Post-operative Epidural Analgesia - Paediatric Full Clinical Guideline – Derby only

Reference no.: PA EP02

INTRODUCTION

The use of epidural analgesia in children is a well established technique. Recent studies have shown that the use of continuous infusion epidurals for post-operative analgesia can substantially improve the rate and quality of recovery after major surgery. The availability of appropriately sized needles and catheters for paediatric use has assisted this process. Continuous epidural analgesia is now accepted as a safe and effective method of providing post-operative pain relief in children.

Continuous epidural analgesia can be used to relieve postoperative pain in infants and children. Unlike Patient Controlled Analgesia (PCA), its use is not limited by the patient's ability to understand how to use the equipment.

Epidural catheters can be inserted at all spinal levels. However, they are most commonly inserted in the lumbar region. Catheters can then be threaded up to thoracic levels if necessary. In infants the caudal epidural route is favoured because of its simplicity and safety.

AIM AND PURPOSE

The aim of these guidelines is to ensure that all children having epidural analgesia receive optimum care in a safe and controlled environment. Appropriate training of nursing staff is of paramount importance. Each nurse will be assessed according to the approved competency document.

It will be the responsibility of the Anaesthetist inserting the epidural to explain to the parent and the child the procedure and the risks and benefits involved. This explanation should be clearly documented in the notes together with the parental and patients verbal consent. An information leaflet will also be available for parents.

INDICATIONS

Intra-operatively

Epidural anaesthesia when used as an adjunct to general anaesthesia reduces the depth of general anaesthesia required for maintenance. It also produces sympathetic nervous system blockade and thereby vasodilatation, which may help to reduce blood loss and provide superior operating conditions.

Post-operatively

Epidural analgesia can provide excellent post-operative pain relief following major surgery involving the chest, abdomen, perineum or lower limbs. It is also useful for patients who have limited respiratory reserve, where respiratory function may be further impaired by poor post-operative pain relief and/or by the use of potent opiate drugs.

CONTRAINDICATIONS

The use of postoperative epidural analgesia is contraindicated in the following situations:

1: Patient and or parental refusal

2: Uncorrected hypovolaemia

3: Bleeding disorder

4: Skin infection near the site of needle insertion

5: Certain cardiovascular diseases e.g. fixed cardiac output state e.g. aortic/mitral stenosis
acute cardiac failure

6: Chronic neurological disease e.g. peripheral neuropathy

MEASURABLE OUTCOMES

- All children receiving an epidural infusion will be counselled with their parents and given an information leaflet pre-operatively
- All children having an epidural will be nursed on PCCU
- All children and parents will have the opportunity to visit PCCU pre-operatively where possible
- All children will have their pain assessed using the paediatric epidural pain chart
- All children will have venous access at all times
- All children will have their level of block tested and have an established block prior to leaving the theatre suite
- Compliance with the observation policy will be 90%
- The overall pain score should not exceed 1 in the first 48hrs

PLACEMENT OF CATHETER

- Venous access needs to be maintained at all times whilst the epidural is in use
- Only anaesthetists with experience in paediatric anaesthesia and epidural insertion should perform the procedure.
- In the majority of cases with the epidural catheter will be inserted with child anaesthetised and in the lateral position.
- The best results are obtained by inserting the epidural catheter at a spinal level, which corresponds to the upper dermatomal level of the surgical incision
- Thoracic epidurals should only be performed in children of adult weight and size. In younger children lumbar catheters can be threaded upwards to the desired level.

- The catheter should be inserted under aseptic conditions. It should be secured as recommended by the hospital policy.
- The spinal level of the insertion, the distance to the space and the length of catheter left in the epidural space should all be recorded on the anaesthetic sheet and epidural form.
- The connector and filter may be secured to a plastic splint. This helps to reduce catheter disconnections.
- NRFit connectors for epidurals to be used according to national guidance.
- All patients will be catheterised following epidural insertion for major surgery.

CONFIRMATION OF CATHETER POSITION

- The correct position of the catheter must be confirmed before the loading dose and infusion can be started.
- Negative aspiration for blood and CSF and a meniscus drop test will help to confirm correct placement.
- An appropriate response to a test dose of local anaesthetic may give further confirmation of catheter placement. This is usually performed intra-operatively

TEST DOSE (Anaesthetist)

- Inject 0.1 ml/kg of 1% Lignocaine through the catheter and measure the blood pressure and heart rate at 5 minute intervals.
- If performed while the child is awake then observe or ask the child about pain relief.
- A normal response may produce a slight drop in blood pressure with pain relief after 5-10 minutes.
- If a significant fall in systolic blood pressure (>30%) with a motor block (muscular weakness) are observed within 10 minutes of the test dose, it is likely that the epidural catheter is not in the correct position.
- **No further local anaesthetic should be injected**.
- Resuscitate with fluids/ephedrine and call for senior help (see ***Management after a bolus dose***).
- It may be possible to resite the catheter later at a different spinal level.
- If a normal response is observed, then continue by giving a loading dose. (see ***Loading dose***)

LOADING DOSE

- A loading dose of Levo-Bupivacaine 2mg/kg (0.8 mls/kg of **0.25% bupivacaine**) is currently recommended up to a maximum dose of 50mg (20 mls of 0.25% bupivacaine).
- Give half the calculated total dose first and the remainder according to the patient's response to the initial dose.

MONITORING

All children with epidurals in-situ will need the following minimal monitoring
Continuous pulse oximetry
Hourly scores for the first 24 hours then 2 hourly

Pain	BP
Respiratory Rate	Nausea & Vomiting
Sedation score	Volume infused

Sensory level and motor block 4 hourly or if complaining of pain

- 4 hourly observations for 12 hours following removal of catheter
- Pressure area assessment using ***Prevention and Management of Pressure Ulcers Care Pathway***

AFTER A BOLUS RECORD EVERY 5 MINUTES FOR 30 MINUTES.

- BP
- respiratory rate
- pulse – bradycardia is common
- sedation score

EPIDURAL MANAGEMENT

PAIN ASSESSMENT
In addition to hourly assessment pain scores should be performed in the following situations:

- Immediately on admission to PCCU.
- If the child complains of pain.
- If the nurse thinks the child is in pain.
- Prior to physiotherapy or nursing interventions e.g. bed bathing.
- After an epidural top-up, in order to assess the effect.

MOTOR BLOCK

- Low concentrations of local anaesthetic are used to provide analgesia so that the patient maintains some movement in their legs
- Patients should be able to move their legs against gravity(lift or move them off the bed and this should be documented on the observation chart
- See appendix 4 assessment of motor block

PRESSURE CARE

- An epidural infusion will provide analgesia but will also reduce mobility and the awareness of pressure on vulnerable parts of legs, bottom and back
- Patient positioning and regular moving will help to ensure that pressure does not progress to tissue damage
- All patients at risk of pressure ulcers must have on-going risk assessments and skin inspections in order to identify the early signs of pressure damage
- Please refer to the ***Prevention and Management of Pressure Ulcers Care Pathway***

TESTING THE BLOCK

- This will assess the spread of the block and help in deciding if the infusion rate needs to be adjusted or if a bolus dose is required.
- The extent of the block is assessed using the response to a cold stimulus. (This could be ice in a glove or specimen bag).
- The ice should be gently pressed against the child's skin beginning at the lower limbs and moving up towards the chest.
- The point at which the child perceives cold sensation marks the upper level of the block. Moving from numb to cold sensation may be easier to spot when a non-verbal child 'jumps'
- A mark may be drawn on the child's body, by the anaesthetist to indicate the desired upper level of the block.
- Alternatively, if the child is of an appropriate age ask him/her to pass a hand down their body (both sides) and indicate when sensation becomes 'different' or 'numb' or 'altered'.
- Indicate the upper and lower level of block on the chart.

DRUGS/INFUSIONS

Epidural infusions commonly used for epidural infusions in the post-operative period may contain

- Bupivacaine alone
- In combination with Fentanyl
- In combination with clonidine
- Combinations may produce more effective analgesia than bupivacaine alone.
- Fentanyl in the epidural infusion will be absorbed into the systemic circulation
- **Opiates should not be given by any other route while a bupivacaine/fentanyl infusion is running without first discussing it with the Anaesthetist in charge**.

EPIDURAL INFUSION SOLUTIONS
Prescribe on paper infusion chart and on Lorenzo

Age > 1 year

Standard Solution	Bupivacaine 0.1% with 2 micrograms/ml fentanyl
Plain Bupivacaine	Bupivacaine 0.125%
With Clonidine For Muscle Spasm/Cerebral Palsy	Bupivacaine 0.125 % + clonidine 1 mcg/ml
Rate Of Infusions For All Drug Combinations	0.1- 0.4 mls/kg/hr **Do not exceed maximum rate**

- **CME BodyGuard 545 Epidural Infusion Pump**
- A yellow epidural giving set should be used to connect to the epidural catheter
- The epidural infusion can be started intra-operatively or in the post-operative period.
- It should only be commenced after a suitable and effective loading dose.
- The infusion should be started at half the maximum recommended rate (see table above)

VARYING THE INFUSION RATE

The constant infusion rate will be adjusted depending on the following factors

- The position of the catheter relative to the dermatomal level of the incision.
- The number of segments to be blocked.
- The pain score, block assessment, sedation score and respiratory rate
- The anaesthetist will prescribe the initial starting rate (mls/hr) and the range on the prescription chart
- The rate may be altered by the nursing staff or the anaesthetist
- Don't forget to check the pain score and bock level after any bolus or rate adjustment
- See Paediatric Epidural Algorithm - Appendix 1- for flow chart and rate adjustment advice

BOLUS DOSE - TO BE GIVEN BY THE ANAESTHETIST ONLY

- May be required in the presence of severe pain and an inadequate level of block
- Remember to always aspirate the catheter prior to giving bolus to check there is no blood or CSF.
- If a bolus dose is required:
- Levo - Bupivacaine 0.25% is a more suitable concentration of drug
- Give 0.1–0.2mls/kg depending on the number of segments to be blocked.

MANAGEMENT AFTER A BOLUS DOSE

- Give oxygen if desaturation occurs.
- A bolus dose of local anaesthetic may cause sympathetic blockade and some degree of hypotension may be anticipated.
- Measure the blood pressure and pulse every 5 minutes for the first 30 minutes after a bolus.
- If the systolic blood pressure decreases by greater than 15%, give 10 mls/kg of crystalloid over 15 minutes.
- Repeat if necessary.
- **CALL FOR ANAESTHETIC HELP** if fluids do not adequately restore blood pressure

BOLUS OF INTRAVENOUS EPHEDRINE

- 1-12 years - 500 micrograms/kg (max dose 7.5mgs). Depending on the degree of hypotension a starting dose of 100 micrograms/kg is recommended.
- Repeat every 3 - 4 minutes until a response is seen to a maximum of 30 mgs per episode.
- >12 years 3 - 7.5 mgs.
- Repeat every 3-4 minutes until a response is seen / to a maximum of 30mgs per episode

INTRAVENOUS ATROPINE

- 10 micrograms/kg (Maximum 300 micrograms) may be used if there is associated bradycardia.
- This is more common with thoracic epidurals because of cardiac sympathetic blockade.

WHAT TO DO ABOUT COMPLICATIONS

- Hypotension
- Respiratory Depression
- Failed or inadequate block
- Excessive motor or sensory block
- Urinary retention
- Disconnection
- Local anaesthetic toxicity
- Catheter migration
- Nausea & Vomiting
- Itching

TROUBLE SHOOTING COMPLICATIONS

HYPOTENSION

- Systemic hypotension is a consequence of the sympathetic blockade produced by the local anaesthetic in the epidural infusion.
- Following major surgery many patients may need additional fluids above their maintenance requirements to compensate for third space loss. It is important to prevent and correct any hypovolaemia which if untreated will exacerbate the hypotension.

Action - See **Management after a bolus dose**.

RESPIRATORY DEPRESSION

- An excessively high block may impair the function of the respiratory muscles
- Opiates used in the infusion may cause central respiratory depression

Action –

- If the child's respiratory rate and effort appears to be falling and the sedation score rising, STOP THE INFUSION IMMEDIATELY
- **Call Paediatric Registrar and/or Anaesthetist on-call**.

FAILED OR INADEQUATE BLOCK

- This may be due to inadequate spread, unilateral block, missed segments or a totally failed block

Action - Use in conjunction with Paediatric Epidural Algorithm

If the block has failed

- Check catheter connections and the insertion site for signs of leakage
- increase infusion rate or ask anaesthetic assistance for an epidural bolus
- withdraw catheter 0.5 cm, change child's position and give an epidural bolus
- change child's position and give an epidural bolus
- Resite the epidural if it has completely failed or fallen out if it is possible to do so with the patient awake
- Change to a PCAS or morphine infusion (remember to give a bolus of morphine if setting up PCAS or intravenous infusion)

EXCESSIVE MOTOR OR SENSORY BLOCK

- Excessive motor or sensory blockade is more likely to occur when concentrated local anaesthetic infusions are used.
- The patient may complain of leg weakness or numbness, which they find unpleasant.

Action - Reduce the rate of the infusion. A poorer quality of analgesia may result.

URINARY RETENTION

- This can be a complication of opioid drugs infused to the epidural space.
- All patients will be catheterised following major surgery.
- The catheter is to remain in situ whilst the epidural is in progress.
- If urinary output is less than 1ml/kg/hr for 2 hours, contact medical team to prescribe a fluid bolus.

DISCONNECTION

- Epidural in line filters are suitable for 96 hours of use and do not routinely need to be replaced within this time.
- Should the infusion line become disconnected between the bag/syringe and the filter, the filter should be capped off, using a sterile non-injectable bung, and the infusion line and bag replaced.
- If the epidural catheter disconnects between the patient and the filter, the procedure to follow will depend on whether the disconnection has been witnessed
- If the event has been witnessed, or less than one hour has passed since a satisfactory catheter inspection and there is no obvious sign of contamination

    - Using aseptic technique, use betadine in alcohol to clean the epidural catheter line to a length of over 10cm. allow the betadine to dry. Do not allow betadine to contaminate the end of the catheter.
    - Cut 10 cms from the end of the epidural catheter, using sterile scissors, then reconnect to the filter.
    - If the event has not been witnessed, or there is a pool of fluid in the bed then, stop the infusion and contact the T1. Remove epidural catheter. Consider resiting depending on the clinical state of the patient; confer with the consultant Paediatric Anaesthetist.

LOCAL ANAESTHETIC TOXICITY

- This rare but serious complication of local anaesthetics occurs if the plasma concentration of local anaesthetic exceeds safe therapeutic levels.
- This may manifest itself as CNS irritability (facial tingling, numbness or generalised convulsion) or cardiac arrhythmias.
- It may occur as a consequence of accidental intravenous bolus or by exceeding recommended infusion rates.

Action - **Stop infusion.**

- **Call Anaesthetist on-call and Cardiac Arrest Team if necessary**
- **Treat convulsions and cardiac arrhythmias using standard protocol**
- **Arrange collection of Intralipid infusion which is kept in Gynae theatre recovery**

CATHETER MIGRATION

- On rare occasions the epidural catheter can migrate into either the subdural or subarachnoid space.
- If this should occur, then even very small doses of local anaesthetic infused into that space will have profound effects, creating a block that is more extensive than expected.
- If the block is very extensive it may cause cardiovascular collapse and respiratory depression (Total spinal block).
- Although this is a rare complication if it is not detected immediately it can have serious consequences

ACTION - TREATMENT OF "TOTAL SPINAL BLOCK" SEE APPENDIX 2

NAUSEA AND VOMITING

- This is a side effect of opioids in the epidural infusion solution
- This should be treated by following the Trust PONV policy.
- If persistent then the Fentanyl should be removed from the epidural infusion solution.
- This will necessitate using an increased rate of infusion of plain 0.125% Bupivacaine, a more concentrated solution.
- Please confer with the Anaesthetist concerned.

ITCHING

- Up to 10% of patients complain of itching when opiates are infused into the epidural space, this can be severe in some cases.
- The phenomenon is ill understood but is an effect of opiates acting at spinal level.
- Removing the opiate from the infusion
- Ondansetron 0.1mg/kg (Maximum 4mgs/kg
- Piriton is not usually effective and may cause sedation
- Cold flannels may be very effective and have no side-effects

WEANING FROM AN EPIDURAL

- Epidurals are most beneficial for the first 48 to 72 hours postoperatively-occasionally they may be used for longer periods.
- The duration should be tailored to individual types of surgery.
- Ideally patients should transfer to subcutaneous/oral opiates and regular NSAID'S
- Other complex analgesic techniques such as PCA should not be necessary.
- It is important to institute regular NSAID therapy (provided there are no contraindications) 12 hours prior to discontinuation of the epidural

REMOVAL OF EPIDURAL CATHETERS

- Prophylactic subcutaneous heparin is rarely used in children; therefore the catheter can be removed as soon as the decision has been made to discontinue epidural analgesia.
- It is not necessary to send the tip of the catheter for culture unless the site is clinically inflamed.
- Follow the removal policy. **See appendix 3**
- Continue observations at 4hourly intervals for 12 hours to ensure there are no residual neurological effects.

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Documentation Controls

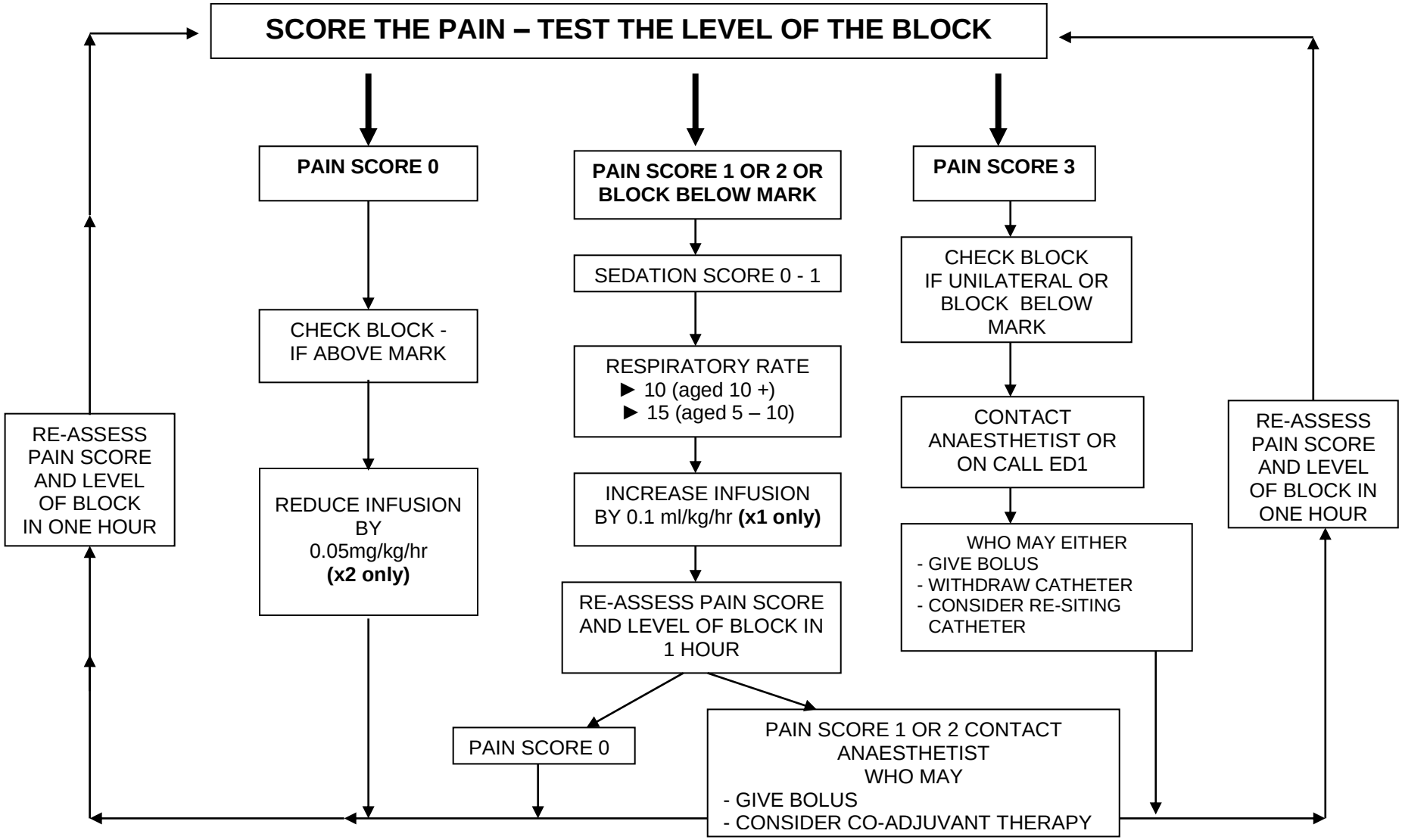
Reference Number PA EP 02	**Version:** V6		**Status** Final	
Version / Amendment History	Version	Date	Author	Reason
	V1	Nov 2020	Dr S Rushman	Review and update
	V6	Nov 2023	Dr S Sarno	Review and update
Intended Recipients: Paediatric Consultants & other medical staff at Derby				
Training and Dissemination: Cascade the information via BU newsletter and address training				
Development of Guideline: Dr Stephen Sarno Consultant Anaesthetist				
In Consultation with: Paediatric Anaesthetists, Senior sisters & Pharmacy				
Linked Documents: (Nice guidance/Current national guidelines)				
Keywords: (Search term for KOHA) Epidural, analgesia				

Business Unit Sign Off	**Group:** Paediatric Guidelines Group **Date: 28th November 2023**
Divisional Sign Off	**Group:** Women's and Children's Clinical Governance Group **Date: 30th November 2023**
Date of Upload	01/12/2023
Review Date	Nov 2028
Contact for Review	Dr S Sarno

APPENDICES

1. Paediatric Epidural Flowchart
2. Treatment of "Total Spinal Block"
3. Guidelines for removal of epidural catheter
4. Assessment of motor block
5. Paediatric post-operative epidural pain chart
6. Completing the epidural pain chart
7. Epidural Training Package (separate document)

APPENDIX 1 - PAEDIATRIC EPIDURAL ALGORITHM



APPENDIX 2

TREATMENT OF "TOTAL SPINAL BLOCK"

This may present when the volume of local anaesthetic used in the epidural space inadvertently enters the subdural or subarachnoid space.

CLINICAL PICTURE

- **COLLAPSE**
- **PROFOUND HYPOTENSION**
- **RESPIRATORY DEPRESSION – APNOEA**
- **BRADYCARDIA AND CARDIAC ARREST (IF UNDETECTED)**

TREATMENT

- STOP EPIDURAL INFUSION
- CALL CARDIAC ARREST TEAM

Airway and Breathing

- Clear the airway
- Give 100% oxygen
- Intubate and ventilate if apnoeic

Circulation

- Infuse crystalloid 10 - 20 mls/kg IV BOLUS
- Administer aliquots of Adrenaline 10 micrograms/kg (0.1ml/kg of 1:10,000) as appropriate
- Atropine 10mg/kg may be useful for Bradycardia

Remember that local anaesthetics and opioids are metabolised in the liver.
Adequate hepatic perfusion will help with recovery from these effects as the drugs are metabolised.

APPENDIX 3

GUIDELINES FOR THE REMOVAL OF THE EPIDURAL CATHETER

EQUIPMENT

Dressing Pack
Sterile Gloves
Small Elastoplast Dressing

PROCEDURE

- Explain the procedure to the child and parents
- Position the child either sitting or lying with the spine fully flexed, head flexed with chin on chest and knees drawn up.
- Wash hands
- Remove dressing and tape from the catheter site
- Remove catheter in one swift gentle movement
- Check that the catheter is intact. The tip should be round and smooth and should measure 10cm from its tip to the first **DOUBLE** marking. If the insertion site shows any signs of any infection send the catheter tip for culture and sensitivity. If the catheter appears broken or damaged in any way, contact the Anaesthetist.
- If the catheter “sticks” or removal is difficult, leave insitu and contact the Anaesthetist.
- Apply Elastoplast dressing over the puncture site, leave insitu for 24 hours.

ENSURE THAT OBSERVATIONS ARE RECORDED FOR 12 HOURS FOLLOWING DISCONTINUATION OF EPIDURAL INFUSION

APPENDIX 4 ASSESSMENT OF MOTOR BLOCK

MODIFIED BROMAGE SCALE	
SCORE	**CRITERIA**
0	The patient is able to move hip, knee and ankle
1	The patient is unable to move hip but able to move knee and ankle
2	The patient is unable to move hip and knee but able to move ankle
3	The patient is unable to move hip, knee and ankle

Local anaesthetics work by blocking nerve impulses on sensory, motor and autonomic nerve fibres. The smallest diameter fibres are most sensitive to the effects of local anaesthetics: autonomic fibres will be blocked first, then sensory fibres and then motor fibres. Motor nerves (as well as sensory nerves) may be affected by local anaesthetics.

It is important to assess motor block:

- to determine the amount of motor function
- to prevent damage to pressure areas
- to ensure the patient is safe to ambulate (if allowed)
- to detect the onset of complications eg epidural haematoma or abscess

Procedure - Explain the procedure and purpose to the child / parent.

1. Assess the motor function:
   Ask the patient to flex their knees and ankles.
   For younger or disabled children (who are unable to follow commands) try to elicit movement by tickling toes, or gentle knee or hip flexion.
   The degree of motor block on both the left and right side should be assessed.

2. Rate their movement according to the Bromage score.

3. With thoracic epidural, upper limb motor function should be assessed by testing bilateral hand and finger extension and flexion.

4. Document the score on the Epidural Pain Chart
   If the motor function is different in each leg, document the scores accordingly, eg Bromage L) 2, R) 0

Assess motor block 4 hourly and at the following times:

- In the recovery room following surgery
- On return to the ward/unit from the operating suite
- At commencement of **each** nursing shift
- Prior to ambulation
- 1 hour after a bolus or increase in the infusion rate

ASK FOR HELP IF

- major changes in motor function (particularly any sudden change)
- almost complete or complete motor block (Bromage score 2 - 3)
- reduced hand or finger motor function with a thoracic epidural

Appendix 5

PAEDIATRIC POST-OPERATIVE EPIDURAL PAIN CHART

Name: Date of birth: Affix Patient label Hospital No	Name of responsible anaesthetist _____ Contact personnel: Day – Night:	EPIDURAL DETAILS Level of Epidural insertion _____ Depth of space _____ cms Catheter tip to skin _____ cms

Date																								
		Time	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Level of Block	Right	Upper																								
		Lower																								
	Left	Upper																								
		Lower																								
Motor Block		Right																								
		Left																								
Pain score																										
Sedation score																										
Nausea and vomiting score																										
Respiratory rate if outside of range (_____)																										
Oxygen saturations if < 91%																										
Blood pressure if systolic outside of range (_____)																										
Infusion rate ml / hour																										
Further analgesia (drug, dose, route, time) Other interventions Further comments																										
Signature/ initials																										

Appendix 6 **Completing the Epidural Pain Chart**

SEDATION SCORE

0 Fully awake
1 Drowsy / easily rousable
2 Difficult to rouse

Actions: Score of 2 – stop infusion, get help

NAUSEA AND VOMITING SCORE

0 No nausea
1 Nauseated
2 Nausea and vomiting

Actions: See PONV guideline

OBSERVATIONS

Record full observations on PCCU chart (frequency as per guideline)

Record only observations of respiratory rate, saturations and blood pressure which are outside of the green and white range for age (taken from PEWS) on the epidural pain chart.

RESPIRATORY RATE

Call for medical help if respiratory rate:

<15/min age 5 -10 years
<10/min age 10 years plus

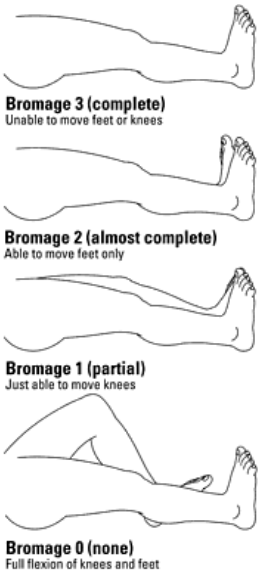
Naloxone must be prescribed
1mcg/Kg – repeated up to 5mcg/Kg

MOTOR BLOCK

How: ask the child to flex their knees and ankles. Rate the movement based on the Bromage scale (1-4 see below)

When: On return from theatre, then 4 hourly, at the start of each shift and an hour after a bolus

Why? To assess level of motor function, help prevent pressure area damage and detect complications (epidural haematoma/abscess)



Actions if score 2-3:
Switch off infusion
Contact Anaesthetist
Re-assess motor function after 30 min

LEVEL OF BLOCK

How: Using ice/cold stimulus against the skin move from the chest down the body asking the patient to identify when the sensation is different or numb. Assess both sides and document the upper and lower limits of the block on each side. (See Dermatomes chart below and larger chart on PCCU

When: On return from theatre, then 4 hourly and at the start of each shift.