



Children's Hospital Ireland at Crumlin

Division of  
Anaesthesia/Acute Pain Management

**Guidelines for Management of Epidural infusions**

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## Contents

<b>1</b>	<b>OBJECTIVE .....</b>	<b>4</b>
<b>2</b>	<b>PURPOSE .....</b>	<b>4</b>
<b>3</b>	<b>SCOPE .....</b>	<b>4</b>
	3.1. RESPONSIBILITY FOR EPIDURAL INFUSIONS.....	4
	3.2. RESPONSIBILITIES OF NURSING STAFF.....	4
	3.3. OTHER DOCUMENTS.....	4
<b>4.</b>	<b>INTRODUCTION .....</b>	<b>5</b>
	4.1. DEFINATION .....	5
	4.2. EPIDURAL SPACE:.....	5
<b>5</b>	<b>ADVANTAGES/DISADVANTAGES OF EPIDURAL ANALGESIA .....</b>	<b>5</b>
	5.1 ADVANTAGES .....	5
	5.2 DISADVANTAGES .....	5
<b>6</b>	<b>INDICATIONS AND CONTRAINDICATIONS FOR AN EPIDURAL INFUSION .</b>	<b>6</b>
	6.1 INDICATIONS FOR AN EPIDURAL INFUSION.....	6
	6.2 RELATIVE CONTRAINDICATIONS.....	6
	6.3 CONTRAINDICATIONS TO EPIDURAL .....	6
	6.3.1 RISK FACTORS.....	6
	6.3.2 PATIENTS WITH ABNORMALITIES OF COAGULATION .....	6
<b>7</b>	<b>PATIENT SELECTION .....</b>	<b>7</b>
<b>8</b>	<b>INSERTION OF EPIDURAL CATHETER.....</b>	<b>7</b>
	8.1 WARDS COMPETENT TO CARE FOR CHILDREN WITH EPIDURAL INFUSIONS:	7
	8.1 CATHETER INSERTION.....	7
	8.2 CATHETER CARE AND DRESSING .....	8
	8.3 CONTAMINATED EPIDURAL DRESSING .....	8
<b>9</b>	<b>EPIDURAL PRESCRIPTION.....</b>	<b>8</b>
	9.1 DRUGS USED FOR EPIDURAL INFUSIONS .....	8
	9.2 MECHANISM OF ACTION OF LOCAL ANAESTHETIC AGENTS .....	8
	9.3 SIDE EFFECTS OF LOCAL ANAESTHETIC INFUSIONS can include:.....	8
	9.3.1 MORE SERIOUS SIDE EFFECTS .....	9
	9.4 DOSAGE OF EPIDURAL INFUSIONS.....	9
	9.5 EPIDURAL DOSAGE RECOMMENDATIONS .....	9
	9.6 ADDITIONAL OPIATES OR SEDATIVES.....	9
	9.6.1 SIDE EFFECTS OF OPIATES .....	10
	9.7 ORDERING EPIDURAL INFUSION .....	10
<b>10</b>	<b>PROGRAMMING AND DELIVERING EPIDURAL INFUSION.....</b>	<b>10</b>
	10.1 DURATION OF INFUSION.....	11
	10.2 ALTERING INFUSION RATE .....	11
	10.3 FREQUENCY OF CHANGING INFUSION BAGS AND EXTENSION TUBING .....	11
	10.4 BOLUS DOSE OF EPIDURAL INFUSION SOLUTION .....	12
	10.5 CONCURRENT ANALGESIA.....	12
	10.6 RUNNING EPIDURAL INFUSIONS AND SYSTEMIC OPIOID INFUSION .....	12
<b>11</b>	<b>MONITORING .....</b>	<b>13</b>
	11.1 EPIDURAL MONITORING .....	13

CHI at Crumlin © 2019	Guideline Name: Analgesia Infusion Guidelines
Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

11.2	TESTING THE SENSORY DERMATOME LEVEL.....	14
11.2.1	PROCEDURE FOR CHECKING SENSORY DERMATOME LEVEL.....	14
11.3	ASSESSMENT OF SENSORY LEVEL IN INFANTS OR CHILDREN WITH INTELLECTUAL DISABILITIES.....	15
11.4	UNILATERAL BLOCK .....	15
11.5	TESTING THE LEVEL OF MOTOR BLOCK .....	16
11.6	PROCEDURE FOR CHECKING MOTOR BLOCK IN LOWER LIMBS.....	16
11.3.2	ACTION FOR MOTOR BLOCK SCORE .....	16
11.3.3	MANAGEMENT FOR DENSE MOTOR BLOCK IN LOWER LIMBS (see above) ....	17
11.7	TESTING THE LEVEL OF MOTOR BLOCK- THORACIC EPIDURAL INFUSION ..	17
11.7.1	MANAGEMENT OF HIGH THORACIC MOTOR BLOCK .....	17
11.7.2	MANAGEMENT OF FACIAL NUMBNESS OR FACIAL TWITCHING.....	17
11.8	RED FLAGS .....	18
<b>12</b>	<b>COMPLICATIONS.....</b>	<b>18</b>
12.1	RESPIRATORY DEPRESSION OR OVER SEDATION .....	18
12.1.1	MANAGEMENT OF RESPIRATORY DEPRESSION:.....	19
12.1.2	MANAGEMENT OF EPIDURAL FENTANYL RELATED RESPIRATORY DEPRESSION WITH NALOXONE.....	20
12.1.3	DOSING FOR NALOXONE.....	20
12.2	PRURITUS.....	21
12.3	URINARY RETENTION.....	22
12.4	ACCIDENTAL DURAL TAP AND POST DURAL PUNCTURE HEADACHE.....	22
12.4.1	MANAGEMENT OF POST DURAL PUNCTURE HEADACHE.....	22
12.5	PRESSURE CARE .....	23
12.6	EPIDURAL HAEMATOMA.....	23
12.7	INFECTION RISKS INCLUDING EPIDURAL ABSCESS .....	23
12.7.1	RISK FACTORS FOR EPIDURAL INFECTION may include:.....	23
12.8	SEPSIS.....	24
12.9	TEMPERATURE.....	24
12.10	LEVOBUPIVACAINE TOXICITY (Appendix 1).....	24
12.10.1	MANAGEMENT OF LEVOBUPIVACAINE TOXICITY.....	24
<b>13</b>	<b>REMOVAL OF EPIDURAL CATHETER.....</b>	<b>25</b>
13.1	PROCEDURE FOR REMOVAL OF EPIDURAL CATHETER.....	25
13.1.1	EQUIPMENT:.....	25
13.1.2	PROCEDURE .....	25
13.1.3	CHILDREN WITH SPICA IN SITU .....	26
<b>14</b>	<b>CONCURRENT ANTICOAGULANT MEDICATIONS<sup>8</sup>.....</b>	<b>26</b>
14.1	KEY POINTS FOR SAFE EPIDURAL IN A PATIENT WITH IMPAIRED COAGULATION ARE:- .....	27
14.2	UNFRACTIONATED INTRAVENOUS AND SUBCUT HEPARIN.....	27
14.3	FRACTIONATED LOW MOLECULAR WEIGHT HEPARINS .....	27
<b>15</b>	<b>TROUBLE SHOOTING .....</b>	<b>28</b>
<b>16</b>	<b>MONITORING COMPLIANCE &amp; EFFECTIVENESS .....</b>	<b>31</b>
<b>17</b>	<b>REFERENCES .....</b>	<b>32</b>
17.1	BIBLIOGRAPHY .....	33

CHI at Crumlin © 2019	Guideline Name: Analgesia Infusion Guidelines
Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

## GUIDELINE FOR EPIDURAL INFUSIONS

### 1 OBJECTIVE

It is the goal of Our Lady's Children's Hospital, Crumlin, to provide quality, holistic and safe care in the best interest of children receiving epidural infusions.

### 2 PURPOSE

To standardize the procedures for the care of children requiring an epidural infusion and ensure safe evidence based practice.

### 3 SCOPE

This guideline details the hospitals requirements in relation to the management of epidural infusions. It is the responsibility of relevant staff to familiarise themselves and adhere to the contents of this guideline.

**3.1. RESPONSIBILITY FOR EPIDURAL INFUSIONS** remain with the department of Anaesthesia, Critical Care and Pain management. Supervision of the patient is passed on to the Pain Service and appropriate competent nursing staff (Royal College of Anaesthesiologists Great Britain and Ireland, 2010).

- The pain team and/or the anaesthetic registrar will be first line managers of epidural infusions, with the initial and overall responsibility being held by the consultant anaesthesiologist who inserted or supervised the insertion of the epidural catheter.
- If difficulties are experienced with the administration of epidural infusions the problem should be referred to the consultant anaesthesiologist responsible for the insertion, or, if not available, to a senior consultant who is experienced in epidural management.

**3.2. RESPONSIBILITIES OF NURSING STAFF** caring for children with epidural infusions must be competent to administer intravenous medication and have attend in-service education or be supervised by a registered nurse who has completed education on epidural infusions provide by the pain service.

- Registered nurses shall be responsible for monitoring children and notifying medical staff of effectiveness and/or of complications of this treatment.

**3.3. OTHER DOCUMENTS:** This guidelines is to be used in conjunction with epidural infusion care plan, observation record sheets and prescription sheet.

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#### 4. INTRODUCTION

The use of advanced analgesic techniques such as epidural analgesia is a well-documented approach to managing severe post-operative pain. This technique has been shown to be safe and effective in children.<sup>1-4</sup> Local anaesthetics via epidural infusions may provide distinct advantages over opioids following major abdominal and thoracic surgery. These techniques are especially useful in managing dynamic pain i.e. pain on coughing and moving and allow cooperation with physiotherapy and mobilisation.

**The safe effective management of epidurals requires a co-ordinated multidisciplinary approach to care.**

**4.1. DEFINATION:** Epidural analgesia infusions involves the insertion of a fine-bore catheter into the epidural space, through which a local anaesthetic drug, alone or in combination with opioids such as fentanyl or preservative free morphine or drugs such as clonidine is introduced.<sup>2</sup>

**4.2. EPIDURAL SPACE:** The epidural space is situated between the dura mater and the vertebral canal. It extends from the cranium to the sacrum and contains loose connective tissue, fat, lymph vessels, blood vessels and nerves.

### 5 ADVANTAGES/DISADVANTAGES OF EPIDURAL ANALGESIA

#### 5.1 ADVANTAGES

- Epidural analgesia can provide highly effective analgesia for controlling acute pain after surgery or trauma with minimal side-effects and high patient/parent satisfaction when compared to other methods of pain relief.<sup>1,4,13</sup> less commonly epidural analgesia can be used to control non-surgical or complex pain or as part of a pain management plan for children receiving palliative care.
- Epidurals can deliver analgesia rapidly
- Reduces side-effects of opiates such as sedation, nausea and vomiting.

#### 5.2 DISADVANTAGES

- Epidural analgesia has the potential to cause serious life-threatening complications.
- Complications of epidurals or adverse events are associated with side effects of the medication used e.g. local anaesthetic toxicity, itch related to use of fentanyl, potential motor paralysis and infection. Other risks are associated with the epidural catheter, equipment used, and training and management issues.
- Additional nursing resources/supervision is required.

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## 6 INDICATIONS AND CONTRAINDICATIONS FOR AN EPIDURAL INFUSION

### 6.1 INDICATIONS FOR AN EPIDURAL INFUSION

- For the management of moderate to severe pain.
- Following major abdominal, thoracic or orthopedic surgery.
- Following major surgery in patients with complex medical histories.
- Following trauma.
- To relieve pain in severe medical/surgical conditions, complex pain or Palliative care.

### 6.2 RELATIVE CONTRAINDICATIONS

- Some spinal abnormalities/injuries/deformity
- Neurological disease
- Hypotension
- Obesity ( making placement difficult)
- Recent anticoagulation
- Septicaemia
- Patient, anaesthesiologist, surgeon, parent or child preference.

### 6.3 CONTRAINDICATIONS TO EPIDURAL

#### 6.3.1 RISK FACTORS

The following risk factors need to be taken into account prior to inserting an epidural catheter:

- Impairment of coagulation (pathological or therapeutic)
- infection, systemic or at the site of the catheter insertion
- Compromised immunity,
- Unstable cardiovascular system
- Untreated shock
- Known allergy to Local Anaesthetic agents
- Raised intracranial pressure
- Parent or child refusal.

#### 6.3.2 PATIENTS WITH ABNORMALITIES OF COAGULATION

Were a patient is prescribed prophylactic anticoagulant therapy e.g. Heparin, Tinzaparin, enoxaparin the Anaesthesiologist and Pain service must be informed. (See section 14.3)

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## 7 PATIENT SELECTION

Patient selection for epidural analgesia should be based on a careful risk/benefit analysis for each child. The Anaesthesiologist or Consultant intensivist, or Consultant in Pain Medicine will assess the patient for appropriateness and the need for an epidural infusion.

Factors considered include:

- The nature of the surgery
- The predicted postoperative course
- The patients previous experience with surgery and analgesic technique
- The patients or parents preference
- Contraindications ( see section 8)

The Anaesthesiologist or member of the Pain Service will provide relevant information to the child and family. Verbal assent for the procedure is obtained at this stage. A separate consent is not required. A leaflet is available to reinforce verbal information given.

## 8 INSERTION OF EPIDURAL CATHETER

In children an epidural catheter is inserted while the child is anaesthetised and the catheter is threaded to the dermatome level appropriate for the surgical procedure or area of pain.

### 8.1 WARDS COMPETENT TO CARE FOR CHILDREN WITH EPIDURAL INFUSIONS:

Prior to initiating an epidural catheter, provision must be made for admission of the patient to an appropriate ward or ICU/HDU, where staff are familiar and competent to care for the technique. Currently these ward areas include:

- PICU
- Our Lady's Ward (general surgical patients aged 2 years and above)
- Nephrology unit, infants and children
- St Joseph's ward
- St Peters Ward

### 8.1 CATHETER INSERTION

- Epidural infusion catheters must be inserted using aseptic technique. This should include hand washing, sterile gloves, sterile gown, hat, mask, appropriate skin preparation and sterile drapes around the injection site.
- An epidural catheter cannot be used for any infusion or medications other than those ordered by an anaesthesiologist.
- Children receiving Lumbar epidurals should have a urinary catheter inserted in theatre.
- Intravenous access should be maintained for the duration of the epidural infusion.

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## 8.2 CATHETER CARE AND DRESSING

- A clear occlusive dressing is placed over the catheter insertion site (Opsite®, Tegaderm® Veneguard® or similar). Sterile gauze may be used to soak up any leaking epidural solution
- A `window` is made around the catheter to allow the catheter markings and entry site to be viewed.
- An occlusive dressing e.g. Mefix™ is then placed over catheter from the entry site to the shoulder/upper back to secure the catheter.
- The filter should be taped to the shoulder or chest wall; preferably in a place where it is comfortable for the patient and where it will remain secure.
- Two clear occlusive dressings can also be used to ensure the catheter does not disconnect from the filter.
- The catheter is connected via in-line filter to the dedicated yellow administration tubing.
- Routine dressing changes are not required.

## 8.3 CONTAMINATED EPIDURAL DRESSING

In neonates and infants, epidurals may be inserted in the caudal region. If the dressing becomes contaminated with faeces which seeps through and reaches the insertion site, the epidural must be removed and alternative analgesia sought.

## 9 EPIDURAL PRESCRIPTION

The prescription and management of epidural analgesic infusions is the responsibility of members of the Department of Anaesthesia and the Pain Service.

### 9.1 DRUGS USED FOR EPIDURAL INFUSIONS

- Local anaesthetics                      Levobupivacaine 0.125%
- Opiates                                      Fentanyl, Preservative free morphine
- Others                                        Clonidine, Preservative free ketamine

### 9.2 MECHANISM OF ACTION OF LOCAL ANAESTHETIC AGENTS

Local anaesthetics inhibit depolarisation in the spinal nerve root preventing the transmission of impulses along the sensory and potentially the motor nerves. Painful impulses cannot reach the central nervous system and pain is not perceived from the area affected by the local anaesthetic.

### 9.3 SIDE EFFECTS OF LOCAL ANAESTHETIC INFUSIONS can include:

- Local irritation, redness and oedema
- Respiratory depression ,
- Hypotension
- Hypersensitivity/allergy
- Pressure sores
- Unintended dense motor block.



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### 9.3.1 MORE SERIOUS SIDE EFFECTS

These are usually associated with massive un-intended intravenous bolus doses the symptoms of which include:

- **Central nervous system toxicity**- may present with circum-oral numbness/ paraesthesia, agitation, dizziness, metallic taste, tremor. This may progress to seizure and coma.
- **Cardiovascular toxicity**- initial subtle ECG changes may progress to arrhythmia and cardiac arrest.

### 9.4 DOSAGE OF EPIDURAL INFUSIONS

Pre-manufactured local anaesthetic infusion solutions are available from the pharmacy:

Levobupivacaine 0.125%, 100ml OR 200ml (1.25mg/ml).

9.5 EPIDURAL DOSAGE RECOMMENDATIONS		
Medication	Neonates & infants ≤ 3months	Children >5kg
Levobupivacaine 0.125% +/-Fentanyl 1microgram/ml +/-Fentanyl 2microgram/ml +/-Clonidine 0.8microgram/ml +/-Clonidine 1microgram/ml	0.1 to 0.2ml/kg/hr  <b>The addition of medication to the infusion bag must be carried out as an aseptic technique.</b>	0.1 to 0.3ml/kg
<b>Maximum hourly dose</b>	0.25mg/kg/hr	0.5mg/kg/hr Max 15 ml
<b>Maximum 4 hour dose</b>	1.8mg.kg (1.5ml/kg)	2.5mg/kg (2ml/kg) Max 75 ml
<b>Bolus dose</b>	0.1ml/kg	Max 5 ml (wards)
<b>Lockout time</b>	30minutes	30 minutes

- In the case of two simultaneous infusions a combined total of 20mls may be infused.
- Infusion rates outside of this range may be prescribed by a consultant anaesthesiologist.

### 9.6 ADDITIONAL OPIATES OR SEDATIVES

Opiates produce analgesia by inhibiting synaptic transmission of pain impulses at the level of the spinal cord and the brain.

- When fentanyl is added to an epidural infusion solution no other opioids or sedatives should be administered without prior consultation with the Pain service/ Consultant Anaesthesiologist or Consultant intensivist.
- When clonidine is added to an epidural infusion no additional clonidine should be administered without approval of pain service, consultant anaesthesiologist/intensivist.

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### 9.6.1 SIDE EFFECTS OF OPIATES

The side effects of opioid drugs delivered via the epidural space are similar to intravenous and orally administered opiates: Pruritus, urinary retention, nausea and vomiting, sedation, and respiratory depression.

### 9.7 ORDERING EPIDURAL INFUSION

The prescriber must:

- Use the Regional Analgesia Prescription form.
- Sign and date prescription
- The prescription form will be submitted to the recovery unit for preparation. (Appendix 1: Analgesia prescription form).
- The prescription is valid for 3 days

### 9.6 STORAGE AND HANDLING OF EPIDURAL SOLUTIONS

- The pre-manufactured solution is handled in a similar manner to a controlled substance and ordered and recorded on the controlled substance book (MDA).<sup>10, 13</sup>
- The Local Anaesthetic solution is stored in the inside or outside compartment of a MDA locked cupboard to avoid accidental Intravenous infusion.
- The local anaesthetic solution is signed out on the MDA register by the staff preparing the solution, one of whom must be registered nurse or doctor and familiar with the drug.
- Dosing schedules are dependent on patient weight as well as the site of infusion.

## 10 PROGRAMMING AND DELIVERING EPIDURAL INFUSION

- Local anaesthetic drugs are infused via dedicated infusion systems that largely prevent the inadvertent administration of other medicines. This is crucial to patient safety.
- Local anaesthetic agents for epidural infusions are delivered using:
- Designated epidural infusion device which has a yellow lock box and a yellow face. (CADD Solis).<sup>3,10,13</sup>
- Designated **AMBER/YELLOW** epidural administration sets, "Labelled" EPIDURAL <sup>3,10,13</sup> are used with the CADD Solis device (without bungs and access ports in the line and burettes without injection ports).
- Epidural infusions may occasionally be administered using disposable elastomeric sets (seek advice from ANP/CNSp Pain).
- Infusions (polybags) are made up in an aseptic manner (ANTT level 2<sup>13</sup>) by the anaesthesiologists, pain team members and senior nursing staff who have been accredited to manage epidurals infusions.



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- Appropriate medication safety and handling guidelines must be adhered to at all times. In particular 'A registered nurse and/or anaesthesiologist and a second registered nurse will independently verify the solution and pump programming with the prescription order and the patient's identity band prior to connecting the infusion.
- All bag changes must be signed for on the prescription form as per hospital policy.

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\* Aseptic Non Touch Technique ANTT level 2

Where the procedure involves

A) an open unhealed wound or B) break in a line or during the preparation of epidural as the addition of medication to the infusion offer a risk of bacterial contamination or C) Taking blood cultures from CVAD

Preparation involves the use of sterile gloves and a sterile field, sterile equipment and solutions  
Antiseptic hand wash to above the wrist using an aseptic hand washing solution (Hydrex) technique or wash hands using soap and warm water, dry hands and follow with alcohol hand rub.

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### 10.1 DURATION OF INFUSION

- An epidural infusion should continue for a minimum of 48 hours. A non-tunnelled epidural catheter is left in situ for a maximum of 5 days in older children. Infusions are generally run for 48 hours in neonates. (The risk of infection increases with length of infusion and risk of toxicity is increased in neonates on continuous infusions).
- Tunnelled catheters can be used indefinitely.

### 10.2 ALTERING INFUSION RATE

- A registered nurse may adjust the infusion rate within prescribed limits. This is documented on the Regional Analgesia prescription sheet by two people.
- The amount of Local Anaesthetic will determine the number of spinal nerves which will be blocked providing pain relief to the corresponding dermatomes. It is important to maintain the hourly rate of infusion at a level that will keep the appropriate analgesia, therefore infusions **should not be titrated down** unless there is a high Motor block.

### 10.3 FREQUENCY OF CHANGING INFUSION BAGS AND EXTENSION TUBING

- The epidural infusion solution may be changed by a competent registered nurse, or anaesthesiologist using an aseptic non-touch technique (ANTT) level 2. Preparation involves the use of sterile gloves and a sterile field, sterile equipment and solutions.
- Alcohol or bactericidal cleaning solutions **MUST NOT** come in contact with the epidural as they are neurotoxic.

#### CHANGING SOLUTION

#### FREQUENCY

- Plain Infusion Levobupivacine 0.125% HCL (bag only) Minimum Every 48 hours
- Levobupivacine 0.125% with additive (fentanyl or Clonidine) Minimum Every **24 hours**
- **The extension set is changed every 48 hours.**

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#### 10.4 BOLUS DOSE OF EPIDURAL INFUSION SOLUTION

Effective management of epidural infusions may require the administration of a bolus injection of solution into the system. Prescriptions for epidural infusions should include a prescription for a PRN bolus dose that can be administered by an anaesthesiologist or Pain team member. This must be performed using the bolus mode of the pump, thus not breaching the system.

If a separate handheld syringe is used, the injection must be performed using strict aseptic technique by appropriately trained staff.

When administering an epidural bolus injection, the anaesthesiologist, OR pain team member will ensure the epidural catheter is still in the correct space. Blood pressure is checked and a sensory level may be tested for in older children.

- Administer the prescribed bolus dose, as per the prescription sheet.
- The anaesthesiologist or nurse who administers the bolus should remain at the bedside during the bolus.
- B/P must be monitored every 15minutes after a bolus for one (1) hour

#### 10.5 CONCURRENT ANALGESIA

Multimodal analgesia is used to improve pain management.

- Regular Paracetamol and a Non-Steroidal Anti-Inflammatory Drug (NSAID) (e.g. Ibuprofen or Diclofenac) may be prescribed and administered concurrently if there are no contra-indications.
- Other analgesic may also be used e.g. Oral or IV opioid, low dose ketamine, Gabapentin, Magnesium.
- Clonidine (**NB only if clonidine has NOT been added to the epidural infusion solution**)
- Some children may require an opioid (either orally or in an infusion) in addition to epidural infusion. This is only prescribed with the discretion of the anaesthesiologist, intensivist or member of the Pain service.

#### 10.6 RUNNING EPIDURAL INFUSIONS AND SYSTEMIC OPIOID INFUSION

The use of an opioid-containing epidural infusion together with a systemic opioid 'bolus-only' Nurse Controlled Analgesia or Patient Controlled Analgesia is possible.

The advantages of this approach include:

- Pain originating from dermatomes that are NOT covered by the epidural can be controlled by the systemic opioid. This may include pain sources such as extremities of a wound (e.g. the upper part of a large midline laparotomy), naso-gastric tubes and IV lines.
- Acute procedural pain (e.g. drain removal, venepuncture) NOT covered by the epidural can be controlled by the systemic opioid.

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## 11 MONITORING

- A core care plan is available for patients with an epidural infusion.
- Epidural observations are recorded on all patients
- While the patient is in the recovery area, pulse, and respiratory rate and oxygen saturation level will be monitored continuously. Blood pressure will be monitored every 15 minutes for the first hour and then hourly for 4 hours.

11.1 EPIDURAL MONITORING	
Monitoring	Frequency
<ul style="list-style-type: none"> <li>• <b>Respiratory rate</b></li> <li>• <b>Heart rate</b></li> <li>• <b>Oxygen saturation level</b></li> <li>• <b>Sedation level</b></li> <li>• <b>Rate of infusion</b></li> <li>• <b>IV Cannula</b></li> </ul>	<b>Hourly for the duration of the infusion</b>
<p><b>Pain score</b> at rest and on movement  <i>To assess the efficacy of the prescribed treatment.</i>  <i>To identify failed or patchy blocks and the need for adjustment of the epidural infusion or additional analgesia</i></p>	<b>Hourly for four (4) hours</b> then at least <b>two (2) hourly</b> for the duration of the infusion. <i>If a child is asleep document <b>S</b> for sleep</i>
<p><b>Pruritus / Nausea and Vomiting</b>  <i>Fentanyl may cause itching, nausea and vomiting.</i></p>	<b>Hourly x 4 hours,</b> Then <b>4 hourly</b> for the duration of the infusion.
<p><b>Temperature</b>  If a child has persistent temperature notify anaesthesiologist or CNSp/ANP Pain</p>	May need to record more frequently if child has symptoms that are concerning. <b>B/P must be monitored every 15minutes after a bolus for one (1) hour</b>
<p><b>Blood Pressure</b>  <i>To identify hypotension as local anaesthetics may lower blood pressure. Local Anaesthetics can spread outside of the epidural space ad block the autonomic nervous system resulting in vasodilation and reduced blood pressure.</i></p>	<i>"Clinically significant decreases in blood pressure are seldom seen in children younger than 8 years of age"<sup>3</sup></i>
<p><b>Pressure area</b>  <i>Reduced sensation can allow areas of pressure to go unnoticed increasing the possibility of tissue breakdown.</i></p>	Document <b>6 hourly</b> or more often if there is evidence of tissue damage.

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

Monitoring	Frequency
<p><b>Sensory Dermatome Level</b>  <i>To monitor the spread and level of the block and to detect any implications that this may have e.g. failed or patchy block, unilateral block, level of block too low</i></p>	<ul style="list-style-type: none"> <li>Sensory and motor dermatome level will be tested as soon as the child is awake and before the child leaves the recovery area.</li> <li>At the start of each nursing shift</li> <li>Prior to ambulation.</li> <li><b>Hourly</b> for first 6 hours, then <b>4 hourly</b></li> <li>Observations will be more frequent if the Bromage score is <math>\geq 2</math> ( see algorithm for high motor block, appendix xx) or if the child is experiencing pain</li> </ul>
<p><b>Motor Level (see Modified Bromage)</b>            where the motor block score is 3 after first <b>four (4) hours</b> call anaesthesiologist.            A score of 3 in recovery is not unusual.  <i>Local anaesthetic may affect motor nerves as well as sensory nerves.</i></p>	

## 11.2 TESTING THE SENSORY DERMATOME LEVEL

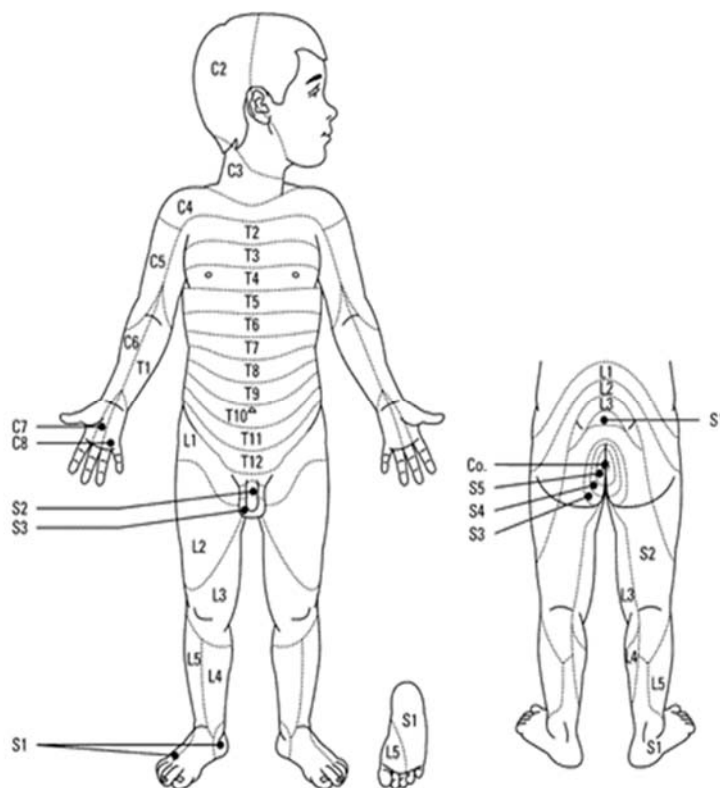
- Sensory nerve fibres respond to pain**, temperature, touch and pressure. As pain and temperature nerve fibres are similarly affected by local anaesthetic drugs, changes in temperature perception indicate where the epidural is working.
- Assessing sensory level is important to ensure the epidural is covering the patients' pain to ensure the block is not too extensive, which may increase the risk of complications.

### 11.2.1 PROCEDURE FOR CHECKING SENSORY DERMATOME LEVEL

- Explain to the purpose of the procedure to the child. **Dermatomal Spread:** Assess the child initially by asking the child (if appropriate) if he/she has any symptoms such as tingling, numbness or inability to lift their arm or leg (s).
- Ass the sensory dermatomal level of the block by using cold sensation (frozen plastic vial of H<sub>2</sub>O for injection or cryogenic spray). Assessment is more accurate if the cold sensation is initially checked from the expected anaesthetised area progressing to the non-anaesthetised area.
- Ask child to close his/her eyes and place ice against skin, e.g. against the patient's inside wrist or cheek so they will be able to determine the difference in sensation from cold to numbness. Check that the child can confirm the sensation feels cold.
- Apply the cold sensation to an area approximately 5cm above the wound where it is likely to be blocked and ask the child "does this feel the same as your face/arm, forehead or different"? The child may say that the sensation is the same, colder or warmer.
- Continue to apply the ice to the areas below this point and work down at 2-4 cm intervals until below the expected level of the block until it is clear at which level the top and bottom of the block is.
- Repeat on opposite side of the body as blocks may be uneven or unilateral.

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
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- Ideally the child should have an insensitive band of skin above and below the wound.
- Document both the upper and lower level of the sensory block where possible e.g. Left: T7-L1, Right T10-L2.



RCH<sup>®</sup>, Melbourne. Used with permission

### 11.3 ASSESSMENT OF SENSORY LEVEL IN INFANTS OR CHILDREN WITH INTELLECTUAL DISABILITIES.

Although it is challenging to determine the sensory dermatome level in infants and children with intellectual disabilities the dermatome level of the block may be obtained by carefully observing flinching and facial expression in response to ice on presumed anaesthetised and unanaesthetised dermatomes.

Another method is by observing the patient's response to movement and their response to very gentle palpation of the operative site.

### 11.4 UNILATERAL BLOCK

Where the child identifies one side of the body only as painful this suggests a unilateral block. This is rarely due to spinal anatomy. Most commonly it is a result of the position of the epidural catheter. If the side that is well blocked is also the location of the surgical procedure and the patient has no pain, then the fact the block is unilateral is of no real concern.

#### Action for suspected unilateral Block where the child is experiencing pain

- If the child's is able, help the child to roll onto the painful side to allow the local anaesthetic to spread.
- The anaesthesiologist or pain nurse specialist may pull back the catheter.

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

### 11.5 TESTING THE LEVEL OF MOTOR BLOCK

The degree of motor block must be assessed and documented. Assessment of motor block is done with the aid of the modified Bromage score. Increasing leg weakness usually means the epidural infusion rate is too high. However it may be an indication that the patient is developing an epidural haematoma. An Epidural haematoma must be diagnosed and treated properly to avoid paraplegia.

It is important to assess motor block to:

- Determine the amount of motor function,
- Prevent pressure areas from developing,
- Ensure the patient is safe to ambulate (where allowed),
- Detect the onset of complications e.g. epidural haematoma or epidural abscess.

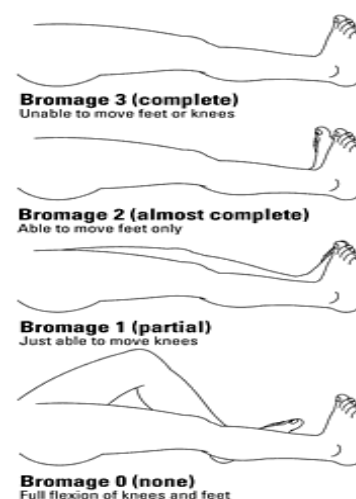
The child's normal level of motor function should be considered when making these observations (e.g. in the case of children with cerebral palsy this may be altered).

### 11.6 PROCEDURE FOR CHECKING MOTOR BLOCK IN LOWER LIMBS

- Explain the procedure to the child where appropriate.
- Assess motor function by direction observation of the child's ability to move their limbs.
- Ask the child 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 child may assist assessment by describing the extent of numbness, and "heaviness".

**NB** for a child in a hip Spica this score can be modified as follows:

- 2=No motor (can move feet)
- 3= Inability to move feet



11.3.2 ACTION FOR MOTOR BLOCK SCORE ( BROMAGE PR,1978)		
CRITERIA		ACTION (SEE ALGORITHM APPENDIX 1)
0	Full flexion of knees, feet & upper limbs possible.	Continue same rate.
1	Partially able to flex knees/elbows but free movement of feet/hands.	Inform the Pain Service or On-call Anaesthesiologist. <b>Consider reducing rate by 10%.</b>
2	Unable to flex knees/elbows but free movement of feet/hands.	Contact Pain Service or On-call Anaesthesiologist. <b>Reduce rate by 20%.</b>
3	Unable to move either lower or upper limbs at all. <b>*See algorithm for dense motor block Appendix 1*</b>	<b>Stop</b> the epidural Infusion Contact Pain Service and/or On-call Anaesthesiologist. Monitor motor block more frequently. Once motor function returns, the infusion can be restarted at a reduced infusion rate.



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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

### 11.3.3 MANAGEMENT FOR DENSE MOTOR BLOCK IN LOWER LIMBS (*see above*)

If the motor block is above 2 because of the use of 0.25% or 0.375% Levobupivacine solution intraoperatively then commencing the infusion can be delayed or started at a lower rate until staff are satisfied that recovery of neurological function is occurring.

Some recovery is expected within 4 hours and failure to observe this should prompt careful assessment and consideration of active investigation to exclude complications such as epidural haematoma. Prompt imaging (MRI) must be considered.

- Where the motor block (Modified Bromage Scale) is 3 in either leg for >4 hours post-surgery contact Consultant Anaesthesiologist, ANP or CNSp Pain. ( Algorithm appendix 1)
- Where the motor block is 3 in either Leg for >3 hours following a Bolus dose or change in infusion rate. **Stop the infusion and contact an anaesthetic consultant.**

## 11.7 TESTING THE LEVEL OF MOTOR BLOCK- THORACIC EPIDURAL INFUSION

- Ask the patient to curl and extend his or her fingers, grasp both of your hands and squeeze and ask the patient to raise his or her arm above their head.
- Assess for any paraesthesia (loss of sensation/numbness in the hands or arms) or Horner's syndrome (Meiosis, ptosis, dry skin on one side of face).
- An unduly high thoracic block (C3, 4, or 5) is indicated by loss of power, voluntary movement or sensation, changes in respiratory status.
- If there are any signs of paraesthesia (sensation of tingling, pricking or numbness) or loss of motor function STOP the infusion and contact the anaesthesiologist on call bleep 8528.

### 11.7.1 MANAGEMENT OF HIGH THORACIC MOTOR BLOCK

- Stop or reduce the infusion.
- Sit the patient up
- Inform the anaesthesiologist on call
- The infusion may be recommenced once the block is at a safe level.
- Recommence at a lower rate.

### 11.7.2 MANAGEMENT OF FACIAL NUMBNESS OR FACIAL TWITCHING

- Stop infusion
- Where possible sit the patient up.
- Administer Face Mask Oxygen,
- Seek an anaesthetic review.

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
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### 11.8 RED FLAGS

The following can be considered as “red flags”: these require immediate referral to an appropriate anaesthesiologist or consultant anaesthesiologist and consideration of neuroimaging.

- Significant motor block with a thoracic epidural.
- Unexpectedly dense motor block.
- Unexpected Bowel incontinence.
- Markedly increasing motor block during an 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 high motor block.

**Note: An algorithm entitled ‘Management of leg weakness with epidural analgesia’ has been developed for the procedure to be followed in the case of suspected epidural haematoma (Appendix 1).**

## 12 COMPLICATIONS

Contact the ANP/CNSp Pain or on-call anaesthesiologist and if appropriate stop the infusion in the event of suspected complications

### 12.1 RESPIRATORY DEPRESSION OR OVER SEDATION

A fall in respiratory rate is a late sign of respiratory depression. Increasing sedation level is an early predictor of respiratory depression. Strict hourly monitoring of patient as per protocol is essential to detect this sign of excess sedation or respiratory depression.

AVPU	SCORE
A	Awake, arousable, alert
V	Responds to voice only (drowsy and sleepy)
P	Responds to pain stimulus only (deeply asleep, arousable only with deep or significant physical or painful stimulus:
U	Unresponsive.
Sleeping, easy to rouse	S

#### Sedation score P or U

- Stop epidural infusion
- Call for help
- Attempt to arouse the child

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

**If breathing:**

- Administer 100% oxygen via appropriate sized non-rebreather face mask.
- Monitor ABC's (Airway, Breathing, Circulation)
- Bleep Anaesthesiologist (8528) and Pain Control Nursing staff (8300)
- Prepare Naloxone (10microgram/kg) for possible administration if epidural opioid in use.
- **Increase frequency of Observations** to every 5 minutes until medically assessed and/or respiratory rate sedation level improves.

**Normal respiratory rate range and oxygen saturation range**

Age (years)	Respiratory Rate	SpO <sub>2</sub>
0 – 3 months	30 - 59	≥94
4 – 11 months	30 - 49	≥94
1 – 4 years	20 - 39	≥94
5 - 11 years	16 - 29	≥94
12+ years	15 - 29	≥94

Irish paediatric early warning score (PEWS) Training Manual (version 4) July 2015

**General Guide for Respiratory Depression requiring an intervention**

Age (years)	Respiratory Rate	SpO <sub>2</sub>
0 – 2 years	<18	≥94
2 - 6 years	<14 breaths / minute	≥94
8 - 10 years	<10 breaths / minute	≥94
12+ years	<8 breaths per minute	≥94

**12.1.1 MANAGEMENT OF RESPIRATORY DEPRESSION:**

Determined by respiratory rate and sedation level.

**If apnoeic:**

- Give 5 rescue breaths via a Bag-Valve Mask (Ambu-Bag)
- Check circulation – if pulseless commence chest compressions at a rate of 30 compressions to 2 breaths
- Call emergency team on **2222** .
- Support ABC's until arrival of the emergency team
- Prepare Naloxone (10microgram/kg) for possible administration if epidural opioid in use.

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### 12.1.2 MANAGEMENT OF EPIDURAL FENTANYL RELATED RESPIRATORY DEPRESSION WITH NALOXONE

- The treatment of opioid overdose is the opioid antagonist naloxone. Naloxone is available in the ward/unit drug cupboard and on the ward/unit resuscitation trolley.
- The duration of action of naloxone is about 30 – 45 minutes. Patients who have responded to naloxone should be carefully monitored as the duration of action of opioids may exceed that of naloxone.
- It is recommended that patients that receive naloxone be continuously observed for a minimum of 2 hours after the last dose.

### 12.1.3 DOSING FOR NALOXONE

Drug	Indication	Dose	Caution
Naloxone IV	Excess sedation when respiratory compromise is present	2 – 10 microgram/kg, repeated as necessary to maintain reversal  Max: 200 micrograms/dose.	Watch for rebound respiratory depression  Naloxone has a short duration of action; repeated doses or infusion may be necessary to reverse effects of opioids with longer duration of action.

- Following Naloxone administration observe patient response and monitor respiratory rate, heart rate, and SpO<sub>2</sub> every minute until ventilation and alertness is achieved.
- The patient should be able to open his/her eyes within 1-2 minutes. If the patient does not respond **REPEAT** the dose.
- Continue to monitor and record respiratory rate and effort, HR SpO<sub>2</sub> and sedation score every 15 minutes for 2 hours, and pain score every 30 minutes, then hourly for 4 hours.
- The infusion may be recommenced once the child's sedation score return to 0 or 1 and the child is clinically stable.
- Recommence the infusion at a lower rate.

## 12.2 HYPOTENSION

Hypovolaemia may be the cause of hypotension. Hypotension related to an epidural infusion is rare in children under the age of 8 years.

- **Management of Hypotension**
- Stop the infusion
- Do not lie child head low
- Check fluid balance
- Administer a Fluid bolus of 10ml/kg over 10 minutes as prescribed.
- This can be repeated x1.
- Hypotension that does not respond to a second fluid bolus **requires urgent attention** by an anaesthesiologist or medical team and would warrant a pews call.

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### 12.3 INADEQUATE PAIN CONTROL

- Assess severity and location of pain.
- Assess sensory block and treat findings.
- Check catheter at insertion site and all connections for disconnection and leakage.
- Evaluate For:
  - Machine delivery problems, urinary retention, tissue ischemia, and excessive leakage. Remedy any of these issues.
- Increase the rate of the infusion, as prescribed
- Administer other analgesics e.g. paracetamol, NSAID, opioid if allowed,
- Contact the ANP/CNSp bleep 8300 or on call anaesthesiologist to request bolus dose.
- **NB.** Staff should be aware that increased or breakthrough pain may indicate surgical complications including the development of compartment syndrome.

### 12.4 NAUSEA AND/OR VOMITING

- The patient will be monitored for early detection and treatment of vomiting if indicated.

#### Management of nausea and vomiting

- Administer anti-emetic or low dose naloxone as prescribed.
- Aspirate nasogastric or gastrostomy tube if appropriate.
- Consider removing fentanyl from infusion solution.

### 12.2 PRURITUS

The patient will be observed for pruritus (itching) at least 4 hourly and 1-2 hourly if itching becomes a problem.

#### Management of pruritus

- Administer Chlorphenamine, ondansetron or low dose Naloxone.
- Remove fentanyl from infusion solution

Drug IV	Age	Dose	Frequency	Maximum dose	Preparation/ comments
Chlorphenamine	< 6 months	250 microgram/kg	Up to 4 times in 24 hours	2.5mg	Chlorphenamine Inj 10mg/ml Dilute in 0.9% Sodium chloride infuse over one minute
	6 months to 6 yrs.	2.5mg			
	6 to 12 years	5mg			
	12-18 years	10mg			
Ondansetron	2-12 years	1mg / kg	8 to 12 hourly	4mg	Ondansetron Inj: 4mg, 8mg Slow IV infusion over at least 15minutes in 0.9% Sodium Chloride or Glucose 5%
	> 12 years	4mgs as single dose		8mg	
Naloxone	> 1 month	1-2 microgram/kg	Repeat after 2 hours if necessary	Max Single dose 200 microgram	400microgram/ml Consider reducing opioid infusion or switch to alternative opioid

N.B. If repeated doses of naloxone are required this may reduce the effectiveness of the analgesia.

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### 12.3 URINARY RETENTION

- Patients with epidural infusions are at increased risk of urinary retention and those without urinary catheters should be observed for this problem. The risk is higher in patients receiving epidural opioids.
- Most children with lumbar epidural will have a urinary catheter inserted.
- A urinary Catheter is not always required with the use of a thoracic epidural infusion.

#### Management of urinary retention

- Where a patient has not passed urine twelve hours after surgery check fluid intake.
- Contact the ANP/CNSp Pain or anaesthesiologist on call
- Naloxone may be administered at a dose of 1-2microgram/kg, max single dose 200microgram. This dose can be repeated after 2 hours if necessary.
- Consider reducing the infusion rate if the patient is pain-free.
- Where there is no urinary catheter in situ: insert a urinary catheter and leave catheter in place until the epidural has been stopped for 4 hours.

### 12.4 ACCIDENTAL DURAL TAP AND POST DURAL PUNCTURE HEADACHE

This can occur at insertion of an epidural catheter, during epidural infusion or within 48 hours of removing the epidural catheter. It is due to leakage of cerebrospinal fluid through a hole or tear in the dura mater. Typically the headache is frontal or occipital with neck and shoulder pain, exacerbated by sitting or standing and relieved by lying down. There may be associated nausea and vomiting and photophobia.

#### 12.4.1 MANAGEMENT OF POST DURAL PUNCTURE HEADACHE

- Lay the patient flat, explain and reassure.
- The consultant anaesthesiologist who performed the procedure should be notified as well as the on call consultant anaesthesiologist.
- If epidural catheter is in situ let it remain so until patient has been seen by prescribing Anaesthesiologist, or instructed otherwise.
- Give adequate, regular simple analgesics, such as paracetamol or other NSAIDs
- Maintain hydration – regular oral fluids or if the patient is unable to take oral fluids then the IV route should be used. Consider drinks with caffeine, (Caffeine competes with adenosine at receptor site causing blood vessels to constrict which helps relieve headache).
- Avoidance of coughing and straining – stool softening agents or laxatives may be useful
- Check the patient's blood white cell count, especially if he / she has a pyrexia, to exclude infection.
- If the headache does not settle spontaneously within 36-48 hours an epidural blood patch may be considered – performed by an Anaesthesiologist in theatre.
- **Blood Patch:** If despite these measures the headache persists, the Anaesthesiologist may perform an "autologous blood patch" to seal over the leak in the Dura. This technique is usually rapidly effective in 70-80% of cases.

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## 12.5 PRESSURE CARE

It is important that pressure area care is meticulous for all patients with an epidural infusions. The decreased sensation produced by this techniques removes the usual warning signs that prompt patients to move and significant motor block may limit patient movement. Both factors potentially contribute to the development of pressure necrosis. Most commonly the heels, medial and lateral malleoli and sacrum are involved but **ALL** pressure points are at risk.

The patient receiving epidural analgesia must be turned 2-3 hourly and have their skin regularly checked for signs of pressure. The Pain Control Service recommends all 'adult-sized' and thin patients be nursed on air mattresses while the epidural infusion is in progress.

## 12.6 EPIDURAL HAEMATOMA

- The initial presenting complaint of a patient with a spinal haematoma is weakness outlasting the anticipated duration of the motor block of the epidural, or a new onset of lower limb weakness or numbness.
- **Neurosurgical intervention should be sought immediately** because recovery is unlikely if delayed by more than 8 hours. See algorithm for management of dense motor block.

## 12.7 INFECTION RISKS INCLUDING EPIDURAL ABSCESS

Epidural infection is a rare but serious complication of epidural catheterisation.

Signs of infection include:

- Un-explained fever
- Back pain
- Pain at the site of catheter insertion.
- Pain on gentle percussion of the spine
- Neurological deficit in a dermatomal or spinal nerve root distribution.
- Epidural space infection may progress to overt meningitis at which time headache; photophobia, neck stiffness and a positive leg raising sign may be detected.
- Epidural infection may present some weeks after epidural insertion (including after discharge from hospital).

### 12.7.1 RISK FACTORS FOR EPIDURAL INFECTION may include:

- Prolonged duration of catheterisation
- Immunocompromised patients
- Systemic sepsis/bacteraemia while a catheter is in-situ
- Where the epidural site is noted to be red or inflamed a swab should be taken and anaesthetic staff and Pain service nursing staff should be notified.
- It may be appropriate to commence antibiotics and arrange appropriate medical imaging. This requires consultation with Neurosurgical, infectious disease and Radiology departments.
- All patients and/or parents should be given an information leaflet with details of who to contact if they are worried.

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## 12.8 SEPSIS

- Where a patient with an epidural catheter in situ is suspected of having accompanying sepsis with potential for bacteraemia, the pain control must be notified to consider removing the epidural catheter

## 12.9 TEMPERATURE

- A persistent temperature of greater than 39<sup>0</sup>c warrants notification to the pain service to consider removal of the epidural catheter

## 12.10 LEVOBUPIVACAINE TOXICITY (*Appendix 1*)

Although Levobupivacaine toxicity is rare, it is most likely to occur in the following situations:

- If the drug is accidentally administered intravenously.
- In neonates and babies if high rates are infused for long periods. Accumulation can occur due to metabolic and renal immaturity.
- Patients with renal failure.

Nursing staff should observe the patient for signs of local anaesthetic toxicity, i.e.:

This is rare and is characterised by:

- **Mild-** Restlessness/confusion  
Light-headedness  
Numbness of tongue and lips (lip smacking)  
Tinnitus  
Double vision, blurred vision
- **Moderate-** Heaviness of limbs  
Muscular twitching  
Convulsions
- **Severe** Cardiac arrhythmias  
Hypotension  
Respiratory arrest  
Cardiac Arrest

### 12.10.1 MANAGEMENT OF LEVOBUPIVACAINE TOXICITY

- Stop the infusion
- Contact the anaesthesiologist bleep 8528 to ensure prompt treatment
- Provide appropriate life support
- See Appendix 1 for the management of Levobupivacaine toxicity.



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### 13 REMOVAL OF EPIDURAL CATHETER

- Removal of short-term epidural catheter is within the scope of practice for registered nurses who have received theoretical instruction and supervised clinical practice. Registered nurses may independently perform this procedure if the following requirements have been met.
- If a child is receiving prophylactic anticoagulation medication see section 15.
- The Pain Service/ Anaesthesiologist has ordered the removal of the epidural catheter.
- The nurse has demonstrated the knowledge and skills necessary and has been assessed as competent to remove an epidural catheter.
- If a tunneled catheter has been used seek advice from consultant anaesthesiologist who placed the catheter or other senior consultant anaesthesiologist or ANP/CNSp Pain.
- When alternative oral analgesia is prescribed and proven to be effective the epidural infusion may be discontinued.
- Ideally stop the infusion at least two (2) hours and preferably four (4) hours before removing the epidural catheter.
- DO NOT reduce the rate of the infusion before discontinuing as the epidural may become ineffective before alternative analgesia has taken effect.
- Where significant pain occurs despite alternative analgesia, the ANP/CNSp Pain or on-call anaesthesiologist should be notified, with a view to re-establishing epidural blockade, or prescribing other analgesia.
- Observations of pulse, respirations, pain score and Levobupivacaine toxicity must be continued for 4-6 hours after an epidural infusion has been discontinued.

#### 13.1 PROCEDURE FOR REMOVAL OF EPIDURAL CATHETER

##### 13.1.1 EQUIPMENT:

- Non-sterile gloves, dressing pack, Skin cleaning agent. 0.9% sodium chloride, Band-Aid, adhesive remover.

##### 13.1.2 PROCEDURE

- Explain the procedure to the child/parent, giving clear and relevant explanation.
- Caution is required if a child is receiving anti-coagulant therapy (see section 11<sup>7</sup>)
- Routine coagulation testing prior to removing an epidural catheter is NOT required.
- Decontaminate hands and wear non-sterile protective gloves.
- Position the child on his/her side of comfort or sitting upright with the insertion site exposed to facilitate removal.
- Remove the tape and dressing from the catheter insertion site using adhesive removal spray/wipes.
- Clean around the catheter insertion site with 0.9% Sodium Chloride.

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
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- Gently in one swift movement, remove the catheter. Although gentle traction is necessary to remove the catheter, it should come out easily and painlessly. If resistance is met or the child reports pain or unusual sensations e.g., tingling or a "catch in the back"), stop the procedure and notify the anaesthesiologist.
- Check that the catheter tip is intact by observing marks along the catheter.
- Apply a Band-Aid and leave in situ for 12 hours.
- Dispose of catheter, infusion tubing and polybag as per hospital policy.
- Document removal of the catheter on the prescription sheet/health care record.
- Report the following problems or symptoms to the anaesthesiologist to enable prompt treatment of problems or adverse symptoms.
  - Signs of catheter entry site infection.
  - Resistance noted upon catheter removal or patient reports of pain or unusual sensations during catheter removal.
  - Catheter tip marking not visualized on catheter removal.

### 13.1.3 CHILDREN WITH SPICA IN SITU

- Turn the child prone (face down) with his/her head tilted down to make space to enable the catheter to be removed.
- Check to see if there is a window in the Spica. The plaster nurses usually cut a window which may be covered with soft cast.
- Remove epidural as above.
- If any difficulties are encountered contact the plaster nurse as a window may need to be cut in the Spica.

## 14 CONCURRENT ANTICOAGULANT MEDICATIONS<sup>8</sup>

Impairment of coagulation from either drugs or due to a coagulopathy may have detrimental effects in the patient having an epidural. Vertebral canal haematoma is a catastrophic complication most often associated with an epidural catheter than with any other central block. The risk is significantly increased in the presence of anticoagulants. Other risk factors include technically difficult punctures and multiple or bloody punctures.

The recommendations of this guideline are taken from the Royal College of Anaesthesiologists' guideline and the American Society of Anaesthesiologists guideline for adults. There are currently no guidelines for children on this subject. This guideline is intended to give advice according to the current best available evidence.

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
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#### 14.1 KEY POINTS FOR SAFE EPIDURAL IN A PATIENT WITH IMPAIRED COAGULATION ARE:-

- Anticoagulation is the most important risk factor for the development of epidural haematoma following insertion of epidural needle / catheter.
- **It is vital that adequate time delays exist between the administration of anticoagulants and the insertion and removal of epidural catheters.**
- Each individual patient's risk / benefit assessment needs to be considered by the individual anaesthesiologist.
- Patients on continuous heparin infusions (generally low dose infusion) require careful planning and full consultation with all involved teams before epidural catheters are removed.

#### 14.2 UNFRACTIONATED INTRAVENOUS AND SUBCUT HEPARIN

- A single dose of unfractionated heparin given subcutaneously does not alter laboratory coagulation parameters but may increase wound haematoma rate. Repeated doses can cause thrombocytopenia in a small number of patients after several days.
- For patients who have had more than 4 days of heparin therapy, a platelet count should be done prior to removal of an epidural catheter to identify heparin-induced Thrombocytopenia.
- A minimum time interval of **60 minutes** needs to be left **between inserting** the epidural and **subsequent heparinisation**.
- Epidural catheters should be **removed 6 hours after the last heparin dose** or following an evaluation of the patient's coagulation status.

#### 14.3 FRACTIONATED LOW MOLECULAR WEIGHT HEPARINS

Low-molecular-weight heparins (LMWHs) have established roles in preventing and treating venous thromboembolism (VTE).

- LMWHs currently in use in OLCHC include Enoxaparin(Clexane®)and Tinzaparin (Innohep®)
  - Epidural catheter placement should occur at least **12 hours after** standard prophylactic LMWH doses.
  - **The first postoperative dose of LMWH** dose should be **given 6–8 hours after surgery** and subsequent doses every 24 hours after that.
- Low Molecular Weight Heparin for prophylaxis should be prescribed as a single daily dose and administered in the evening (e.g. at 18.00 hrs.) to allow safe "time window" for removal of neuroaxial catheter during daytime.
- Removal of the Epidural Catheter should occur when anticoagulation activity is low.
  - Removal of an epidural catheter should occur **12 hours after LMWH administration**.
  - A minimum of **2 hours** should elapse **before** the next dose of LMWH is administered following removal of an epidural catheter.

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REMOVAL OF THE EPIDURAL CATHETER			
Drug	Insertion	Removal	Comment
<b>Heparin</b>	Delay administration until after intervention if possible.		If more than 4 doses check platelet level.
	Delay administration until <b>one hour</b> after catheter insertion.	<b>Wait 6-8 hours after administration before removal of the catheter.</b> Subsequent dose can be given 2-4 hours later	Measure PT
<b>LMWH</b> Tinzaparin (innohep®) Enoxaparin (Clexane®)	Epidural catheter placement 12 hours after standard prophylactic dose. <b>1<sup>st</sup> dose 6-8 hours post-operatively.</b>	<b>Removal 10-12 hours after last dose.</b> Subsequent dose can be given <b>2 hours or more later</b>	<b>Administer in evening to allow safe window for removal</b>

15 TROUBLE SHOOTING	
Problem	Action
<p><b>LEVEL OF BLOCK TOO HIGH</b></p> <ul style="list-style-type: none"> <li>▪ Can result in respiratory distress, decreased SaO<sub>2</sub>, bradycardia</li> <li>▪ Numbness or tingling of finger/arms</li> <li>▪ Loss of hand function</li> <li>▪ Horner's sign</li> <li>▪ Miosis, ptosis, dry/ward skin on face</li> <li>▪ May be unilateral or bilateral</li> </ul>	<ul style="list-style-type: none"> <li>▪ Stop or reduce the infusion if concerned.</li> <li>▪ Nurse child in an upright position.</li> <li>▪ Resuscitate appropriately</li> <li>▪ Contact the Anaesthesiologist, Bleep 8528 and /ANP OR CNSp Pain, bleep 8300.</li> <li>▪ Monitor the level of the block more frequently</li> <li>▪ The infusion can be recommenced once the level of the block is at an acceptable level.</li> <li>▪ Recommence infusion at a lower rate.</li> </ul>
<p><b>UNILATERAL BLOCK</b></p>	<ul style="list-style-type: none"> <li>▪ Turn the patient onto their painful side, i.e. the side that is not being blocked, gravity can sometimes help spread the local anaesthetic across.</li> <li>▪ Inform the ANP/CNSp or anaesthesiologist as the patient will probably need a 'top up' bolus dose to be administered.</li> <li>▪ The catheter may be required to be pulled back slightly (usually 1 or 2 cm) which may resolve the problem.</li> </ul>
<p><b>PATCHY BLOCK</b></p>	<ul style="list-style-type: none"> <li>▪ If the blocked area is becoming ill defined or 'patchy' notify the ANP/CNSp or anaesthesiologist</li> <li>▪ Increase the epidural infusion rate (within the parameters described).</li> <li>▪ 'Patchy' blocks are nearly always an early sign that the patient is going to lose their dermatome levels altogether and the ANP/CNSp or anaesthesiologist usually administers a 'top up' bolus dose.</li> </ul>

CHI at Crumlin © 2019	Guideline Name: Analgesia Infusion Guidelines
Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
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PROBLEM	ACTION
<b>PERSISTANT LEG WEAKNESS WITH EPIDURAL INFUSION</b>	<ul style="list-style-type: none"> <li>▪ See Appendix 1</li> </ul>
<b>LOOSE DRESSING</b>	<ul style="list-style-type: none"> <li>▪ If the dressing starts to peel off place a new one over the top.</li> <li>▪ Inform ANP/CNSp Pain or anaesthesiologist on call.</li> <li>▪ Avoid removing the original dressing.</li> </ul>
<b>LEAKING EPIDURAL CATHETER</b> Leaking of an epidural solution from the entry site is common, particularly in small children	<ul style="list-style-type: none"> <li>• Observe the site more frequently.</li> <li>• Reinforce the dressing if necessary, (do not remove).</li> <li>• If the patient is comfortable (suggesting the infusion is providing adequate analgesia), the dressing should be covered with a sterile pad and observe.</li> <li>• Any large leak should be discussed with the ANP/CNSp Pain or Anaesthesiologist on Call, bleep 8528.</li> <li>• Where the patient is in pain, the infusion should only be discontinued after discussion with consultant anaesthesiologist.</li> </ul>
<b>CATHETER DISCONNECTION FROM FILTER</b>	<ul style="list-style-type: none"> <li>• Stop the infusion pump.</li> <li>• Wrap the filter and catheter in sterile paper or lint free gauze.</li> <li>• <b>Do not warp the ends in Alco-wipe as this is neurotoxic.</b></li> <li>• Contact the anaesthesiologist 8528 or ANP/CNSp Pain.</li> <li>• Document time in epidural observation sheet.</li> <li>• Do not reconnect the catheter.</li> </ul>
<b>Reconnection of an epidural catheter</b>	<ul style="list-style-type: none"> <li>• The catheter should only be reconnected by an anaesthesiologist <b>following a risk benefit analysis.</b></li> <li>• An aseptic technique wearing sterile gloves is mandatory.</li> <li>• The procedure requires a second person.</li> <li>• The catheter is cleaned 5cms from the tip taking care not to get cleaning solution near the catheter tip.</li> <li>• Allow cleaning fluid to evaporate. Using sterile scissors cut the catheter within the cleaned strip.</li> <li>• The catheter is reconnected to the filter the catheter and connection to the filter is reinforced using two Tegaderm® dressings.</li> </ul>
<b>AIR IN LINE</b>	<ul style="list-style-type: none"> <li>• Stop pump</li> <li>• Disconnect at filter using ANTT( ensuring filter remains attached to the patients end of the epidural catheter)</li> <li>• Press purge button ensuring air is expelled from the line</li> <li>• Reconnect and restart pump</li> <li>• Document in patient's notes.</li> </ul>

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PROBLEM	ACTION
<p><b>CATHETER OCCLUSION OR KINKING</b></p> <p>Epidural catheters are very fine and may occlude easily.</p>	<ul style="list-style-type: none"> <li>▪ It may help to reposition the patient.</li> <li>▪ Check to see if connections to filter is too tight, loosening the connection slightly may help.</li> <li>▪ Check the catheter and the system to determine if it is kinked. If this does not resolve the problem: <ul style="list-style-type: none"> <li>• Disconnect at filter using ANTT level 2 ensuring filter remains attached to the patients end of the epidural catheter,</li> <li>• Press purge button ensuring air is expelled from the line,</li> <li>• Reconnect and restart pump.</li> </ul> </li> <li>▪ Where there is a persistent alarm despite taking appropriate action, always contact the ANP or CNSp Pain for review and consider changing the pump.</li> <li>▪ If kinked the anaesthesiologist may be able to correct this by pulling back the catheter by a few millimetres</li> <li>▪ The anaesthesiologist may flush the catheter using a syringe.</li> <li>▪ If these interventions fail, the catheter may be removed.</li> </ul>
<p><b>BACK PAIN ( EPIDURAL)</b></p>	<ul style="list-style-type: none"> <li>• Most common at insertion site. Mild back pain is common and usually transient.</li> <li>• Severe, persistent and increasing back pain could be a sign of abscess/haematoma and must be investigated thoroughly.</li> <li>• Contact on call anaesthesiologist to assess the child.</li> </ul>
<p><b>LOW BATTERY</b></p>	<ul style="list-style-type: none"> <li>• Stop the pump</li> <li>• Remove battery pack and bring it to recovery</li> <li>• Replace with charged battery</li> <li>• Replace battery in pump</li> <li>• Restart pump, all values will be stored in pump when changing batteries</li> <li>• Alternatively replace battery pack with 4 AA batteries and keep the battery pack with pump.</li> </ul>

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## 16 MONITORING COMPLIANCE & EFFECTIVENESS

Element to be monitored	Adherence to the guideline
Lead	ANP/CNSp Children's Pain
Tool	Regional analgesia audit form
Frequency	The pain forms will be audited on a yearly basis.
Reporting arrangements	The audit is reported back to Consultant lead for Pain services and Assistant Director of Nursing for CNSp Acute Pain.
Acting on recommendations and Lead(s)	Pain Service
Change in practice and lessons to be shared	Required changes to practice will be identified and actioned within 1 month. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders

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Issue Date: September 2019	Department Name: Anaesthesia, Critical care & Pain management
Author(s): Gill O' Callaghan	Authorising Committee: Drugs and Therapeutics Committee

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### Appendix 1: Management of Leg weakness with epidural Infusion

## Management of Leg weakness with Epidural Analgesia

All patients receiving epidural analgesia must have leg strength assessed regularly using the "Bromage score" that appear on the epidural observation form. Thoracic epidural analgesia should not cause profound leg weakness.

Increasing leg weakness usually means that 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.

