Belfast Health and Social Care Trust

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Title:	**Clinical guideline for the management and care of children (0-16 years) with epidural analgesia in the post-operative setting**				
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22/11/2013	V1.1	AK	Comments from Una Convery
April 2014	V2	AK	Adjusted the indexing and inserted a section on roles and responsibilities and deleted a section on MRI in the resources section.
December 2014	V 2.1	UC	Insertion of advice on prescribing Epidural analgesia
July 2018	V 3	LM JQ	Policy reviewed with minor changes

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1. INTRODUCTION/PURPOSE OF POLICY

1.1 Background

This clinical practice guideline outlines best practice for the management of epidural analgesia in paediatric surgical patients 0 – 16 years of age.

1.2 Purpose

The purpose of this guideline is to ensure that all Healthcare Professionals (HCPs) have clear instructions on how to safely and effectively manage the care of paediatric surgical patients who have an epidural infusion for postoperative pain relief.

1.3 Objectives

To ensure safe and effective management of children with epidural infusions by providing evidence based clinical practice guideline.

2.0 SCOPE OF THE POLICY

This guideline is concerned with the management of epidural analgesia for children in the post-operative setting**.** It is not concerned with the management of epidural analgesia for obstetrics, palliative care or management of persistent non-cancer pain.

It should apply throughout the whole of the BHSCT.

3.0 ROLES / RESPONSIBILITIES

The author (Paediatric Acute Pain Team BHSCT) will be responsible for:
drafting and obtaining approval for the document.
updating the policy when and if new analgesic technology, techniques or drugs become available.
disseminating the policy to the Paediatric/Anaesthetic Clinical Director and all Paediatric/ Anaesthetic Clinical Leads throughout the BHSCT and the Paediatric Service Manager.

The Clinical Directors/Clinical Leads and Paediatric Service Manager will be responsible for disseminating the policy to all staff who manage and care for children with epidural analgesia throughout the BHSCT.
Clinicians within the four hospitals of the Belfast Trust will be informed via the Trust intranet Policies and Guidelines site.
Roles and responsibilities of Paediatric/Anaesthetic staff are outlined in policy below.

4.0 KEY POLICY PRINCIPLES

The definition and background of the policy:
This information has been written to provide detailed, practical, evidence based information for all HCPs involved in the management and care of children with epidural infusions for postoperative pain relief. The information has been developed from existing

information in The Belfast Health and Social Care Trust, a literature search, an evaluation of other hospital guidelines and guidance from professional bodies.

5.0 IMPLEMENTATION OF POLICY

Implementation/Resource requirements:
Resource implications:

- Observation charts.
- Laminated pain assessment charts
- Education of staff regarding epidural management and care: with regular updates and time away from the clinical area.
- Team of experienced Acute Pain Nurses with advanced nursing skills to complement the role of the Anaesthetic staff in the management of children with epidurals.
- Training and education for Acute Pain Nurses to manage and care for children on epidural infusions with regard to advanced skills.
- Team of PACU / HDU / PICU / Surgical nursing staff trained in the management and care of epidural infusions.
- Dedicated epidural infusion pumps.
- Dedicated epidural giving sets.
- Epidural labels for lines.
- Ready- made epidural infusion bag: 0.125% Levobupivacaine (200mL)
- Ready- made epidural infusion bag: 0.125% Levobupivacaine & Fentanyl 2microgram/mL (500mL).
- Infant < 6months of age protocol
- Child > 6months of age protocol
- Audit of implementation of guideline
- 24 / 7 availability of MRI

5.1 Dissemination

This policy should be disseminated to all staff who are responsible for the management and care of children with epidural analgesia throughout the BHSCT. When this revised policy has been approved by BHSCT Drugs and Therapeutic Committee and the BHSCT Standards and Guidelines Committee this policy should be implemented immediately.

6.0 MONITORING

The effectiveness of this policy will be continuously monitored by regular audits by the paediatric acute pain team and receipt of complaints or Adverse Patient Incident Reporting (Datix).

7.0 EVIDENCE BASE/REFERENCES

Source(s)/Evidence Base:
Royal College of Anaesthetists.
Royal College of Paediatrics and Child Health.
Great Ormond Street Hospital for Sick Children.
The Royal Children's Hospital Melbourne.

References, including relevant external guidelines:

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21. Tobias JD, Gaines RW, Lowry KJ, Kittle D, Bildner C “A dual epidural catheter technique to provide analgesia following posterior spinal fusion for scoliosis in children and adolescents “ Paediatric Anaesthesia 2001 March 11(2): 199-203
22. Wilson GAM, Doyle E “Local and Regional Anaesthetic Techniques” Acute Paediatric Pain Management: a practical guide. (1998) Chapter 5 edited Neil Morton. Blackwell Science.

8.0 CONSULTATION PROCESS

- Discussion with colleagues in the UK Paediatric Pain Travelling Club with membership from all the major Paediatric centres in the UK and Ireland
- Intranet search regarding epidural guidelines and search of international paediatric centres.
- Discussion with Consultant anaesthetic staff in R.B.H.S.C
- NPSA (2007) Alert 21: Safer Practice with Epidural Injections and Infusions
- Literature search with regard to specific best practice points for management of epidural infusions in paediatric patients.
- Trust acute pain nurses
- Consultation with other hospitals in The Belfast Health and Social Care Trust.
- Consultation with Standards and Guidelines & Drug and Therapeutics committees.

9.0 APPENDICES/ATTACHMENTS

Appendix 1 = Procedure for checking motor block in children of 5 years and above.
Appendix 2 = Procedure for checking the sensory level of an epidural block in children over the age of 5 years with the ability to understand and cooperate with the ice test.
Appendix 3 = Procedure for the removal of an Epidural catheter
Appendix 4 = Management of Severe Local Anaesthetic Toxicity
Appendix 5 = NAP3 Ch 15 Management of Dense Motor Block
Appendix 6 = NAP3 Appendix 2 Example discharge advise for patients who have received CNB
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Appendix 8 = Paediatric observation charts

10.0 EQUALITY STATEMENT

In line with duties under the equality legislation (Section 75 of the Northern Ireland Act 1998), Targeting Social Need Initiative, Disability discrimination and the Human Rights

Act 1998, an initial screening exercise to ascertain if this policy should be subject to a full impact assessment has been carried out.
The outcome of the Equality screening for this policy is:

Major impact

Minor impact

No impact.

SIGNATORIES
(Policy – Guidance should be signed off by the author of the policy and the identified responsible director).

_____ **Date:** _____
Author

_____ **Date:** _____
Director

EPIDURAL INFUSIONS AND DRUGS

The standard epidural solution used is:

- Levobupivacaine 0.125% with Fentanyl 2 micrograms per mL.
  Available in ready-prepared bag from pharmacy: 500mL.
- Levobupivacaine 0.125%
  Available in ready-prepared bag from pharmacy: 200mL.

Drugs must NOT be added to ready-prepared epidural bags.

Other medications:

- Only an Anaesthetist may administer other medication via the epidural route e.g. Clonidine or Preservative Free Ketamine.

Concurrent drugs:
Additional intravenous or oral opioids **must not** be administered to a child already receiving an epidural solution containing Fentanyl.

In some instances a patient may require a Levobupivacaine epidural infusion that **does not contain Fentanyl,** and for this to be supplemented with a morphine NCA/PCA. This is known as a **combined analgesic technique**.

Indications:

- Thoracic surgery
- Upper abdominal surgery
- Extensive abdominal incision e.g. Laparotomy
- Major lower limb orthopaedic surgery
- Multiple rib fracture, Flail chest
- Septicaemia
- Sepsis at planned site of insertion
- Coagulation disturbance – DIC, thrombocytopenia, moderate to severe haemophilia or other bleeding disorder
- Severe liver disease
- Therapeutic heparinisation
- Allergy to local anaesthetic
- Head injury or other CNS depression
- Some types of spinal deformity
- Some diseases of the central nervous system

Contraindications:

- Lack of parental consent

Preoperative Assessment:

- Preoperatively an Anaesthetist should discuss the options for postoperative analgesia with the parents (and child where appropriate), including the risks and benefits of each option.
- Written parent/patient information on epidural analgesia is available and should be given to the family preoperatively.
- A preoperative visit with a member of the Acute Pain Team should also take place, if possible.
- Parents must give verbal consent for the epidural infusion.
- It is recommended that once verbal consent has been obtained this should be documented in the medical notes.
- All parents and children should be given information about pain assessment. Children that are old enough to communicate their own pain scores should be given a pain score and taught how to use this.
- Parents should be encouraged to be involved in their child's pain assessment and pain management.
- If a child has any pre-existing limb weakness, poor mobility or has pre-existing abnormal sensation, this must be clearly documented in the medical and nursing notes prior to going to theatre.
- All children should have the following baseline observations recorded in the medical and nursing notes, prior to going to theatre: Temperature, Respiratory Rate, Heart Rate, and Blood Pressure.

Prescription for Epidural Analgesia:

The levobupivacaine-fentanyl/levobupivacaine solution (s) must be prescribed in the regular injectable section of the patients Medicine Kardex and dedicated observation chart, to include the following:

- The concentration of Levobupivacaine (milligrams/ml) in sodium chloride
- The concentration of Fentanyl (micrograms/ml)

Insertion of Epidural catheter:

Drugs
- Levobupivacaine 0.125% with Fentanyl 2 micrograms per mL.- 500mL.
- Levobupivacaine 0.125% - 200mL bag.
- Levobupivacaine 0.25% 10mL amp
- 0.9% Sodium Chloride for injection 10mL amp

Equipment
- A sterile dressing pack
- Sterile drapes
- An epidural pack
  - 19 gauge needle and a 23 gauge catheter
    or
  - 18 gauge short paediatric needle and 21 gauge catheter
    or
  - 18 gauge adult needle and 21 gauge catheter
- 5ml syringe
- 0.9% sodium chloride for injection
- Sterile occlusive, hypoallergenic transparent dressing, e.g. Opsite™
- Adhesive dressing e.g. Mefix™

Procedure
Only a Consultant Anaesthetist or an Anaesthetist in training with appropriate skills and competencies in paediatric epidural analgesia should insert an epidural.

Epidural catheter insertion must be performed using a strictly **aseptic technique**.
Aseptic technique means “without micro-organisms” and refers to the procedure used to avoid the introduction of pathogenic organisms into the epidural site.

Staff should comply with the BHSCT policy on Hand Hygiene and ensure the use of a sterile theatre gown, drapes, hat, gloves and mask.

Epidurals should be inserted in a theatre environment and NOT on a general ward.
- The patient is positioned appropriately.
- After sterile skin preparation, the desired spinal level is identified.
- A loss of resistance technique is used to locate the epidural space.
- The epidural catheter is placed to the appropriate height. At least 4cm should be left in the epidural space.
- Consideration can be given to tunnelling the epidural catheter if appropriate.
- A bacterial filter is then attached.
- Once in place the catheter should be secured using;
  - A clear dressing e.g. Opsite ™ over the entry site
  - Tape e.g. Mefix™ covering rest of the catheter up to the back of the shoulder.

Drug Administration:

Initial

A bolus dose of 0.5mL/kg of 0.25% levobupivacaine (1.25mg/kg) may be given in theatre at the discretion of the Consultant Anaesthetist.

Additional doses may be given intra-operatively or an infusion commenced of either:

- Levobupivacaine 0.125% (1.25mg/mL)

or

- Levobupivacaine 0.125% (1.25mg/mL) with fentanyl 2 micrograms/mL.

Drug Administration: On-going

< 6months of age

Epidural solution

0.125% levobupivacaine

ready prepared bag (200mL)

Suggested start rate:
0.1mL/kg/hour

(0.125mg/kg/hour levobupivavcaine)

Maximum infusion rate:
0.2mL/kg/hour

(0.25mg/kg/hour levobupivacaine)

> 6months of age

Epidural solution

0.125% levobupivacaine

OR

0.125% levobupivacaine & fentanyl 2microgram/mL

ready prepared bag
(200mL)

ready prepared bag
(500mL)

Suggested start rate range:
0.1 – 0.3 mL/kg/hour

Equipment for Infusion:

- Dedicated epidural pump - lockable & programmable
- Epidural infusion set (yellow line)
- Ready-prepared epidural bag
- The pump serial number must be written on the patient's chart.

Initial set up of infusion

- The epidural pump and epidural infusion should ONLY be set up by two HCPs with appropriate skills and competencies.
- One of the above HCPs should be present when an Anaesthetist attaches the epidural infusion to the patient.
- The infusion must be set up using an **Aseptic Non Touch Technique** in a theatre environment.

Epidural giving sets/lines

- All epidural sets/lines have a **yellow stripe.**
- All lines must be labelled clearly with black text on yellow labels stating "Epidural use only"
- All Epidural infusions must run via a dedicated lockable & programmable pump. **This pump must NOT be used for any other purpose.**
- The pump and the extension line must be connected to an epidural catheter via a bacterial filter.

Changing the infusion rate:

- HCPs with appropriate skills and competencies (anaesthetist or paediatric acute pain nurse) may adjust the epidural infusion rate within the prescribed range, in consultation with the consultant anaesthetist, as determined by the patient's clinical needs and taking into account the individual patient's 4 hourly maximum dose of levobupivacaine.
- The epidural infusion rate must **not** be increased by more than 25%. Any increase in rate MUST REMAIN WITHIN THE PRESCRIBED RANGE.
- If the child is still experiencing discomfort after this increase, contact the appropriate HCP.

Epidural Boluses:

From infusion pump

A bolus of epidural solution may be required if analgesia is inadequate.

- This must be prescribed by an Anaesthetist and can be administered from the infusion pump as a "loading dose".
- Only a HCP with appropriate skills and competencies **(i.e. a member of the acute pain team)** should administer a loading dose via the infusion pump.
- If a bolus from the infusion pump is not effective contact an Anaesthetist.

Top Up:

- If pain is severe an Anaesthetist may decide to administer additional boluses to a maximum of 2mg/kg of Levobupivacaine in a 4-hour period.
- If a separate hand held syringe is used the injection must be performed using a strictly aseptic technique.
- If the concentration of Levobupivacaine used for the top-up is greater than 0.125%, then an Anaesthetist must remain in the ward for a least 20 minutes following administration of the top up or until they are satisfied that the child's condition is stable.

CAUTION: The need for an epidural bolus (either from the infusion or as a "top-up") **must** be discussed with a Consultant Anaesthetist if the child has been receiving the maximum infusion rates for more than 3 hours. This is in order to avoid the risk of toxicity. (See section 9.1.)

Epidural bag changes:

- It is important to ensure that adequate stock of epidural bags is available at ward level.
- Only two practitioners authorised to administer medicines (if the epidural contains a controlled drug one of these practitioners **must** be a registered nurse) and who have appropriate skills and competencies should erect a new epidural bag. These two practitioners **must** check the

CARE OF THE PATIENT

When collecting the patient from theatre a verbal report should be obtained including:

- Details of intra-operative analgesia.
- Details of the epidural solution and rate.
- Details of any pain or epidural related complications that have been experienced peri-operatively.

Before accompanying the patient to the ward from recovery, it should be ensured that:

- The drug being administered corresponds with what has been prescribed.
- The discharging recovery nurse and the receiving ward nurse have both checked the cumulative dose of epidural administered. This must be signed by both of them on the patient's observations chart.
- The patient's pain is being managed effectively.
- The patient is not excessively sedated.
- The pain management observation chart has been completed correctly.
- The patient's drug kardex has been completed correctly i.e. it should clearly state the epidural solution, the infusion range, and supplementary drugs to prevent side effects.
- The Anaesthetist is satisfied that the epidural block (both sensory and motor) is satisfactory prior to discharging the child from the recovery ward.

General ward care:

A core care-plan, if available, should be used for all patients with an epidural and should be adapted for each individual patient.

Supplementary analgesia e.g. paracetamol and either Diclofenac or ibuprofen, where appropriate, should be given regularly.

A member of the Acute Pain Team should review the patient at least once daily and be available to answer any pain related queries.

Resident medical /anaesthetic staff must have had training in the management of patients with epidural analgesia, including the recognition and management of epidural associated complications.

HCP training (including medical and anaesthetic staff) needs to raise awareness of the importance of neurological monitoring and the need for a prompt and appropriate response to dense block or deteriorating neurological function. The possibility of neurological problems occurring after removal of the catheter due to haematoma formation or later still abscess formation should be included in this training. Training should include "red flag," recognition. Hospitals are encouraged to develop their own treatment algorithms for monitoring and management of dense block; please see appendix 7.

'Best practice' guidance from the Royal College of Anaesthetists (RCOA) recommends that an anaesthetist with appropriate competencies and training should be immediately available to attend a child who is receiving an epidural infusion. 'Immediate' in this context is considered to mean a member of the resident anaesthetic team is always readily available. Where this is not currently possible, the BHSCT will work towards achieving this goal and continue to investigate and implement measures to cohort paediatric patients in the RBHSC where an anaesthetist is more readily available. Until then this issue will remain noted on the BHSCT Risk Register.

Skin integrity
The decreased sensation that results from the epidural infusion removes the usual warning signs that prompt children to move. It is therefore important that pressure area care is meticulous for all patients receiving epidural infusions.
It is advisable to order pressure-relieving aids for patients requiring major surgery and that are likely to have an epidural infusion postoperatively.
Patients may be at risk of pressure sores particularly at the heels, the medial and lateral malleoli and at the sacrum.

Mobilisation
- If on bed rest or reluctant to mobilise regular pressure area care should be given.
- The patient may be encouraged to mobilise if their condition allows.
- Patients must be accompanied at all times when mobilising.
- Patients may sit out in a chair or walk to the toilet as directed by the surgeon.
- Older children should be warned that initially they might experience some dizziness when mobilising.
- **Intravenous access MUST** be available throughout the duration of the infusion and for **6 hours** after the infusion has been discontinued.

Observations

1. Respiratory Rate, Heart Rate, Blood Pressure, Temperature and Oxygen Saturation, Motor and Sensory Block should be recorded **every 15 minutes for the first hour after surgery**. **If these initial observations are stable then**:
2. Respiratory Rate and Heart Rate are recorded HOURLY for the duration of the epidural infusion.
3. Blood Pressure and Temperature are recorded HOURLY for the first 4 hours. If these observations are stable then Blood Pressure and Temperature may be reduced to 4-HOURLY for the duration of the epidural. Pain score is recorded HOURLY while awake.
4. Oxygen saturations are monitored continuously and recorded HOURLY for the duration of the epidural infusion.
5. Sedation and Postoperative Nausea and Vomiting are recorded HOURLY for duration of the epidural infusion.
6. Motor and Sensory block should be assessed and documented 4-HOURLY and at the following times: when the patient arrives in the recovery ward, on return of the patient to the ward from theatres, at the beginning of each nursing shift, prior to the patient mobilising and after epidural bolus administration or an increase in the epidural infusion rate. (Refer to Appendices 1 and 2 for guidance on how to assess motor and sensory block in children). If required contact a member of the Acute Pain Team for further advice.
7. Observation for Pruritis 4-HOURLY
8. Skin integrity should be assessed and recorded initially in the recovery ward and then 4-HOURLY.
9. The epidural site should be checked initially in the recovery ward and then 4- HOURLY.
10. The epidural catheter connection should be checked initially in the recovery ward and then 4-HOURLY.

Peri-operative fluid management in children with epidurals

The Association of Paediatric Anaesthetists (APA) Consensus Guideline on Fluid Management in Children (2007) highlights groups of children who are at risk of hypoglycaemia intra-operatively. This guideline states:

“Children at risk of hypoglycaemia if non-dextrose containing fluid is given intra-operatively are: those on parenteral nutrition or a dextrose containing fluid prior to theatre, children of low body weight < 3rd centile or children having surgery of more than 3 hours duration and children having extensive regional anaesthesia. These children should be given dextrose containing solutions or have their blood sugar monitored during surgery”

Regular blood glucose monitoring should be performed in children who have an epidural in situ post-operatively and require intravenous fluids. A glucose containing fluid should be used when indicated.

PLEASE NOTE:
If the patient receives **an epidural bolus**
or
if the **rate of infusion is adjusted**
or
if there is **any change in the patient’s clinical condition**
then **ALL** observations **must** revert to **every 15 minutes for the next hour** and until the patient’s condition has stabilised as documented in **statement 1** above .

Epidural Observations must continue as above for 6 hours after discontinuation of the epidural infusion.

Observations after bolus or change in epidural infusion rate:
Respiratory Rate, Heart Rate, Blood Pressure, Temperature and Oxygen Saturation, Motor and Sensory block should be recorded every 15 minutes for the first hour after epidural bolus or top-up administration or after a change in the epidural infusion rate. If these observations are stable, then continue standard observations as above.

CAUTION: Nerve compression
Special attention should be given to avoid nerve compression. Superficial nerves (e.g. peroneal nerves at the top of the fibula) are vulnerable to damage from unrecognised pressure due to decreased sensation.

COMMON PROBLEMS ASSOCIATED WITH EPIDURAL ANALGESIA

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

- Assess severity and location of pain using an age appropriate pain assessment tool.
- Assess sensory levels on both sides.
- Check catheter at insertion site for leaking or dislodgement.
- Check connection of catheter and filter for disconnection or leaking.
- Administer prescribed simple analgesics e.g. paracetamol and either Diclofenac or ibuprofen, if appropriate.
- All HCPs should be aware that increased or breakthrough pain while receiving an epidural may sometimes indicate a surgical complication e.g. infection or haemorrhage. In lower limb surgery breakthrough pain may indicate the development of compartment syndrome, a rare but serious complication. Therefore a surgical review of the patient should be requested **immediately** to exclude these complications.
- Contact a member of the Acute Pain Team for further advice.

Further management may include:

- Increasing the epidural rate.
- Giving additional epidural boluses.
- Redressing the site.
- In some instances it may be necessary to discontinue the epidural and arrange alternative analgesia e.g. morphine PCA / NCA.

Pruritis (itch)
The patient should be observed for pruritus (itch):

- At least four hourly.
- 1-2 hourly if itching becomes a problem.
- If pruritis is a problem consider administering an antihistamine e.g. chlorphenamine
- If pruritis still persists consider use of naloxone after discussion with an Anaesthetist.
- It may be necessary to remove Fentanyl from the epidural infusion.

Leaking epidural
Leaking of the epidural solution from the skin entry site is common, particularly in small children. If leaking occurs and the child remains pain free:

- Observe the entry site more frequently: 1-2 hourly if possible.
- If the dressing starts to peel off, place a new one over the top.
- **Do not** remove the original dressing, as removal may dislodge the epidural further.
- **If leaking occurs and the child has inadequate pain relief see 9.1 above.**

Nausea and vomiting
The patient should be observed for nausea and vomiting **HOURLY.**
If the patient complains of nausea or has been vomiting:

- Administer an anti-emetic as prescribed.
- Aspirate the nasogastric tube or gastrostomy tube if appropriate.
- Consider the use of an alternative anti-emetic if the patient is still symptomatic.
- If the above measures are unsuccessful contact a HCP with appropriate skills and competencies.

Urinary retention

- All patients should be catheterised.
- Record the patient's urine output hourly.
- The catheter should be left in situ until the epidural is discontinued.

Occlusion
Epidural catheters are very fine and therefore can occlude easily. If the infusion pump occludes or is not delivering at the programmed rate:

- Check that the epidural infusion line is not occluded or kinked
- Check that the taping has not resulted in any kinks in the catheter
- If the cause for the occlusion is not found, inform a member of the Acute Pain Team.

Disconnection

- If a member of medical or nursing staff witnesses the disconnection of the epidural catheter from the bacterial filter, **and** the time of disconnection is known (and the epidural catheter has **not** been soiled) it may be possible for a HCP with appropriate skills and competencies to reconnect the epidural catheter.
- Turn off the epidural pump.
- Wrap the disconnected epidural catheter tip and the bacterial filter in a sterile towel or sterile gauze.
- It may be possible to reconnect the epidural catheter using an aseptic non touch technique; clean with alcohol swab, ensure alcohol dries, cut using sterile scissors and reconnect. **Allow alcohol to dry before reconnecting.**
- If the epidural disconnection is not witnessed or if the disconnection happened more than 1 hour previously the epidural catheter may have to be removed.
- If there are any concerns regarding the disconnection of the epidural catheter contact a member of the Acute Pain Team for advice.

Site care
Contact a member of the Acute Pain team if:

- The skin entry site becomes red or swollen; epidural catheter may need to be removed.
- The catheter has become displaced.
- The dressing has fallen off.
- There is excessive leaking or fluid around the entry site.

If the dressing falls off:

- Put a new sterile transparent occlusive hypoallergenic dressing on immediately and await further input from a member of the Acute Pain Team.

Technical problems

- If a technical problem occurs with the pump contact a member of the Acute Pain Team.
- If there is a fault with the pump, it must be withdrawn from service **immediately** and held over for interrogation by the Acute Pain Team. The faulty pump must be labelled with the time, date and description of the fault.
- Technical problem labels are available from the surgical wards and recovery.
- Complete an adverse incident form.

COMPLICATIONS ASSOCIATED WITH EPIDURAL ANALGESIA

Respiratory depression / Over sedation

The respiratory rate must be monitored hourly for the duration of the epidural infusion.
The frequency of monitoring the respiratory rate should be increased if the patient is excessively sedated or if their condition deteriorates.
The acceptable minimum respiratory rate for the individual patient is written on the epidural observation chart. However this is for guidance only as it does not take into account the following:

- Depth of respiration
- Respiratory effort
- Level of sedation
- Peripheral Arterial Oxygen Saturation

Sedation scores should be recorded hourly while the epidural infusion is in progress.

If Over Sedation occurs i.e. a **sedation score of 3:**

- **IMMEDIATELY STOP** the infusion
- **ADMINISTER 100% OXYGEN**
- **IMMEDIATELY** Contact a HCP with appropriate skills and competencies to assess the patient.
- Simultaneously contact an Acute Pain Nurse and an Anaesthetist. Once the sedation level has improved it may be possible to recommence the infusion. It may be necessary to reduce the epidural infusion rate or to remove the Fentanyl from the epidural infusion bag.

If Respiratory Depression occurs:

- **IMMEDIATELY STOP** the infusion.
- **ADMINISTER 100% OXYGEN**
- **IMMEDIATELY** Contact a HCP with appropriate skill and competencies to assess the patient.
- Administer Intravenous Naloxone
- Simultaneously contact an Acute Pain Nurse and an Anaesthetist.
- Record these actions in the child's medical and nursing notes and complete an adverse incident form.

If Respiratory Arrest occurs:

- **IMMEDIATELY STOP** the infusion and contact the **Cardiac Arrest Team**.
- ADMINISTER 100% Oxygen and manage "Airway, Breathing, Circulation" as per Paediatric Basic Life Support until the Cardiac Arrest Team arrive.
- Administer intravenous Naloxone.
- Simultaneously contact an Acute Pain Nurse and an Anaesthetist.
- Record these actions in the child's medical and nursing notes and complete an adverse incident form.

High block

- It is important to assess sensory block to ensure the epidural is providing adequate pain relief and to ensure the block is not too high which may lead to complications.
- The level of sensory block can be assessed in any child over 5 years who has the ability to understand and co-operate with the ice test. (Appendix 2).
- In younger children it may be possible to assess this indirectly by the ability of the child to spontaneously move their arms.
- If the epidural block is at T3/4, **IMMEDIATELY** contact a member of the Acute Pain team.

Back pain

Mild back pain is common and can be caused by minor trauma related to epidural insertion. However, because of the serious consequences of epidural abscess and epidural haematoma, **all back pain after epidural insertion must be reported promptly to a member of the Acute Pain Team**

Dense Motor Block

Fever
If a patient with an epidural has a pyrexia, or is suspected of having sepsis with potential for bacteraemia, the epidural catheter may need to be removed. **This must be discussed promptly with a member of the Acute Pain Team.**

Hypotension
Local anaesthetic in the epidural infusion can cause sympathetic blockade with a resulting decrease in blood pressure. However this is rare in younger children (younger than 8 years of age). If there are concerns regarding a patient's blood pressure **IMMEDIATELY** contact an appropriate HCP with appropriate skills and competencies. Simultaneously contact a member of the Acute Pain team The patient may require a bolus of fluid and the epidural rate may need to be reduced or stopped until the blood pressure has normalised.

Headache
If a patient with an epidural infusion experiences a headache unresponsive to simple oral analgesics contact a member of the Acute Pain Team.

Local anaesthetic toxicity
Although Levobupivacaine toxicity is rare, it can occur with the following:
- If the drug is accidentally administered intravenously
- In neonates and babies if high rates of infusion are used for long periods
- In patients with renal failure

If Local Anaesthetic Toxicity does occur it is a **MEDICAL EMERGENCY** and an Anaesthetist and the Cardiac Arrest Team must be contacted **IMMEDIATELY.**

LOCAL ANAESTHETIC TOXICITY

SIGNS MANAGEMENT
- Tingling of mouth & lips
- Increased anxiety, irritability
- Excessive sedation
- Hypotension
- Cardiac arrythmia
- Seizures
- Cardiac Arrest **STOP** epidural infusion
- **IMMEDIATELY CALL CARDIAC ARREST TEAM**
- **IMMEDIATELY CALL AN ANAESTHETIST**
- Administer 100% Oxygen and Manage Airway, Breathing, Circulation until Cardiac Arrest Team arrive
- Ensure IV access
- IV Bolus 20mLs/kg N.Saline
- Consider Intralipid (stored in Theatre Environment-immediately available) (Appendix 4)

DISCONTINUING THE EPIDURAL INFUSION

The epidural should only be discontinued after discussion with a member of the Acute Pain Team. However the epidural infusion may be stopped in the following circumstances:

- Over sedation
- Respiratory depression/Respiratory arrest / Cardiac arrest
- A high sensory block or a high motor block
- Persistent hypotension, especially if symptomatic (see section 10.6)
- Disconnection from the filter
- Pump occlusions
- Displacement of the epidural catheter

Discontinuation of an epidural should be recorded in the child's medical and nursing notes. Discontinue on medicine kardex.

Removing the epidural catheter

- Epidural catheters should only be removed following instructions from a member of The Acute Pain Team.
- If there is any suspicion of a clotting abnormality or of a low platelet count (platelets < 100,000) a platelet count should be checked and an Anaesthetist must be contacted **BEFORE** the catheter is removed. A coagulation screen may also be required.
- Only a HCP with appropriate skills and competencies should remove an epidural catheter (Appendix 3). Removal of the epidural catheter should be documented in the patient's notes.

The epidural catheter should **NOT** be removed if:

- The child has an abnormal coagulation screen or a platelet count <100,000.
- The last dose of prophylactic low molecular weight heparin (LMWH) was administered less than 12 hours ago.
- The child has a suspected post dural puncture headache.
- The child has a suspected epidural haematoma.

Anti-coagulation medication and epidural removal

- Epidural catheter should be removed 12 hours after the last prophylactic dose of low molecular weight heparin (LMWH).
- Epidural catheter should be removed 24 hours after the last treatment dose of LMWH.
- The next dose LMWH should be delayed for at least 4 hours after catheter removal. (The next dose may need to be delayed for up to 24hrs if there has been a bloody tap or if there has been any suspicion of an epidural haematoma.)
- In **Renal patients** who are receiving dialysis, the epidural catheter should only be removed on a day when dialysis is **NOT** planned.

Accidental catheter removal

- Reassure the patient
- Put a small plaster over the entry site and keep the catheter.
- Contact a member of the Acute Pain Team.
- Record the incident in the child's medical and nursing notes and complete an IR1.
- As in (Anti-coagulation medication and epidural removal) above, if the patient is on low molecular weight heparin (LMWH) wait for at least 4hrs (or in some instances 24hrs) after accidental removal before administering the next dose of LMWH.

Infected catheter removal

- If the epidural site looks red and infection is suspected, contact a member of the Acute Pain Team. The epidural catheter should be removed, the tip of the catheter should be sent for culture and a swab should be taken from the site and sent for culture. A member of the Acute Pain Team must follow up all swabs.
- A bacteriologist must be consulted regarding a positive culture.
- A treatment plan must be clearly documented in the medical notes.

Disposal of Epidural Solution

Two HCPs with appropriate skills and competencies **must record and verify** the volume of epidural solution remaining in the epidural bag at the time of disposal.
This volume **must** be documented and signed for on the epidural observation chart. Disposal should comply with hospital policy. The pump should be cleaned as per hospital policy.
Discontinued or partly used epidural solutions containing controlled drugs must be emptied into a burn bin (designated for pharmaceutical waste) into the bottom of which some absorbent material (paper towel) and liquid soap has been placed as per BHSCT CD policy.

Patient Education

Ideally patients being discharged home following treatment with an epidural should be given clear instructions about the need to respond to late onset neurological deterioration that might occur (most likely due to abscess formation) after discharge.
An example of an advisory pamphlet is provided in Appendix 6

Appendix 1

Procedure for assessing motor block in children with an epidural

1. Assessing motor block in children 5 years of age and above with the ability to understand and co-operate.

Rationale for assessing motor block

Occasionally problems can occur. Problems are outlined below. Regular checks will alert staff to any serious problems, which can include: -

- **A 'total spinal'** where the epidural catheter can theoretically migrate into cerebrospinal fluid (CSF) causing cardiac arrest.
- **Slow intravenous administration** where the epidural catheter can migrate intravenously, causing toxicity and cardiac arrest.
- **Increased motor block** with decreased movement, which can be a sign of an epidural haematoma or an epidural abscess (causing compression on the nerves and permanent nerve damage).

Procedure

1. For ALL children it is important to have a documented record of their preoperative mobility/leg movement. Any decrease in their preoperative mobility/leg movement in the post-operative period MUST be reported to an Acute Pain Nurse and an Anaesthetist.
2. Be aware that children may be frightened or unsure of what is expected of them and may be reluctant to move.
3. Ask the child to move toes and feet. The child should be able to flex at the ankle and "wiggle" toes.
4. Ask the child to bend their leg at the knees. The child should be able to bend their knees fairly easily.
5. Ask the child to move their leg at the hip if possible. This may be more difficult.
6. Children may complain of heaviness or numbness in their legs or of "pins and needles". This should be reported to an Anaesthetist or an Acute Pain Nurse and must be documented. The epidural infusion rate may need to be reduced. Discuss with Consultant Anaesthetist.
7. The degree of motor ability should be scored using the Bromage score shown below. This score should be documented on the Epidural observation chart.
8. Motor block must be assessed and documented at regular intervals as stated "Observations."
9. The degree of motor block on both the left and right should be assessed and documented.

Bromage scale and score criteria

Bromage 3	**Unable to move feet and knees**
Bromage 2	**Able to move feet only**
Bromage 1	**Just able to move knees**
Bromage 0	**Full flexion of knees and feet**

2. Assessing motor block in children less than 5 years of age and those who are non-verbal or have special needs (or a child > 5years who is sleeping).

It is possible to assess motor block in children < 5 years by stroking or tickling the child's limbs and by observing for spontaneous movement.

Appendix 2

Procedure for assessing the sensory level of an epidural block in children

1. Assessing sensory block in children over the age of 5 years with the ability to understand and cooperate with the ice test.

Rationale for assessing sensory block

- **To detect an Ascending block** where the epidural infusion is spreading upwards, increasing the risk of respiratory and cardiac arrest.
- **To detect a Uni - lateral block,** where the epidural infusion is blocking dermatomes on one side only and the patient is experiencing pain.
- **To detect an Ineffective block** where the patient is experiencing pain, as the epidural may not be at the appropriate level.

Requirements

Ice Appropriate dermatome chart. (The dermatome level refers to area of skin supplied by an afferent nerve from the posterior spinal nerve root)

Observation chart

Procedure for ice test

1. Inform the child and parent what you are going to do and the purpose of the test.
2. Place a small piece of ice on the child's cheek and ask the child to describe what he feels. (They should say "cold").
3. Tell the child that you are going to touch their skin at different places on their body starting from the toes up. Sometimes the child will feel cold and sometimes pressure.
4. Ask the child to close his eyes.
5. Start at the foot and apply the ice to several points all the way up the body to the shoulder. Record the level at which the child does not feel freezing cold. Where the epidural is working well, the child should only feel pressure.
6. Record the level of the block by checking the chart (for example a child that has a block up to the umbilicus has a block to T9/10; a child that has a block up to the level of the nipple has a block to T3/4).
7. Do the procedure again on the other side. The child should have approximately the same sensation on both sides.
8. Record the level of the block on both sides.
9. The level of the block should not go above T3/4 (the nipple line). If the block has reached this level **immediately** inform an Anaesthetist or an Acute Pain Nurse. **Stop the infusion.**
10. Sensory block should be assessed and documented at regular intervals as stated in section "Observations."

Frequency of Observations

2. Assessing sensory block in children less than 5 years of age or those who are non-verbal or have special needs.

It is possible to assess sensory block in children < 5 years by carefully observing flinching and facial expression in response to ice on presumed blocked and unblocked dermatomes. The inability of a child to spontaneously move their arms (in a child who preoperatively could spontaneously move their arms) may indicate the presence of a high block and should be notified **immediately** to a member of the Acute Pain Team.

Appendix 3

Procedure for the removal of an Epidural catheter

Rationale

To provide staff with instructions on how to remove an epidural catheter safely.

Equipment

Clean Trolley
Sterile dressing pack
0.9% Sodium chloride.
Swab
Bacteriology bottle
Sterile scissors
Alcohol wipes
Medical adhesive remover wipes
Small Mepore ™ dressing
Non-sterile gloves and sterile gloves
Patient's notes and anaesthetic chart
Pain score chart

Procedure

1. Check the patient's anaesthetic notes. Check the level of the catheter and how much catheter is in situ.
2. Check the patient's blood results. An epidural catheter should **not** be removed if the patient has a low platelet count (< 100,000) or abnormal coagulation. Please discuss with an Acute Pain Nurse or an Anaesthetist **before** proceeding.
3. Explain to the parents and the child what you are going to do. Inform them that the removal of the catheter will not be sore and the procedure is short.
4. Assemble the trolley and bring to the bedside. Wash your hands thoroughly and put on gloves.
5. Ask the child to turn on to their side or sit up, whichever is more comfortable. The parents may help.
6. Remove the tape with alcohol wipes or medical adhesive remover wipes.
7. When all the tape is removed, check the site as the catheter may be tunnelled under the skin. Observe the skin condition following removal of the tape for signs of infection.
8. Put on sterile gloves to remove the catheter.
9. Check the catheter position and start to slowly and gently pull the catheter away from the patient. The catheter should come away easily. If there is resistance **do not pull**. Contact an Acute Pain Nurse or an Anaesthetist for advice.
10. Once the catheter is removed, check the blue markings and measure the catheter checking that the entire catheter has been removed. There should be a blue tip at the end.
11. If there is any sign of infection, cut the tip of the catheter with sterile scissors and send off for culture.
12. Examine the site. If there is any sign of infection swab the site, then clean with saline and apply a dry dressing. It is normal for some clear ooze, which is usually some of the epidural infusion.
13. Advise the parents and child to keep the dressing on for 24 hours and to observe for any ooze. There should be minimal ooze from the site.
14. Epidural observations must continue for at **least 6 hrs.** After epidural catheter removal or more frequently depending on the patient's clinical condition. (See section 8.0).

AAGBI Safety Guideline

Management of Severe Local Anaesthetic Toxicity

1 Recognition

Signs of severe toxicity:

- Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions
- Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur
- Local anaesthetic (LA) toxicity may occur some time after an initial injection

2 Immediate management

- Stop injecting the LA
- Call for help
- Maintain the airway and, if necessary, secure it with a tracheal tube
- Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)
- Confirm or establish intravenous access
- Control seizures: give a benzodiazepine, thiopental or propofol in small incremental doses
- Assess cardiovascular status throughout
- Consider drawing blood for analysis, but do not delay definitive treatment to do this

3 Treatment

IN CIRCULATORY ARREST

- Start cardiopulmonary resuscitation (CPR) using standard protocols
- Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment
- Consider the use of cardiopulmonary bypass if available

GIVE INTRAVENOUS LIPID EMULSION

(following the regimen overleaf)

- Continue CPR throughout treatment with lipid emulsion
- Recovery from LA-induced cardiac arrest may take >1 h
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

WITHOUT CIRCULATORY ARREST

Use conventional therapies to treat:

- hypotension,
- bradycardia,
- tachyarrhythmia

CONSIDER INTRAVENOUS LIPID EMULSION

(following the regimen overleaf)

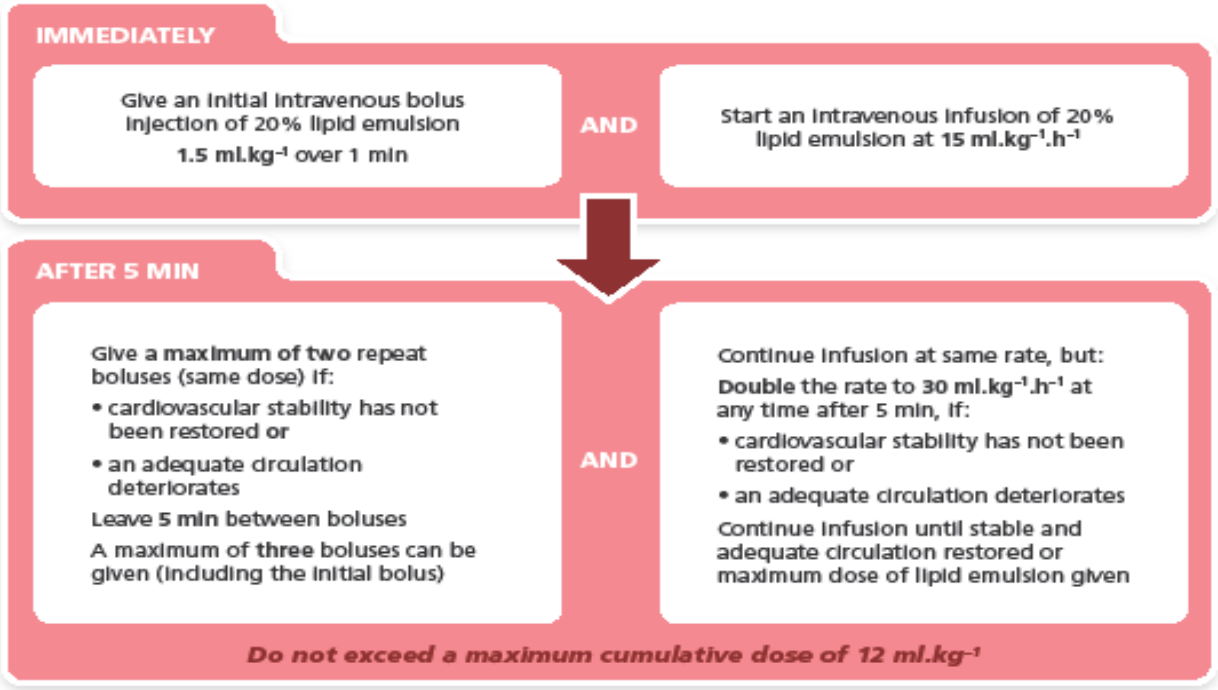
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

4 Follow-up

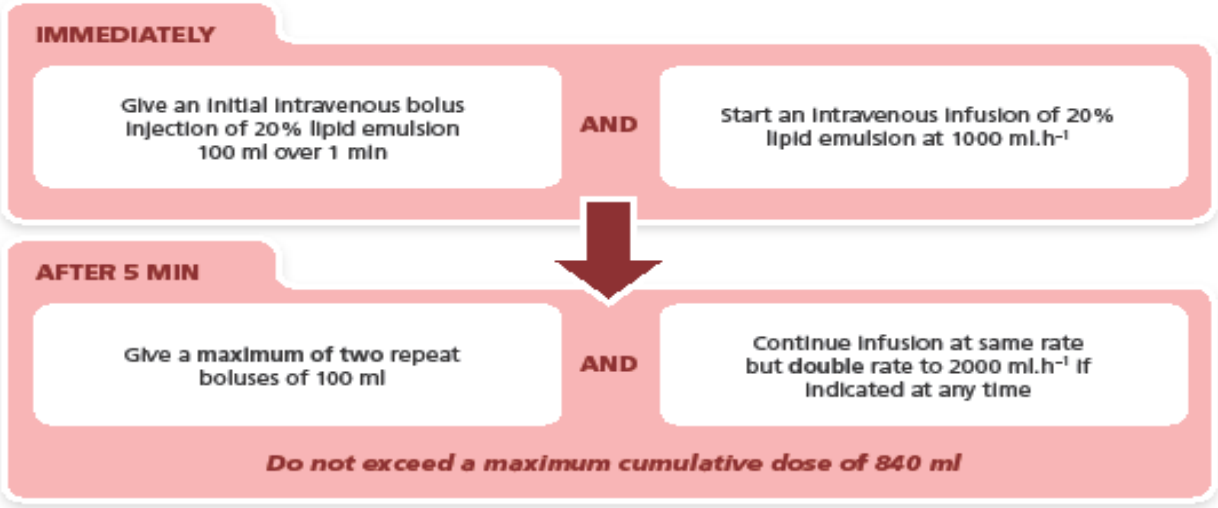
- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved
- Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days
- Report cases as follows:
  - in the United Kingdom to the National Patient Safety Agency (via **www.npsa.nhs.uk**)
  - in the Republic of Ireland to the Irish Medicines Board (via **www.imb.ie**)

If Lipid has been given, please also report its use to the international registry at **www.lipidregistry.org**. Details may also be posted at **www.lipidrescue.org**

Your nearest bag of Lipid Emulsion is kept .....



An approximate dose regimen for a 70-kg patient would be as follows:



This AAGBI Safety Guideline was produced by a Working Party that comprised:
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This Safety Guideline is endorsed by the Australian and New Zealand College of Anaesthetists (ANZCA).

CHAPTER 15: MANAGEMENT OF DENSE MOTOR BLOCK FOLLOWING CNB OR DURING CONTINUOUS EPIDURAL ANALGESIA

Dr David Counsell

Dr Tim Cook

Early recognition of neurological abnormality may be critical in diagnosing spinal cord ischaemia, vertebral canal haematoma and vertebral canal abscess (*Chapters 6, 7, 8*)

The NAP3 project identified several cases of delayed management of spinal cord compression as a result of delayed identification, review or diagnosis in patients with inappropriately weak legs either following CNB or during continuous CNB.

Early decompressive laminectomy was effective in several cases of vertebral canal abscess with neurological symptoms, but less so for vertebral canal haematoma. Logically earlier identification, diagnosis and management offers the best hope of prompt intervention and good outcome.

It is not the remit of this document to be proscriptive about how this should be managed and indeed that would be impossible given the wide range of infusion regimes and intra-operative epidural management observed. The following are presented as issues to be considered.

PROCEDURE

- Lumbar epidurals (e.g. used for lower limb surgery) can be expected to cause weak legs and therefore developing cord compression may be particularly difficult to detect in these patients. The benefits of an epidural for unilateral lower limb surgery are uncertain in most patients and epidural use in this context should be considered carefully.
- Thoracic epidural blockade should not lead to any significant leg weakness: therefore leg weakness occurring with a thoracic epidural always requires further review and if necessary investigation.
- Combined spinal epidurals (CSEs) pose a particular problem as a spinal block (dense motor block) is routinely followed by initiation of an epidural infusion before resolution of the former block is confirmed and often without the usual safety checks for the latter block.
- Use of segmentally placed epidurals will minimise avoidable leg weakness. For example there is little reason to place a lumbar epidural for any thoracic or abdominal surgery, with the exception of pelvic surgery. Indeed, there is considerable evidence that if the collateral benefits of epidural analgesia are to be achieved, thoracic placement is required. Use of a lumbar epidural in these circumstances cannot be recommended.

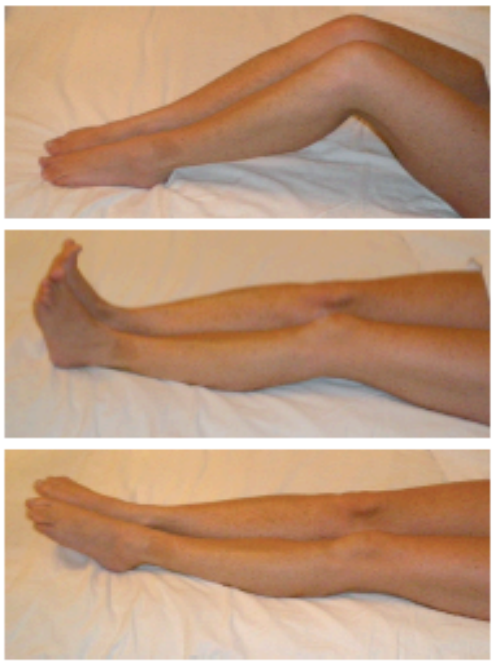
NAP3 Ch 15 Management of Dense Motor Block

Appendix 5

DRUG CONSIDERATIONS

- The use of high concentration local anaesthetic solutions intra-operatively via an epidural catheter may preclude early postoperative neurological assessment (e.g. in the recovery area) as dense motor block may persist long into the post operative period. This is compounded by ongoing epidural infusion. If motor block immediately postoperatively is denser than expected, (or is dense because of use of strong local anaesthetic per-operatively) an epidural infusion should not be started immediately but the patient observed frequently to ensure that recovery of neurological function is occurring. If dense block is expected then appropriate measures must be in place to ensure that dense block does not persist indefinitely. As a working rule of thumb some recovery should be seen within four hours and if this is not seen further assessment and investigation to exclude major complications is required
- Use of a combination of drugs for epidural infusions (most commonly a local anaesthetic and an opioid) provides improved analgesia with lower doses of local anaesthetic. Such combinations are less likely to lead to profound motor weakness.
- The use of a single, hospital wide, standard epidural infusion mixture in the majority of cases allows more predictability of the effects by staff monitoring patients.

Increasing motor weakness is always a cause for concern



MONITORING

- Motor function should be assessed and recorded as a baseline assessment in the recovery area using an appropriate scale (*Appendix 3* shows an example).
- Assessment of density of motor block is more important than assessment of level of block and a simple scale, adapted from the Bromage leg weakness score has proven useful in several hospitals. (See *Appendix 3* for an example). Assessments should be undertaken at four hourly intervals alongside other routine monitoring in line with previous recommendations.[1]
- Abnormal motor (or sensory) block during any epidural infusion, even in the recovery area, should be reported to the responsible anaesthetist and an informed decision made based upon clinical expectation. If the block is denser than expected the epidural infusion should be stopped immediately. The patient should be observed frequently to ensure that recovery of neurological function occurs. Again some recovery should be expected within four hours and failure to observe this should prompt careful assessment and consideration of active investigation to exclude complications.
- Increasing motor block when an epidural is turned off is an indication that further investigation is required to exclude important complications.

- The switching off of an epidural due to dense block or the first identification of worsening block should trigger an urgent review by an appropriately experienced anaesthetist (usually a specialist registrar or above).
- Subdural blocks (i.e. local anaesthetic penetrating the layer between the dura and arachnoid meninges) can cause a dense and very persistent block that is often unilateral. Persistent unilateral block is not however limited to subdurals and may be caused by vertebral canal haematoma (*Chapter 7: Vertebral Canal Haematoma*). The cause must not be assumed to be benign.
- Use of epidural analgesia cannot be regarded as safe in circumstances where monitoring of motor block density and observation of its recovery cannot be undertaken.[1]
- When an epidural has been switched off in response to dense block, perceptible recovery should occur within four hours and should be seen to be progressing towards resolution in a reasonable time scale. If this is not the case prompt imaging (preferably MRI) should be considered.
- The recurrence of surgical pain is a useful indicator of the need for recommencing the epidural but it should only be restarted if adequate motor (and or sensory) recovery has been observed. If the presence of a subdural block is suspected then restarting the epidural is probably unwise as the further development of a dense block is likely.
- When epidural infusions are restarted in the above circumstances increased surveillance should continue. If abnormal blockade then recurs it is prudent to abandon the epidural and assess or investigate to exclude treatable complications.
- When epidural analgesia is terminated as a result of abnormal block the epidural catheter should only be removed when it is safe to do so. For example if a vertebral canal haematoma is considered, it is wise to exclude this before removing the catheter, as catheter removal may be followed by further bleeding.
- Neurological observations should continue for a further 24 hours after catheter removal in these patients and longer in patients who remain immobile after catheter removal.

RED FLAGS

The following can be considered as 'red flags': these routinely require immediate referral to an appropriate anaesthetist and consideration of neuroimaging

- Significant motor block with a thoracic epidural
- Unexpectedly dense motor block, including unilateral block
- Markedly increasing motor block during epidural infusion
- Motor block that does not regress when an epidural is stopped.
- Recurrent unexpected motor block after restarting an epidural infusion that was stopped because of motor block

TRAINING AND PROTOCOLS

- Staff training (including medical and anaesthetic staff) needs to raise awareness of the importance of neurological monitoring and the need for a prompt and appropriate response to dense block or deteriorating neurological function. The possibility of neurological problems occurring after removal of the catheter due to haematoma formation, or later still abscess formation, should be included in this training.
- Training should include 'red flag' recognition.
- Hospitals are encouraged to develop their own treatment algorithms for monitoring and management of dense block; example are provided as flowcharts in *Appendix 3*.

PATIENT EDUCATION

- Ideally patients being discharged home following treatment with an epidural should be given clear instructions about the need

to respond to late onset neurological deterioration that might occur (most likely due to abscess formation) after discharge. An example of an advisory pamphlet is provided in *Appendix 2*.

REFERENCE

1 Good practice in the management of continuous epidural analgesia in the hospital setting. ***Royal College of Anaesthetists***, London November 2004 (http://www.library.nhs.uk/guidelinesFinder/viewResource.aspx?resID=121622).

Appendix 6

NAP3 Example discharge advise for patients who have received CNB

APPENDIX 2:

Example discharge advice for patients who have received CNB (Wrexham Maelor Hospital)

TRUST ADDRESS

POST EPIDURAL INFUSION / INJECTION PATIENT INSTRUCTION LEAFLET/ DISCHARGE INSTRUCTIONS

Introduction

Serious complications from epidural analgesia are **rare (1 in 10,000)**. Because the epidural space is close to the spinal cord a collection of pus, or a blood clot can cause pressure on the spinal cord. In the **unlikely event** that there is pressure on the spinal cord it is crucial to diagnose and treat it as quickly as possible; this must be done by expert hospital doctors to prevent delays in treatment and long lasting damage. This leaflet tells you what to look for and what action to take if you think that you have a problem.

Assessment before the removal of epidural catheter

At the end of treatment with your epidural infusion the team of doctors and nurses caring for you will examine you to ensure that you do not have any residual numbness or weakness of your legs from the action of the drugs in your epidural infusion. They will ask to you move your legs and examine you to make sure that the sensation in your legs is as it was before the operation. It is important to remember that some operations can cause altered sensation in the legs therefore any changes experienced may be as a result of the surgery and not the epidural. If you do have altered sensation when the epidural is removed the attending team can discuss this with you.

If you experience any of the listed **signs and symptoms** (see list below) as a new problem, after your epidural infusion has been stopped as an inpatient ask the nurse in charge of the ward to contact the Pain Team or on call anaesthetist immediately.

If you have been discharged it is important that you contact the on call anaesthetist at the hospital **immediately** (Telephone **XXXX XXXXXX** and ask the switchboard operator to **bleep XXXX**). After speaking to the on call Anaesthetist they will arrange to see you in the Accident and Emergency department in order to examine you.

Signs and symptoms

- Redness, pus, tenderness, or pain at the epidural wound site
- Feeling generally unwell despite the fact that all seems to be well with the surgical wound
- High temperature, neck stiffness
- Numbness and or weakness in your legs / inability to weight bear
- Difficulty passing water / incontinence of faeces

Further Information

For further information on this subject, please contact: Pain Nurse Specialist on Ext XXXX or Bleep XXXX.

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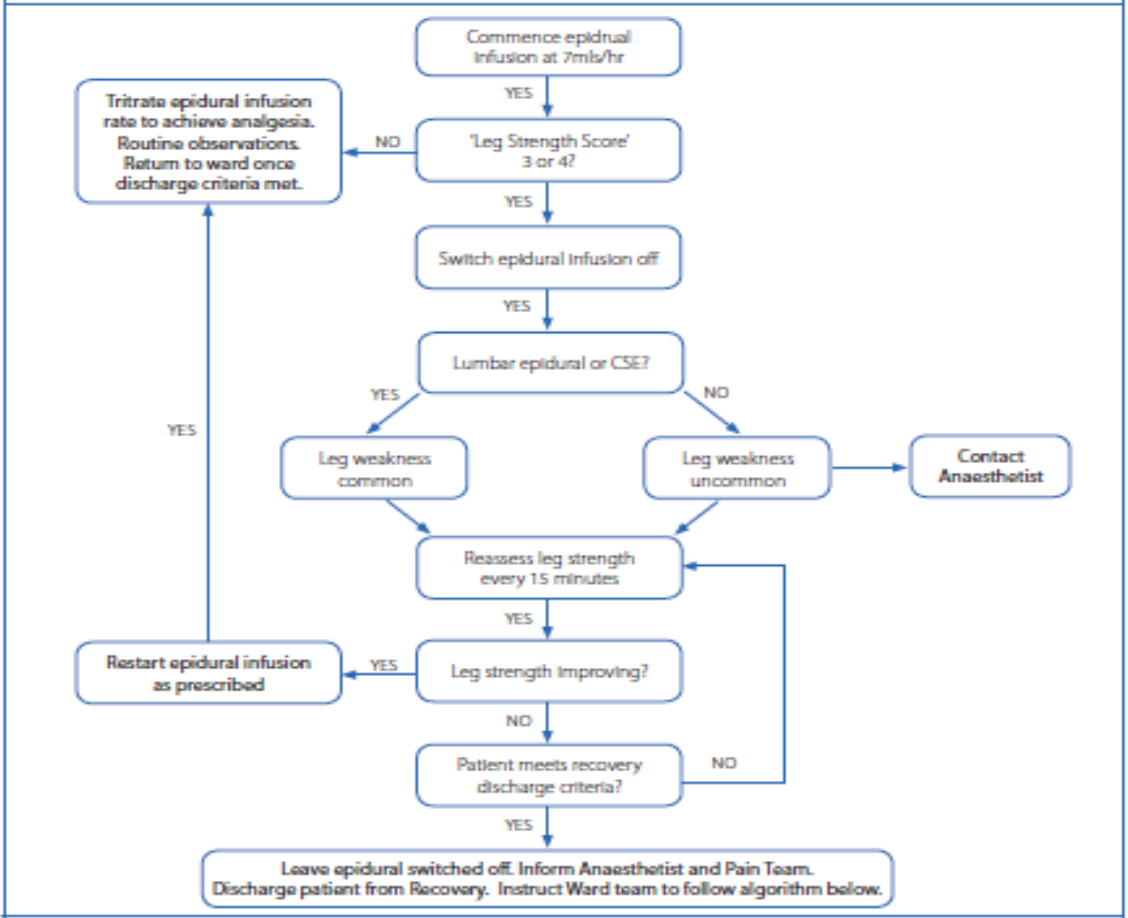
NAP3 Appendix 3 Derriford Algorithm for Management of Weak Legs during CNB **Appendix 7**

APPENDIX 3:

Management of weak legs during CNB: Example algorithms for recovery and on the wards (Derriford Hospital, Plymouth)

Management of leg weakness with Epidural Analgesia in Recovery Areas

Leg strength is used as a critical monitor of spinal cord health. Leg weakness in patients receiving epidural analgesia is to due either the local anaesthetic infusion or a spinal cord injury (epidural haematoma). Differentiation is achieved by switching the epidural infusion off – failure to recover suggests spinal cord injury. Epidural haematomas usually develop soon after either insertion or removal of the epidural catheter. In a patient receiving a CSE, it is important to demonstrate that the leg weakness due to the spinal is wearing off before starting the epidural, otherwise an epidural haematoma might be missed. All patients receiving epidural analgesia must have their leg strength assessed regularly using the 'leg strength score' that appears on the epidural observation chart. Follow the algorithm below.



Inform the Pain Team (in hours) or the Anaesthetist on call (after hours) of all patients that are discharged from recovery with their epidural infusion turned off. Once on the ward the "Managment of Leg Weakness with Epidural Analgesia" algorithm must be followed. Ensure that the ward staff are aware of the implications. An epidural haematoma must be evacuated within 8 hours of the onset of symptoms for the patient to have the best chance of recovery.

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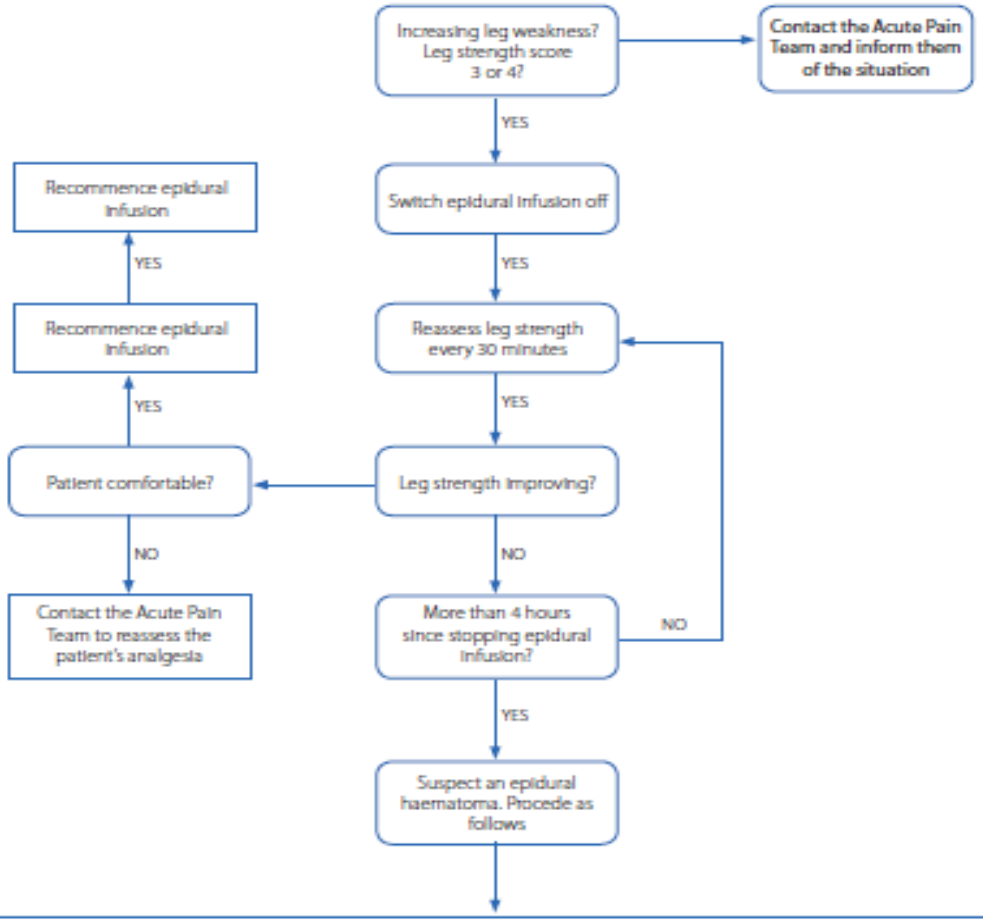
Appendix 7

Management of leg weakness with epidural analgesia

All patients receiving epidural analgesia must have leg strength assessed regularly using the 'leg strength score' that appear on the epidural observation form. Thoracic epidural analgesia should not cause profound leg weakness. Increasing leg weakness usually means the infusion rate is too high. However it may mean that the patient is developing an epidural haematoma. If not diagnosed and treated promptly, this will lead to paraplegia. Use this algorithm to help differentiate.



During weekday office hours contact a member of the Acute Pain Team (XXXX or bleep YYYY) who will arrange an urgent spinal MRI scan through the neuroradiology department and contact the neurosurgical team on take. After hours and weekends contact the Anaesthetist on call (bleep ZZZ) who will arrange an urgent spinal MRI scan through the on call radiologist and neurosurgical teams. An epidural haematoma has to be evacuated within 8 hours of the onset of symptoms for your patient to have the best chance of recovery of neurological function. Do not delay.

Appendix 7

Description of the Bromage Scale

The Bromage scale was graded as set out in the table below.[1] A modification of the scale has also been described by Breen et al.[2]

Grade	Criteria	Degree of block
1	Free movement of legs and feet	Nil (0%)
2	Just able to flex knees with free movement of feet	Partial (33%)
3	Unable to flex knees, but with free movement	Almost complete (66%)
4	Unable to move legs or feet	Complete (100%)

References

1 Bromage PR (Ed). Epidural Analgesia. *WB Saunders*, Philadelphia 1978: pp 144.
2 Breen TW et al. Epidural anesthesia for labor in ambulatory patient. *Anesth Analg* 1993;**77**:919–924.

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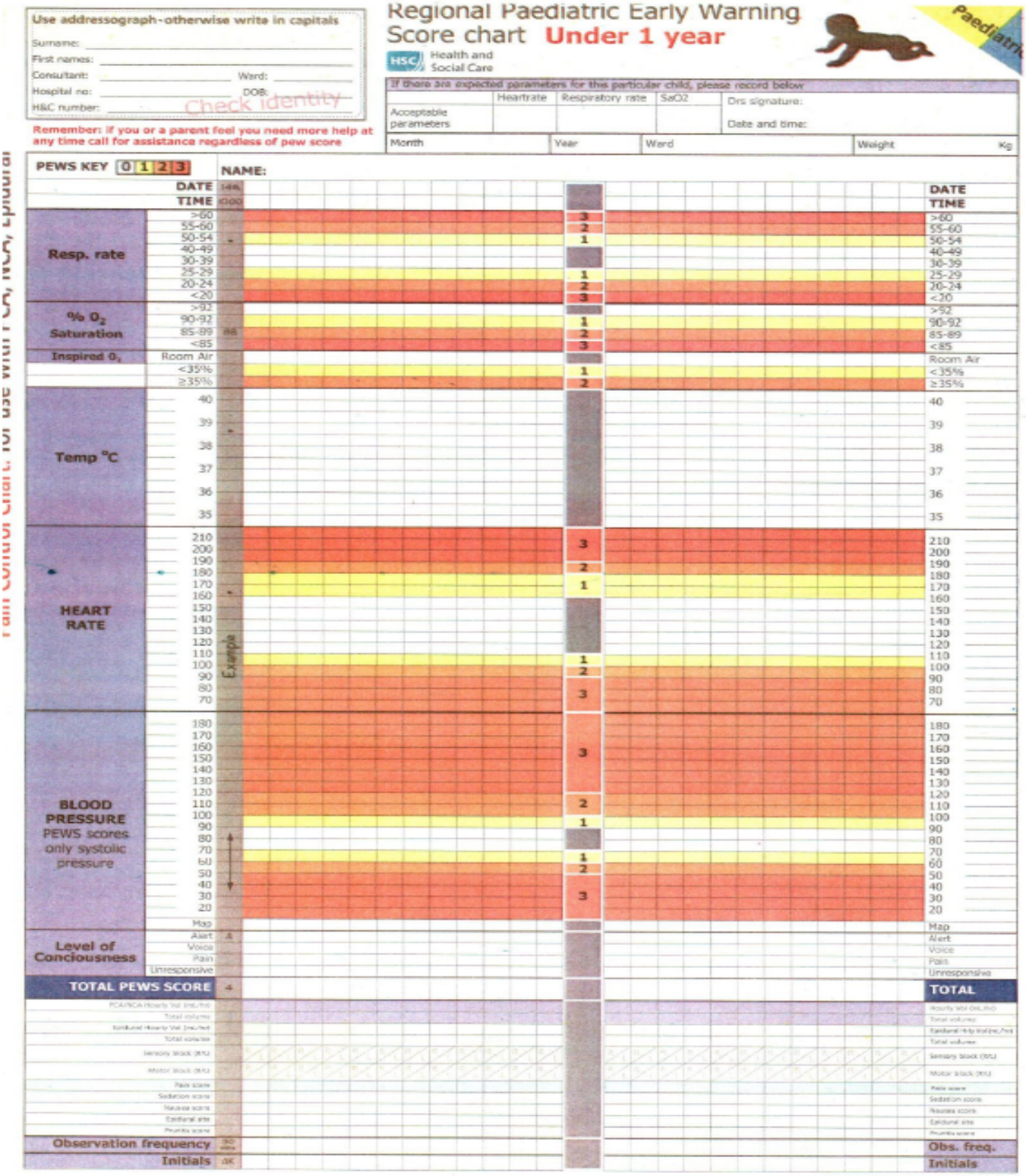
Paediatric observation charts **Appendix 8**


Use addressograph - otherwise write in capitals
Surname:
First names:
Consultant:
Ward:
Hospital no:
DOB:
H&C number:
Check identity
Remember: if you or a parent feel you need more help at any time call for assistance regardless of pew score
Regional Paediatric Early Warning Score chart Under 1 year
HSC Health and Social Care
Paediatric
If there are expected parameters for this particular child, please record below
Heartrate
Respiratory rate
SaO2
Acceptable parameters
Drs signature:
Date and time:
Month
Year
Ward
Weight
Kg
PEWS KEY 0 1 2 3
NAME:
DATE
TIME
Resp. rate
>60
55-60
50-54
40-49
30-39
25-29
20-24
<20
% O2 Saturation
>92
90-92
85-89
<85
Inspired O2
Room Air
<35%
≥35%
Temp °C
40
39
38
37
36
35
HEART RATE
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
Example
BLOOD PRESSURE PEWS scores only systolic pressure
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
Map
Level of Conclousness
Alert
Voice
Pain
Unresponsive
TOTAL PEWS SCORE
Observation frequency
Initials
TOTAL
Obs. freq.
Initials

Use addressograph - otherwise write in capitals

Surname: ______________________

First names: ______________________

Consultant: ______________ Ward: ______________

Hospital no: ______________ DOB: ______________

H&C number: ______________ Check identity

Remember: if you or a parent feel you need more help at any time call for assistance regardless of pew score

Regional Paediatric Early Warning Score chart 1 - 5 years

HSC Health and Social Care

Paediatric

If there are expected parameters for this particular child, please record below

	Heartrate	Respiratory rate	SaO2	Drs signature:
Acceptable parameters				Date and time:

Month	Year	Ward	Weight Kg

PEWS KEY 0 1 2 3 NAME:

Parameter		Example	Score
	DATE	5/6/6	
	TIME	10.00	
Resp. rate	>50		3
	40-50		2
	30-39	•	1
	25-29		
	20-24		1
	15-19		2
	<15		3
% O_2 Saturation	>92		
	90-92		1
	85-89	88	2
	<85		3
Inspired O_2	Room Air		
	<35%		1
	≥35%		2
Temp °C	40		
	39	•	
	38		
	37		
	36		
	35		
HEART RATE	190		3
	180		3
	170		3
	160		2
	150	•	1
	140		1
	130		
	120		
	110		
	100		
	90		1
	80		1
	70		2
	60		3
BLOOD PRESSURE PEWS scores only systolic pressure	180		3
	170		3
	160		3
	150		3
	140		3
	130		3
	120		3
	110		2
	100		1
	90		
	80		
	70	↑	1
	60		2
	50		3
	40		3
	30		3
	20	↓	3
	Map		
Level of Conciousness	Alert	A	
	Voice		
	Pain		
	Unresponsive		
TOTAL PEWS SCORE		4	
	PCA/NCA hourly vol (mL/hr)		
	Total volume		
	Epidural Hourly vol (mL/hr)		
	Total volume		
	Sensory block (R/L)		
	Motor block (R/L)		
	Pain score		
	Sedation score		
	Nausea score		
	Epidural site		
	Pruritis score		
Observation frequency		30 mins	
Initials		AK	

Example

Use addressograph - otherwise write in capitals

Surname: ______________________

First names: ______________________

Consultant: ______________ Ward: ______________

Hospital no: ______________ DOB: ______________

H&C number: ______________ Check identity

Remember: if you or a parent feel you need more help at any time call for assistance regardless of pew score

Regional Paediatric Early Warning Score chart 6 - 12 years

HSC Health and Social Care

Paediatric

If there are expected parameters for this particular child, please record below	Heartrate	Respiratory rate	SaO2	Drs signature:
Acceptable parameters				Date and time:

Month	Year	Ward	Weight Kg

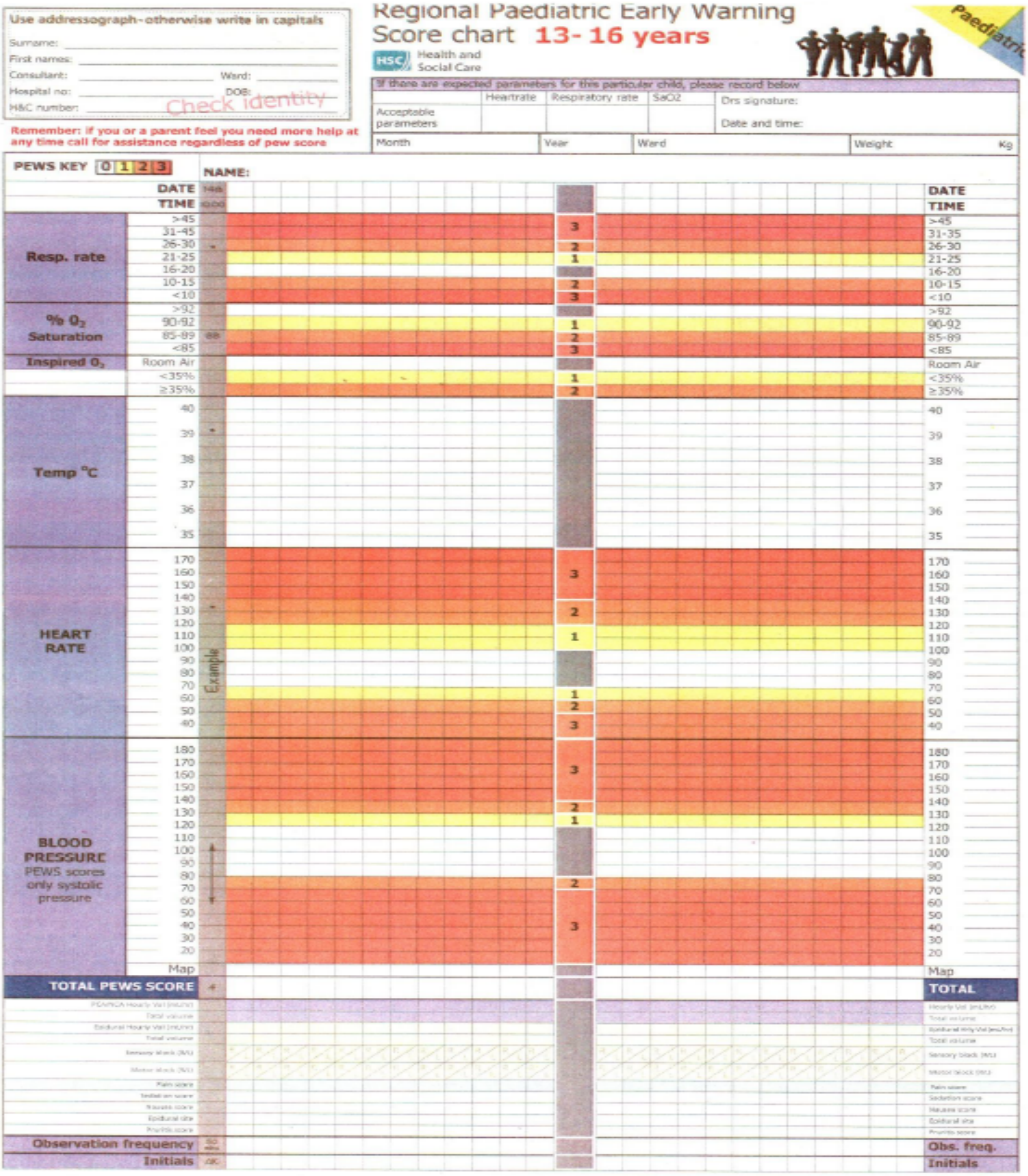
PEWS KEY 0 1 2 3

NAME:

Parameter	Value	Example	Score
DATE		14th	
TIME		10:00	
Resp. rate	>45		3
	36-45		2
	31-35		
	26-30	•	1
	21-25		
	16-20		1
	12-15		2
	<12		3
% O_2 Saturation	>92		
	90-92		1
	85-89	88	2
	<85		3
Inspired O_2	Room Air		
	<35%		1
	≥35%		2
Temp °C	40		
	39	•	
	38		
	37		
	36		
	35		
HEART RATE	170		3
	160		
	150		
	140		2
	130	•	1
	120		
	110		
	100		
	90		
	80		2
	70		
	60		3
	50		
	40		
BLOOD PRESSURE PEWS scores only systolic pressure	180		3
	170		
	160		
	150		
	140		
	130		2
	120		1
	110		
	100		
	90		
	80		2
	70		3
	60		
	50		
	40		
	30		
	20		
	Map		
Level of Conciousness	Alert	A	
	Voice		
	Pain		
	Unresponsive		
TOTAL PEWS SCORE		4	
	PCA/NCA Hourly Vol (mL/hr)		
	Total volume		
	Epidural Hourly Vol (mL/hr)		
	Total volume		
	Sensory block (R/L)		
	Motor block (R/L)		
	Pain score		
	Sedation score		
	Nausea score		
	Epidural site		
	Pruritis score		
Observation frequency		30 min	
Initials		AK	

Example

DATE
TIME
>45 36-45 31-35 26-30 21-25 16-20 12-15 <12
>92 90-92 85-89 <85
Room Air <35% ≥35%
40 39 38 37 36 35
170 160 150 140 130 120 110 100 90 80 70 60 50 40
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20
Map
Alert Voice Pain Unresponsive
TOTAL
Hourly Vol (mL/hr)
Total volume
Epidural Hrly Vol (mL/hr)
Total volume
Sensory block (R/L)
Motor block (R/L)
Pain score
Sedation score
Nausea score
Epidural site
Pruritis score
Obs. freq.
Initials



Use addressograph–otherwise write in capitals

Surname:
First names:
Consultant: Ward:
Hospital no: DOB:
H&C number: Check identity

Remember: if you or a parent feel you need more help at any time call for assistance regardless of pew score

Regional Paediatric Early Warning Score chart 13-16 years

HSC Health and Social Care

Paediatric

If there are expected parameters for this particular child, please record below

	Heartrate	Respiratory rate	SaO2	Drs signature:
Acceptable parameters				Date and time:

Month	Year	Ward	Weight Kg

PEWS KEY 0 1 2 3

NAME:

		Score
DATE		
TIME		
Resp. rate	>45	3
	31-45	3
	26-30	2
	21-25	1
	16-20	
	10-15	2
	<10	3
% O_2 Saturation	>92	
	90-92	1
	85-89	2
	<85	3
Inspired O_2	Room Air	
	<35%	1
	≥35%	2
Temp °C	40	
	39	
	38	
	37	
	36	
	35	
HEART RATE	170	3
	160	3
	150	3
	140	3
	130	2
	120	2
	110	1
	100	1
	90	
	80	
	70	1
	60	2
	50	2
	40	3
BLOOD PRESSURE PEWS scores only systolic pressure	180	3
	170	3
	160	3
	150	3
	140	3
	130	2
	120	1
	110	
	100	
	90	
	80	2
	70	3
	60	3
	50	3
	40	3
	30	3
	20	3
	Map	
TOTAL PEWS SCORE		
PCA/NCA Hourly Vol (ml/hr)		
Total volume		
Epidural Hourly Vol (ml/hr)		
Total volume		
Sensory block (M/L)		
Motor block (M/L)		
Pain score		
Sedation score		
Nausea score		
Epidural site		
Pruritis score		
Observation frequency		
Initials		

Example

Appendix 8

Belfast Health and Social Care Trust

The Royal Belfast Hospital for Sick Children Epidural Observations

Epidural

Pain Control Chart: for use with Epidural

Use addressograph-otherwise write in capitals

Surname:
First names:
Consultant: Ward:
Hospital no:
DOB:

Check identity

Ward:
Weight of child: Kg
Month: Year:
Age:

Record of transfer of controlled drug and transfer of responsibility

Date	Time (24hr)	Volume remaining (mL)	Nurse signature 1 & Discharging area	Nurse signature 2 & Receiving area

Observations explanation

Pain tool	Sedation score	Nausea score
(0-10) FACES/RULER Details available on ward	0 = crying/upset	0 = No nausea
	1 = awake/settled	1 = Mild nausea
	2 = drowsy/rousable	2 = 1 vomit
	3 = unrousable*	3 = >1 vomit

*** If sedation score is >3, increase SCEWS by 1 point.**

Bromage Scale

Bromage 3 (complete)	– unable to move feet or knees
Bromage 2 (almost complete)	– able to move feet only
Bromage 1 (partial)	– just able to move knees
Bromage 0 (none)	– full flexion of knees and feet

Bromage PR (1978) 'Epidural Analgesia' WB Saunders (ed), Philadelphia

General instructions

1. Intravenous access **must** be maintained at all times while the epidural is in situ and for 6 hours after discontinuation of the epidural infusion.
2. All drugs doses and routes **must** be written on the medicine kardex.
3. Additional i.v, i.m, s.c, or oral opioids must not be administered to a child already receiving an epidural solution containing Fentanyl.
4. All children must have Oxygen Saturation (SpO_2) monitoring for the duration of the infusion.
5. Pumps must be clearly labelled EPIDURAL INFUSION. Only two registered nurses who have the appropriate skills and competencies should erect a new epidural bag. These two registered nurses must check the new epidural bag and ensure that the following information has been written on the epidural bag: the childs name, hospital number, date, time and signature of the two registered nurses.
6. When a patient with an epidural infusion is transferring between wards and departments, two registered nurses **MUST** sign the front of the observation chart to verify that they both agree the amount of drug administered and amount of drug remaining at time of handover of care.
7. If nausea and vomiting: administer an anti-emetic.
8. Epidural catheters should only be removed following instructions from a member of the Acute Pain Team. Epidural catheters must not be removed in the presence of a bleeding abnormality or anticoagulent treatment without contacting a Consultant Anaesthetist.

Observations

1. Respiratory Rate, Heart Rate, Blood Pressure, Temperature, Oxygen Saturation, Motor and Sensory Block must be recorded **every 15 minutes** for the first hour after surgery, after epidural bolus administration and after any increase in the epidural infusion rate. If these observations are stable then:
2. Blood Pressure and Temperature may be recorded **hourly** for the next 4 hours. If these observations are stable then Blood Pressure and Temperature may be reduced to **4-hourly** for the duration of the epidural infusion. However, if the patient receives an **epidural bolus** or the **rate of infusion is adjusted** or if there is any change in the **patients clinical condition** then observations **must** revert to **15 minutes** for the next hour and until the patient's condition has stabilised.
3. Respiratory rate and heart rate are recorded **hourly** for the duration of epidural infusion.
4. Pain score is recorded **hourly** while awake.
5. Oxygen Saturations are monitored continuously and recorded **hourly** for the duration of the epidural infusion. If Oxygen Saturations drop below 95% and the child develops a need for oxygen, please inform a member of the Acute Pain Team.
6. Sedation and Postoperative Nausea and Vomiting are recorded **hourly** for the duration of the epidural infusion.
7. Motor and Sensory Block should be assessed and documented **4-hourly** and at the following times; when the patient arrives in recovery ward, on return to ward from theatres, at the beginning of each nursing shift and prior to the patient mobilising.
8. Pruritis is assessed **4-hourly** for the duration of the epidural infusion.
9. Epidural site and catheter connection is checked initialy in the recovery ward and then **4-hourly** for the duration of the epidural infusion.
10. Skin integrity is checked initially in the recovery ward and then **4-hourly** for the duration of the epidural infusion.
11. Epidural observations must continue for 6hrs after epidural discontinued.

Problems

If respiratory rate <25 breaths / minute or systolic BP <50mmHg.

- **IMMEDIATELY STOP** the infusion
- **ADMINISTER 100% OXYGEN** and manage airway, breathing and circulation as per Paediatric Basic Life Support
- **IMMEDIATELY** contact the ward doctor to assess the patient. Simultaneously contact an Acute Pain Nurse and an Anaesthetist
- Administer Intravenous Naloxone (4 micrograms/kg) if patient has Respiratory Depression. Administer 10mL/kg N.Saline if patient is Hypotensive
- Record these actions in the childs medical and nursing notes and complete an adverse incident form online (Datex).

Epidural information

Epidural catheter site:
C/T/L
Length of epidural catheter in space: cm
Initial epidural dose:
Levobupivacaine % mLs
Additives (specify) mg/mcgs
Time given hours
Tunnelled Yes / No

Epidural prescription

Levobupivacaine %
Fentanyl micrograms/mL
Total volume
Start rate mLs/hr
Infusion range mLs/hr
Start date Time
Doctor signature
Nurse signature
Pump programmed by
Witnessed by

New bag

Date Time
Signature
Pump programmed by
Witnessed by

Date Time
Signature
Pump programmed by
Witnessed by

Epidural drugs Amount destroyed mLs Date Time

Destroyed by (signature) Witnessed by (signature)