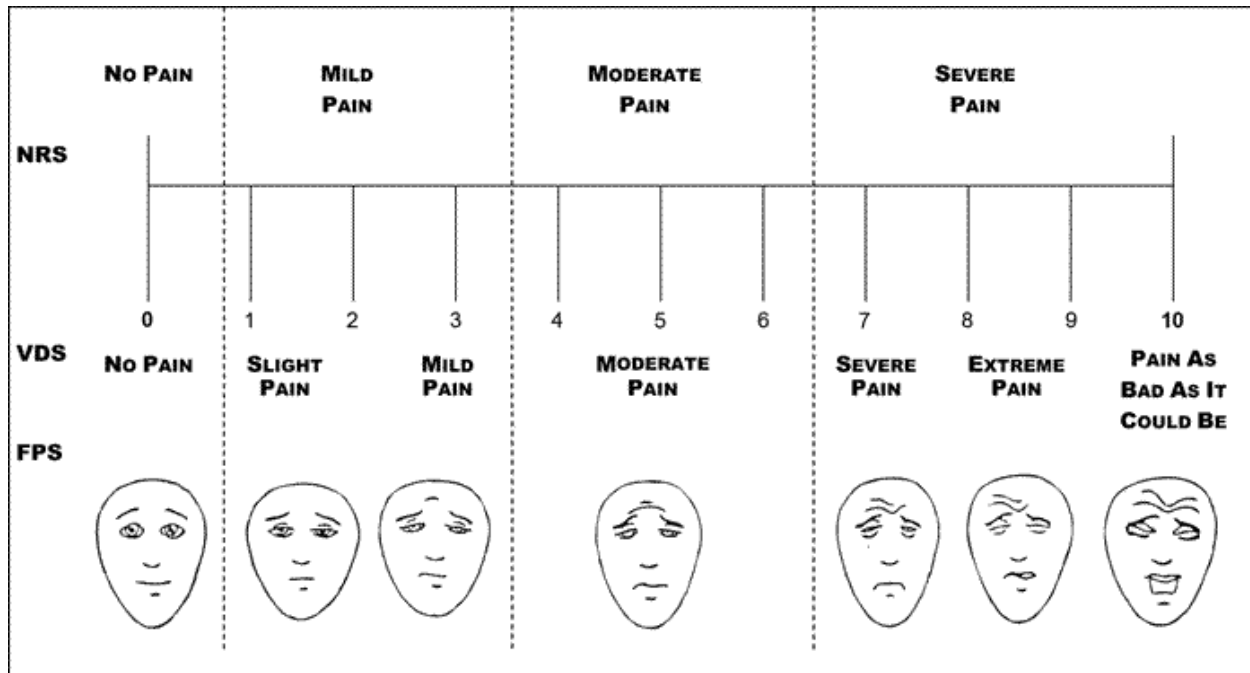
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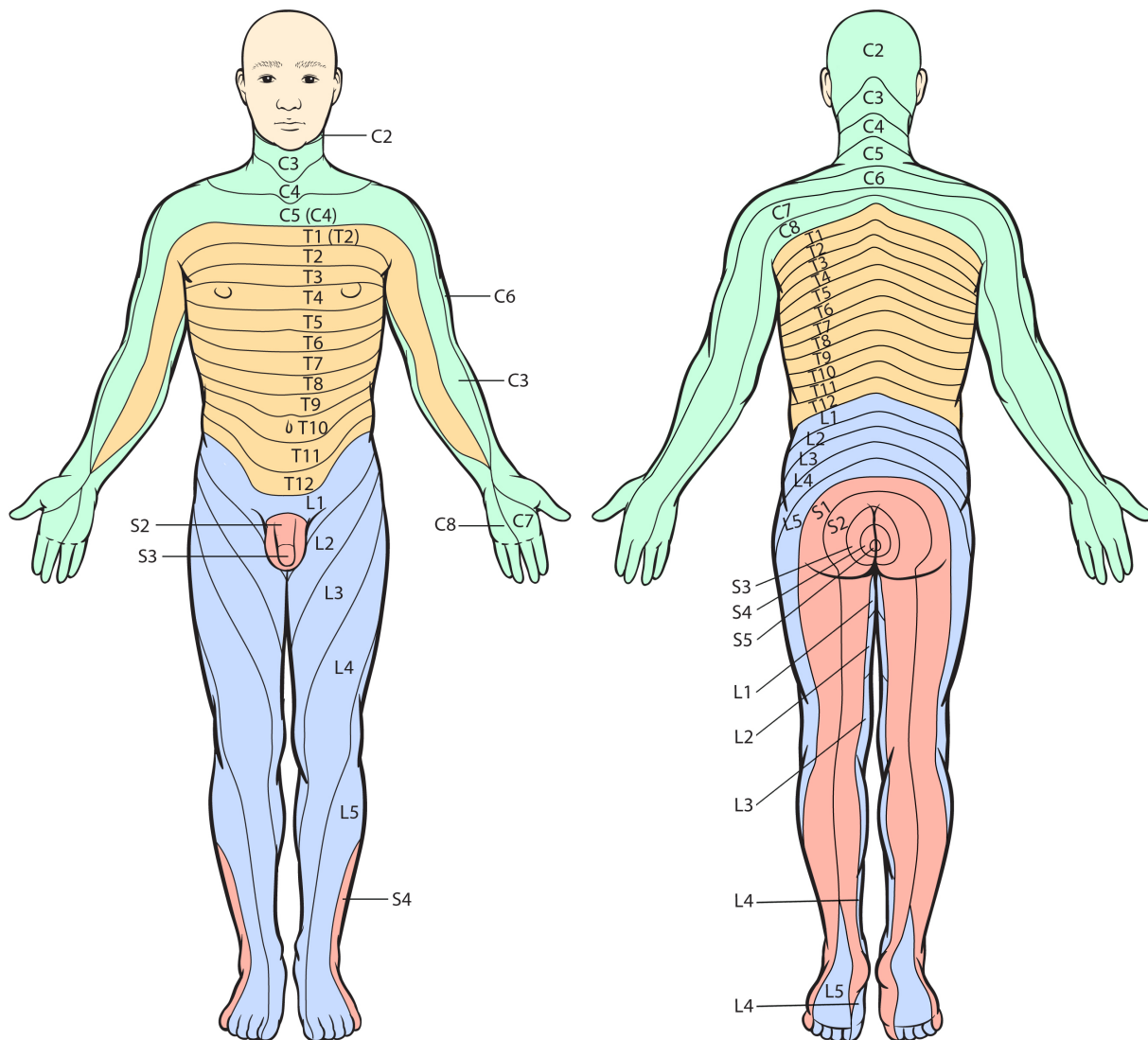
## Appendix A: Self Reporting Pain Intensity Scales



**Figure.**

Numeric Rating Scale (NRS), Verbal Descriptor Scale (VDS), and Faces Pain Scale (FPS). *Source* (FPS): Bieri D, Reeve RA, Champion GD, Addicoat L, Ziegler JB. The Faces Pain Scale for the self-assessment of the severity of pain experienced by children: Development, initial validation, and preliminary investigation for ratio scale properties. *Pain*. 1990;41(2):139–50. [\[PMID: 2367140\]](#) Used with permission.

## Appendix B: Dermatome Chart



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