CLINICAL PRACTICE GUIDELINE

Regional Anaesthetic Infusion/Blocks

Children's Pain Management Service (CPMS)
Royal Children's Hospital, Melbourne

Disclaimer:
This pain management guideline was written by the staff of the Children's Pain Management Service for the Royal Children's Hospital, Melbourne.

This guideline may NOT be suitable for use in other institutions.

Nurse competencies

- All Registered Nurses caring for patients receiving regional anaesthetic infusions should be competent in epidural management.
- The epidural self directed learning and competency can be accessed at: http://www.rch.org.au/anaes/pain/

Indications

- Regional anaesthetic blocks/infusions are used to provide local anaesthetic to a discrete area of the body.
- Regional anaesthetic block/infusion is used for the management of moderate to severe pain.

Commonly used regional anaesthetic blocks

Extrapleural/paravertebral

The catheter is placed next to the vertebral column in the paravertebral space, which exists between T1 and T12. The catheter may be placed percutaneously or under direct vision during surgery.

Interpleural

The catheter is placed in the interpleural space between the parietal and visceral pleurae under direct vision during surgery.

Extrapleural/interpleural infusions are used for unilateral thoraco-abdominal incisions for example thoracotomy, breast, gall bladder or renal surgery, and provide unilateral analgesia on the side the catheter is placed.

Femoral

The catheter or block is placed into the femoral nerve canal. The femoral nerve is located lateral to the femoral artery just below the inguinal ligament.

This technique is used for managing fractured femur, skin graft donation sites and surgical incisions over the cutaneous distribution of the femoral nerve – anterior aspect of thigh and femur periosteum.

Brachial plexus/Axillary

The catheter or block is placed via the axilla into the peri neural sheath next to the axillary artery. The brachial plexus is derived from the cervical roots C5, C6, C7, C8 and the thoracic root T1.

Brachial plexus/Interscalene

The catheter or block is placed at the site of the interscalene groove level to the cricoid cartilage. This approach was developed to avoid a pneumothorax.

The auxillary and interscalene catheter/blocks are used for surgical procedures of the shoulder and upper arm

Wound catheter

A multi-hole catheter is placed under the skin along the wound to deliver local anaesthetic solution to the incision.

Caudal and Epidural

See epidural protocol.

Prescription of regional anaesthetic infusions

- Regional anaesthetic infusions are a specialised analgesic technique and are managed by CPMS.
- **ONLY** CPMS and Anaesthesia staff may prescribe regional anaesthetic infusions.
- The regional anaesthetic infusion is prescribed according to the guidelines on the *Regional anaesthetic infusion attachment.* This attachment is only valid if attached to a current medication chart (MR52).
- The site of insertion of the catheter and catheter position at the skin are recorded on the *Regional anaesthetic infusion attachment*.
- The local anaesthetic solution to be used and additives (if any) are prescribed on the *Regional anaesthetic infusion attachment*, with the infusion rate prescribed in mL/hr.
- For rapid relief of breakthrough pain, a bolus dose may be prescribed +/- an alteration to the infusion rate. In some situations only CPMS staff may administer the bolus. The reason for this will be documented.

Regional anaesthetic infusion solutions

- **0.125% levobupivacaine** (*Chirocaine*) is the usual local anaesthetic solution prescribed. Less commonly, other strengths of levobupivacaine or other local anaesthetics such as **ropivicaine** may be used. More dilute concentrations may be prescribed if less sensorimotor blockade is desired.

Flasks of 0.125% levobupivacaine (100 mL or 200 mL) are kept in the ward drug cupboard and are available from the RCH pharmacy department. It is important to ensure that sufficient solution is ordered for nights, weekends and public holidays. CPMS should be

contacted if there is a problem with availability of regional anaesthetic solutions out of hours.

If the regional anaesthetic solution contains **fentanyl** or **hydromorphone,** it must be stored in the Drugs of Addiction (DA) safe.

Regional anaesthetic infusion set up

Lines and giving set

- The regional anaesthetic infusion solution must be prepared in accordance with RCH medication policy and labelled clearly.
- Only REM-EPISET™ is to be used for delivery of regional anaesthetic infusions. The REM-EPISET™ tubing has a T-configuration. The clear tubing with the bag spike connects to the flask of anaesthetic solution. The short yellow tubing is connected to the syringe, allowing the syringe to be refilled. The long yellow tubing with the yellow luer lock connects to the filter or the catheter hub. There are two one-way valves in the REM-EPISET™ tubing to prevent the risk of gravity free-flow.
- A yellow dedicated Alaris PCAM must be used for all regional anaesthetic infusions.
- A yellow Codan™ syringe is to be used.
- The two authorised persons who put up each flask of infusion solution must sign the record of infusion on the *Epidural/Regional anaesthetic infusion attachment*.
- The regional anaesthetic infusion lines are to be maintained as a closed system. Changing flasks of infusion solution must be done using aseptic technique.
- To refill the syringe from the flask the infusion should be paused and the syringe removed from the pump before being refilled from the flask. Ensure the spiked end of the flask is pointing downwards to avoid air being drawn into the tubing.

Securing the regional anaesthetic catheter

- A sterile sponge or gauze may be applied at the insertion site to soak up any leaking local anaesthetic solution.
- An occlusive clear dressing (eg *Tegaderm* or *Opsite*) is placed over the catheter and sponge.

NB: ***The extrapleural catheter site is usually covered by the surgical dressing. There is a suture securing this catheter.***
Wound catheters are under the surgical dressing. There is no suture securing this catheter.

- Where possible a 'window' is made around the clear dressing with tape to reinforce the clear dressing and to allow viewing of the insertion site and catheter markings. Hypoallergenic and firmly adhering tape (eg *Hyperfix* or *Mefix*) is preferred.
- The filter (if used) should be securely taped to the patient (in a place where it is comfortable) to avoid dislodgement of the catheter.
- Any loose catheter tubing should be securely taped to the skin to prevent kinking and/or disconnection.
- Routine dressing changes are not indicated and are only to be done by a member of CPMS as required.

Catheters used for regional anaesthetic block infusions

A range of catheters may be used. Most commonly used are epidural catheters.
The **18G Portex™** and **19G Portex™** For wound catheters, a **Stryker** set is used.

- The catheter in the **18G Portex™** epidural kit has a single bold mark at 5cm, then a mark every 1cm up to the two bold lines indicating 10cm. The 1cm markings continue until three bold lines together, which indicate 15cm. There are no further markings until four bold lines together, which indicate 20cm.
  The catheter has a coloured closed tip and three lateral holes.
  The locking hub at the filter is **blue**.
- The catheter in the **19G Portex™** epidural kit has a mark every cm from 2cm with a bold mark indicating 5cm. There are two bold lines together indicating 10cm. Markings continue every 1cm up to three bold lines together, which indicate 15cm.
  The catheter has a single end hole with a coloured tip.
  The locking hub at the filter is **white**.
- **Stryker wound catheters** have multiple holes (fenestrated) between the tip and the first depth mark. These catheters are only used for wound infiltration. The catheter must not be cut prior to insertion, as there is a fine wire inside the tubing. A double mark is located at 10cms from the tip, a triple mark at 15cm and four lines at 20cm. The tip of the catheter has a black mark, ensure the catheter is intact on removal.

Regional anaesthetic infusion delivery

- The regional anaesthetic infusion is commenced in recovery.
- The usual infusion rate range is 0.1mL/kg/hr – 0.3mL/kg/hr.
- In **NEONATES** the usual maximum infusion rate is 250mcg-400mcg/kg/hr this depends on route of administration and concentration of Levobupivacaine. For example epidurals 0.3ml/kg/hr of 0.1% (300mcg) vs extrapleural 0.6ml/kg/hr of 0.0625% (375mcg).

Changing the infusion rate

- The infusion rate may need to be changed to alter the extent of the block.
- The rate is **not** to be changed except following an order by CPMS or an anaesthetist.
- Changes in infusion rate must be prescribed and documented on the *Regional anaesthetic infusion* attachment. The reason for the change should also be documented.

Regional anaesthetic infusion boluses

- It is important to optimise the analgesic effect of the regional anaesthetic. A bolus of local anaesthetic solution may be required if the patient is in pain or the block is inadequate to cover the required area.
- Nurses who have completed the epidural competency may administer a bolus of 0.0625% - 0.125% levobupivacaine +/- additive as prescribed. Two authorised persons must check and sign for the bolus on the R*egional anaesthetic infusion* attachment. The reason for the bolus and the effect should also be documented.

- An anaesthetist **must** administer a bolus if the levobupivacaine concentration **exceeds** 0.125%. This anaesthetist **must** remain in the ward/unit for 20 minutes following the bolus.
- Bolus doses of the infusion (as prescribed on *Regional Anaesthetic Infusion attachment*) should be administered using the handset button on the PCAM pump.
- Regional anaesthetic blockade infusions are usually run for 2-3 days and rarely longer than 5 days.
- In **NEONATES** the duration of infusion is normally limited to **36 hours** for 0.125% levobupivacaine to reduce the risk of local anaesthetic toxicity.
  Weaker solutions of local anaesthetic (e.g. 0.1% levobupivacaine or 0.0625% levobupivacaine) may be used to enable greater spread of the block or to allow a longer duration of infusion.

Observations

The following observations should be recorded on the general Observation Chart (MR77):

- **Respiratory rate and heart rate and blood pressure: 1 hourly** for ***the first four hours*** of the infusion.
- **Respiratory rate & heart rate: 1 hourly** and **blood pressure & temperature 4 hourly** until infusion is ceased.
- **Pain score: 1 hourly** (using developmentally appropriate scale eg Wong-Baker Faces scale, Numeric scale, FLACC scale or PAT score for neonates).
- **Pulse oximetry** if indicated.

Indications for pulse oximetry:

*Pulse oximetry **MUST BE** used **continuously** in high-risk patients with:*

- Sedation score > 2
- Infants under 6 months of age
- Significant cardiorespiratory impairment
- Sleep apnoea, snoring or airway obstruction
- Spot oximetry less than 94% SaO_2

or patients receiving:

- Supplementary oxygen
- Concurrent sedative agents
- Hydromorphone in epidural solution *(for first 24 hours)*

*Clinical indicators for **'spot'** pulse oximetry are:*

- Tachypnoea or bradypnoea
- Respiratory distress
- Pallor or cyanosis or impaired oxygenation
- Confusion or agitation
- Hypotension
- Nurse concern

University of Michigan Sedation Scale (UMSS)

0	Awake and alert
1	Minimally sedated: may appear tired/sleepy, responds to verbal conversation and/or sound
2	Moderately sedated: somnolent/sleeping, easily aroused with light tactile stimulation or simple verbal command
3	Deep sedation: deep sleep, arousable only with deep or significant physical simulation
4	Unarousable
S	Patient is sleeping

Sensory: 4 hourly *(**LINK** to assessing sensory and motor block)*

- The effectiveness of the analgesia should be recorded in the Nursing Progress notes or in the appropriate clinical pathway.

Observations following a bolus of anaesthetic infusion:

- **Heart rate, respiratory rate & blood pressure** every **5** minutes for **20** minutes. If the observations remain unchanged, return to routine observations.

Observations following infusion rate increase:

- **Heart rate, respiratory rate & blood pressure 1** hourly for **4** hours. If the observations remain unchanged return to routine epidural observations.
- **Unilateral Horner's sign may be associated with a high paravertebral block**

CPMS should be called if pain relief is inadequate 30 minutes after a bolus is given.

Any observations outside reportable limits (as identified on the Regional anaesthetic Infusion attachment) or outside normal values for age should be reported to CPMS +/- the primary treating team.

Assessing sensory and motor block

Dermatomes:

Sensory assessment should be done **4 hourly** and at the following times:

- In the recovery room on waking from anaesthetic
- On return to the ward/unit from the operating suite
- If the patient complains of pain
- 1 hour after a bolus or increase in infusion rate

Contact CPMS if:

- Block higher than T3
- No evidence of block
- Block insufficient to relieve pain

Motor Block:

Motor nerves (as well as sensory nerves) may be affected by local anaesthetics.

It is important to assess motor block:

- to prevent pressure areas
- to ensure the patient is safe to ambulate
- to detect the onset of complications

With extrapleural/paravertebral, axillary and interscalene blocks, upper limb motor function should be assessed by testing bilateral hand and finger extension and flexion.

Motor block assessment should be done **4 hourly** and at the following times:

- In the recovery room on waking from anaesthetic
- On return to the ward/unit from the operating suite
- Prior to ambulation
- 1 hour after a bolus or increase in infusion rate

Contact CPMS if:

- major changes in motor function (particularly any sudden change)
- reduced hand or finger motor function with axillary, interscalene or paravertebral block

Catheter position and insertion site

- At least once each nursing shift the catheter insertion site should be checked for redness, tenderness, leaking and dressing integrity. The catheter markings at the point of skin insertion should be checked against those documented on the *regional anaesthetic infusion* attachment if applicable.
- Any change or abnormality must be reported to CPMS **urgently**.

Pressure area care

- It is important that pressure area care is meticulous for all patients receiving regional anaesthetic infusions. The decreased sensation produced by analgesia removes the usual warning signs that prompt patients to move. Significant motor block may limit patient movement. Both of these factors may contribute to the development of pressure areas.
- Patients with femoral nerve catheters must be turned 2-3 hourly, have extra pressure control devices (such as sheepskins and air mattresses), and their skin should be regularly checked for signs of pressure.
- Particular pressure care should be given to the region or limb affected by the regional anaesthetic blockade.

Nerve compression

- It is vital that during regular pressure area care, special attention is made to avoid nerve compression.
- Superficial nerves (eg: common peroneal nerve) are vulnerable to damage from unrecognised pressure due to decreased sensation.

Intravenous access

- All patients with a regional anaesthetic infusion **must** have intravenous access at all times with a minimum hourly infusion rate.

- After the regional anaesthetic infusion is ceased, the IV cannula must remain in situ until the catheter is removed.

Concurrent drugs

Opioids

- Regional anaesthetic infusions (**without** an opioid added) may be supplemented by IV or oral opioids to improve analgesia.

Anti-coagulant medication

- If a patient is prescribed anti-coagulant medication and will be having a regional anaesthetic block, the first dose must not be administered until after the catheter is inserted.
- If a patient is on subcutaneous anti-coagulant medication the regional anaesthetic catheter must **not** be removed until 12 hours after the last subcutaneous dose is administered or **as discussed with CPMS**.

Sedatives

- It is uncommon for opioids to be added to regional infusions.
- If clonidine is added to the anaesthetic solution hypotension and sedation may occur, if this is a problem the solution may need review by CPMS.

Patient review

- CPMS review patients twice daily on week days and once daily on weekends and public holidays.
- If a patient is experiencing pain or undesirable side effects CPMS must be called to review the patient.
- CPMS can be contacted **at all times** on **pager 5773.**

Minor problems and management

Inadequate analgesia

If the patient complains of pain or appears to be in pain:

- Assess extent of block.
- Check catheter at insertion site for leaking/dislodgement.
- Check at connection of catheter and filter for disconnection/leaking.
- Assess severity and location of pain.
- Consider surgical review if risk of surgical complications, e.g. compartment syndrome, infection or haemorrhage.
- Call CPMS as a bolus may be required.

Leaking regional anaesthetic catheter

- If the patient is **comfortable** (suggesting the regional anaesthetic block is providing adequate analgesia), the dressing should be reinforced and the leakage observed.

- Sometimes leaking from an extrapleural/paravertebral catheter is excessive. In these cases CPMS should be contacted, as the catheter may need to be reinforced, adjusted or may need to be removed.
- If the patient is in **pain** or the catheter dressing needs changing, CPMS should be contacted.

Occlusion

Paediatric regional anaesthetic catheters are very fine. They can occlude easily and the infusion may need to be run at higher pressure than is usual for IV infusions.

If the infusion pump occludes or is not delivering the programmed rate:

- Check the infusion line is not occluded or kinked.
- Check that taping has not resulted in any kinks in the catheter.
- Check the infusion pump pressure.

If the cause for occlusion is not found call CPMS **urgently**.

Disconnection

- If the regional anaesthetic catheter becomes disconnected, call CPMS **immediately**.
- **DO NOT** reconnect.
- Wrap the two ends in a sterile towel or gauze.
- Turn off the infusion pump.

Complications

IF RESPIRATORY DEPRESSION OR OVERSEDATION IS SUSPECTED:

- CEASE the anaesthetic infusion
- CEASE all other infusions that could be contributing to sedation
- Attempt to rouse the patient
- **Call 777** [MET team] if appropriate
- If apnoeic: administer bag and mask ventilation with 100% oxygen
- If breathing: maintain airway, monitor oxygen saturations and administer oxygen via face mask at 8L/min
- Check circulation. If pulseless: commence chest compressions
- Administer naloxone per instructions on the attachment chart if opioid toxicity is suspected

***Call CPMS URGENTLY if any of the following occur*:**

- **high block >T3**
- **fever >38.5^{o}C**
- **dense motor block**
- **sedation score ≥ 3 / respiratory depression**
- **hypotension**
- **signs of local anaesthetic toxicity**

Fever

If the patient has a temperature >38.5^{o}C, or is suspected of having sepsis with potential for bacteraemia, the catheter may need to be removed.

Dense motor block

Moderate motor block is common immediately following surgery due to the higher doses of local anaesthetic used during surgery. Mild motor block is common following this initial period. However, because of the serious consequences of perineural abscess and perineural haematoma, **all persistent motor block after perineural catheter insertion must be reported and thoroughly assessed.**

Sedation / Respiratory depression

Clonidine may contribute to sedation. If there are no opioids or clonidine in the solution but sedation is present local anaesthetic toxicity or a high block must be urgently excluded.

Hypotension

Sympathetic blockade may cause hypotension (this is rare in children less than 8 years of age). The addition of clonidine to the anaesthetic solution may increase the likelihood of hypotension.

Local anaesthetic toxicity

Signs of local anaesthetic toxicity include: dizziness, blurred vision, decreased hearing, restlessness, tremor, hypotension, bradycardia, arrythmias, numbness of tongue, seizures, sudden loss of consciousness.

Ceasing the regional anaesthetic infusion

- Ceasing the regional anaesthetic infusion therapy should **only** be done in consultation with CPMS or an anaesthetist.
- When it is decided that regional anaesthetic analgesia is no longer required, the infusion is ceased and alternative analgesia administered.
- It is important to warn the patient and parents about the possibility of experiencing some discomfort as the local anaesthetic wears off and normal sensation returns (usually within 2–4 hours).
- If significant pain occurs after ceasing the regional anaesthetic infusion despite alternative analgesia, CPMS should be contacted

Removing the catheter

An accredited Registered Nurse can remove the regional anaesthetic catheter after instruction by CPMS or an anaesthetist.

NB *If the patient is receiving anti-coagulant medication, refer to concurrent drug section before removing the catheter.*

If there is any difficulty encountered removing the regional anaesthetic catheter or if any abnormality is detected, CPMS must be called immediately.

To remove the catheter:

- Place the patient in a comfortable position.
- Remove the tape and dressing.
- Use non-sterile gloves.
- Cut suture if present (common with extrapleural and femoral catheters).

- Withdraw the catheter slowly and steadily. If any resistance to catheter withdrawal is felt, STOP and call CPMS urgently. DO NOT forcefully withdraw the catheter.
- Check the catheter tip is intact and examine the site for redness, pus or any abnormality.
- Consider placing a bandaid over the insertion site. This can be removed the following day.
- ***Complete details about regional anaesthetic catheter removal and sign on the Regional anaesthetic infusion attachment.***
- If clinically indicated or requested by CPMS, the catheter tip should be sent to pathology along with a skin swab, full-blood examination (FBE) and blood cultures. CPMS must be contacted if this is done.

Companion Documents

Assessing Dermatomes
Pain assessment tools
Staff training: Epidural updates
Sedation legend

Resources

Links

Web links
Related sites
Prof bodies

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Evidence Table:

Infusion concentrations
Infusion rates
Administration sets
Observations
Assessment
PAC
Anti-coagulants
CCs
Regional blocks

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