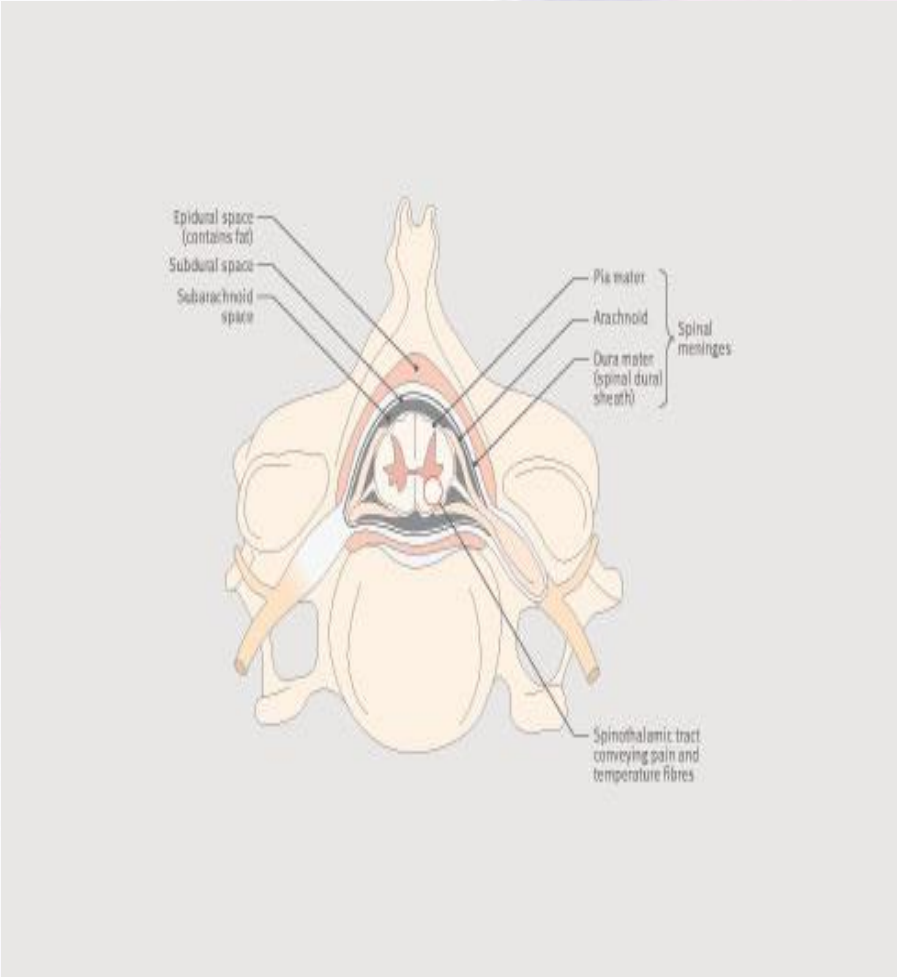
Epidurals and Caudals

For Neonates

The Epidural Space



- The epidural space is the small space lying between the spinal meninges (layers surrounding the spinal cord) and the sides of the vertebral canal.
- It extends from the base of the skull to the sacral hiatus.
- It is filled with fat, blood vessels and nerve roots that traverse it.

What is epidural analgesia?

- Epidural analgesia is a form of regional anesthesia involving administration of drugs through a needle or catheter placed into the epidural space.
- The drugs administered can cause both a loss of sensation (anesthesia) and a loss of pain (analgesia) by blocking the transmission of signals through nerves near the spinal cord.

Continuous Epidural Analgesia

- This refers to placement of a catheter in the epidural space with subsequent administration of a continuous infusion of drugs for pain relief.
- The goal is to provide safe and effective analgesia that will minimize postoperative stress and facilitate recovery.

What is caudal analgesia?

- When the epidural space is entered through the sacrococcygeal membrane it is referred to as a caudal.
- If it is a single-injection technique with no catheter placement it is referred to as a ‘single-shot caudal’.
- If a catheter is placed it is commonly referred to as a caudal (epidural) catheter.
- The catheter may be threaded up the epidural space to the desired level / location (thoracic or high lumbar) and a continuous infusion of drugs can be administered for pain relief.

Benefits of Epidural and Caudal Analgesia in Neonates

- It provides good intraoperative and / or postoperative analgesia after thoracic, abdominal, lower extremity, or perineal / urologic surgery.
- It reduces the need for systemic narcotics (which may predispose the neonate to respiratory depression and need for continued intubation / mechanical ventilation) thereby facilitating earlier extubation in the post-operative period.
- It reduces general anesthesia requirements and in some instances can be the sole anesthetic.

Contraindications to Caudals / Epidurals

- Systemic sepsis
- Local skin pathology
- Patient (in this case parental) refusal
- Clinically significant coagulopathy
- Ongoing, progressive neuroaxial disease
- Abnormal anatomy (example myelomeningocele)

Drugs

- Typically a local anesthetic + /- an opioid are run as an infusion through an epidural or caudal catheter
- Local anesthetics are drugs that cause reversible loss of nociception. Commonly used examples of local anesthetics include lidocaine, bupivacaine, chloroprocaine and ropivacaine.
- Commonly used opioids include fentanyl and morphine.
- All drugs administered caudally / epidurally should be preservative free.

Maximum Dosages & Rates

Local Anesthetic	Common Concentrations	Max rate for ≤ 2 months	Max rate for > 2 months
Bupivacaine	0.1% (1 mg/ml) (> 2 months) 0.0625% (0.625 mg/ml) (≤ 2 months) 0.05% (0.5 mg/ml) (≤ 2 months)	0.25 mg/kg/hr	0.5 mg/kg/hr
2-Chloroprocaine	1.5% (15 mg/ml) (≤ 2 months)	12 mg/kg/hr	12 mg/kg/hr
Ropivacaine	0.1% (1 mg/ml) > 2 months	0.25 mg/kg/hr	0.5 mg/kg/hr

Dosages & Rates of Common Epidural Infusion Adjuncts

Drug	Common Concentrations	Usual rate for ≤ 2 months	Usual rate for > 2 months
Fentanyl	1 mcg / ml	0.5 - 1 mcg/kg/hr	0.5 - 1 mcg/kg/hr
Morphine	10 mcg/ml	3 - 5 mcg/kg/hr	3 - 8 mcg/kg/hr
Clonidine (caution in infants < 1 yr – increased risk of apnea)	0.2 mcg/ml	Usual rate for ≤ 6 months: 0.05 – 0.08 mcg/kg/hr	Usual rate for > 6 months: 0.1 – 0.2 mcg/kg/hr

Risks of Epidural / Caudal Placement

- Infection
- Bleeding +/- hematoma
- Nerve damage
- Dural puncture (wet tap)

Side Effects of Local Anesthetics

Side Effect	Possible Treatment / Intervention
Urinary retention (rare in neonates) (secondary to loss of sensory, autonomic & motor input to bladder)	• Monitor bladder distention (Q6H) if no foley •Intermittent catheterization or foley
Sympathetic blockade (hypotension is common in adults but rare in infants and small children)	•Adequate hydration •Careful local anesthetic dosing
Motor blockade (dose dependent)	•Decrease concentration of local anesthetic •Change to a different local anesthetic (for example ropivacaine causes less motor blockade as compared to bupivacaine)
Pressure ulcers (secondary to sensory blockade)	•Protect potential pressure points •Reposition frequently (at least Q4H) •Avoid leaving hard / sharp objects in patient's crib
Systemic toxicity -may be the result of slow accumulation of local anesthetic or the result of inadvertent intravascular injection -may cause seizures, arrhythmias, cardiovascular collapse	•Limit dosage (see dosage maximum table) •Aspiration and test dose when epidural placed to avoid intravascular injection •Avoid infusion of bupivacaine > 48hrs •If severe rxn, supportive tx + / - CPR and consider administering 20% Intralipid.

Side Effects of Opioids in Epidural Infusions

Side Effect	Possible treatment / intervention
Itching	•Naloxone infusion 0.5 – 2 mcg/kg/hr •Remove or decrease opioid in epidural infusion
Nausea / vomiting	•Ondansetron 0.1 mg/kg IV •Naloxone infusion 0.5 – 2 mcg/kg/hr •Remove or decrease opioid in epidural infusion
Urinary retention (secondary to effect on parasympathetic tone of the bladder detrusor muscles) – rare in neonates	•Monitor bladder distention (Q6H) if no foley •Intermittent catheterization or foley
Respiratory depression and Over - sedation	•Stimulate patient •Provide ventilatory support +/- oxygen •Naloxone bolus 5 mcg/kg IV Q 1-3 minutes until spontaneous ventilation resumes •Remove or decrease opioid in epidural infusion

Continuous Epidural Analgesia Guidelines

- An anesthesiologist's order is required for epidural analgesia.
- Only the acute pain service may change epidural orders.
- All previous opioid and sedative orders should be reviewed and discontinued as appropriate by the anesthesiologist writing epidural orders.
- There should NOT be any administration of opioids or sedatives unless ordered or approved by the acute pain service while the patient has the epidural.
- Naloxone (1 amp with syringes) should be at the bedside with a pre-planned dose clearly marked. It should accompany the patient off the unit.
- Oxygen, suction and cardio-respiratory resuscitation equipment should be immediately available.

Continuous Epidural Analgesia Guidelines

- The epidural / caudal catheter should be clearly marked and labeled.
- The infusion device and all tubing attached to the epidural / caudal catheter should be clearly labeled.
- Infusion tubing and filter should be changed every fourth day.
- All epidural catheters should be removed by the pediatric acute pain service.

Monitoring Neonates with Epidurals

- Pulse ox and cardiac monitors (ECG) are required for all neonates receiving epidural analgesia.
- Monitor pain (using PIPP scale), sedation, vital signs (RR, BP, HR & SpO2) & motor strength.
- Monitoring should continue for 8 hours after last morphine bolus, 4 hours after last fentanyl bolus, and 2 hours after any infusion is stopped.
- Patients should have a patent IV while they have an epidural in place and for 8 hours after epidural discontinuation unless otherwise ordered.

	Basal	After bolus given from pump or rate increased	After local bolus given by Pain Service staff
Respiratory rate and Sedation score	Q 1 hr x 12 hrs, then Q 2 hr x 12 hrs, then Q 4 hrs if no change in pain management and patient is stable	In 15 minutes, then q4 h	Q 4 h
Pulse ox	continuous	continuous	continuous
HR & BP	Q 4 h	Q 4 h	In 20 minutes then Q 4 h
Pain Score	Q 4 h	Q 30 min x 2, then Q 4 h	Q 30 min x 2, then Q 4 h
Dressing and Catheter site	Q 4 h	Q 4 h	Q 4 h
Skin Integrity / pressure	Q 4 h	Q 4 h	Q 4 h
Bladder distention (if no foley)	Q 6 h	Q 6 h	Q 6 h

Documentation

- Document epidural solution, basal rate, pump bolus (if applicable), hourly max as well as any changes to the aforementioned epidural settings on the flowsheet.
- Document vital signs, pain scores, sedation scores, skin assessment, catheter site assessment.
- Frequency of documentation is equivalent to the monitoring frequency (see monitoring table).
- Document side effects, problems or adverse events.
- Document any additional medications relevant to the patient’s pain management on the flowsheet.

Notify Anesthesia Acute Pain Service if:

- Over sedation and / or inability to arouse patient
- Respiratory distress
- Decrease in SpO2 or increase in oxygen requirements or RR < 20
- Inadequate pain control
- Prior to RN epidural pump bolus
- Side effects (itching, N/V)
- New, unexplained neurologic deficit
- Decreasing movement of lower extremities
- Site leaks clear or bloody fluid
- Induration or redness at insertion site
- Fever
- Blood is in epidural catheter
- Catheter is disconnected or displaced
- Catheter is contaminated
- Occlusion in the line
- Dressing becomes loose

What to do if:

- Epidural catheter becomes disconnected: cover both ends with sterile gauze and notify the Pediatric Acute Pain Service.
- Epidural leaking at skin insertion site (very common in neonates / infants): notify the pain service, reinforce dressing with clear occlusive tape (tegaderm) if necessary. May require a pressure bandage to decrease leak.

How to contact the Pediatric Acute Pain Service:

- The number to page is 123-4459 (24 hours a day, 7 days a week).
- If a prompt response is not obtained:

  ⇨ please check ‘Web X-change on call now’ for the Pediatric PSC Attending.

If you call the APS at night:

- You will get the PSC attending who is on service but is not ‘in house’
- They will assist by phone, may give verbal orders
- If pump needs trouble shooting or patient needs evaluation, the G1 resident (anesthesiology resident on call for the OR) will be asked to assist (triaged based on urgency)
- Therefore please call early with regards to pain interventions

Questions about the pump?

- Please refer to the NCCC Inservice powerpoint
- Please refer to the NCCC Epidural Pump Binder (will be kept in the Nurse Practitioner call room and at the patient bedside)
- Additional resources: 7CH and PICU nurses (soon the NCCC nurse practitioners as well)
- Key for epidural pump is only in the NCC1 pyxis machine, under ‘key control’