EPIDURAL WORK BOOK
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INTRODUCTION

The pain service has provided you with this work book designed to aid your development and confidence in the clinical management of patients with continuous epidural infusion. It will provide evidence of learning and can be presented at your Performance and Talent Review and part of your NMC revalidation.

As this was given to you when you booked onto the epidural study day you will NEED to complete it before attending on the day itself. This is only an introduction and provides a foundation on which to base your knowledge concerning epidural care but if you have not completed it you cannot attend the study day. We have also included the competencies we expect you to achieve. These will need to be achieved no later than 3 months following your attendance on the study day.

To achieve your competencies you will have to attend the full study day. During the study day your knowledge gained from reading this work book will be assessed with a pass mark of 80%. Following this a ward based assessment will be carried out in the clinical area. Two supervised and assessed practices are required prior to completion. This can be completed by either a member of the pain service or a Band 6 or above in your clinical area who has completed epidural competencies themselves. Once full competencies are completed and achieved, you will be required to attend a 2 yearly session. If you are deferred for any reason you will need to re-attend the full study day.

In line with the Scope of Professional Practice, care of patients with an epidural is an advanced practice and therefore requires additional training and assessment (RCoA et al, 2010). It should always be remembered that all nurses are ultimately accountable for their own practice and should only carry out practice that is within their scope of competence. Once a nurse has completed their assessment it remains the responsibility of that nurse to remain clinically and professionally updated. The responsibility of booking yourself on our updates is yours (NMC, 2015).
Epidural analgesia is one of the most effective forms of pain relief but has a potential for causing serious complications. It has the potential to provide complete pain relief while maintaining metabolic stability. The success of epidural does not only depend on catheter insertion, it relies on effective post-operative nursing management. The registered nurse plays a pivotal role in maintaining epidural infusions to ensure the patient receives optimal nursing care leading to effective pain management.

The Trust provides several resources regarding epidural care to support education and practice. These include:

- The Trust Policy for the Management of Epidural analgesia. (Updated August 2014) and available on the Trust intranet. The policy applies to all designated areas except obstetrics and paediatrics.
- This learning package
- Epidural study days/ workshops organised by the inpatient adult pain service.
- The Epidural and PCA observation chart which includes clear guidance and instructions.

**PATHWAY TO INDEPENDENT PRACTICE**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>You must be competent to give IV drugs according to the Trust policy and working in an area designated to take patients receiving epidural analgesia or planning to do so.</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Start working through the work book.</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Attend the epidural study day.</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Be assessed as competent in the care of continuous epidural infusions. This must be completed within three months of attending the epidural study day. When you feel ready to begin practice independently discuss this with your mentor/supervisor providing you both feel confident. Organise time for assessment with either a recognised assessor or a Clinical nurse specialist from the inpatient pain service.</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Begin to care for patients receiving epidural analgesia under direct supervision.</td>
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<tr>
<td>--------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Care for patients with epidural catheters and continuous infusions independently and be able to supervise other nurses in this practice.</td>
</tr>
</tbody>
</table>

It should always be remembered that all nurses are ultimately accountable for their own practice and should only carry out practice that is within their scope of competence. Once a nurse has completed the specified practice assessment it remains the responsibility of the individual nurse to remain clinically and professionally up-dated.

**LEARNING OUTCOMES**

The workbook is the first step to successfully completing your learning outcomes. Its completion is essential in order to have an understanding of epidural analgesia, its side effects and complications.

At the end of the workbook you are expected to have an understanding of:

1. The uses, advantages, side effects and complications of epidural analgesia.

2. Anatomy and physiology of the epidural space and surrounding structures.

3. Drugs used in Epidural analgesia; their actions; side effects and complications

4. Assessment and documentation

5. Equipment used for the administration of epidural analgesia

6. How to change a bag and charge the Epidural pump
7. Discontinuation of Epidural analgesia and step down medication


WHAT IS AN EPIDURAL?

The Vertebral Column

The vertebral column consists of 33 vertebrae:

- Seven cervical
- Twelve thoracic
- Five lumbar
- Five sacral (fused to form the sacrum)
- Four coccygeal (fused to form the coccyx)

The vertebrae are placed on top of one another. As a result they form the vertebral canal, which contains and protects the spinal cord and membranes. At the upper (rostral) end, the vertebral canal meets the skull at the foramen magnum. At the lower (caudal) end, it continues down into the body of the sacrum.

The spine has 3 functions:

- To allow body movement while giving stable support.
- To transmit the weight of the upper half of the body to the legs (through the anterior vertebral body of the spine).
- To protect the neurological tissue of the spine cord.
**Spinal Cord**

The spinal cord begins at the level of the foramen magnum. In the adult it usually ends at the level of the second lumbar vertebra.

The spinal cord is made up of columns of white matter (tract of nerve fibres) surrounding a column of grey matter (cells).

The grey matter of the spinal cord is roughly H-shaped. Most pain fibres synapse in the dorsal horn, within the substantia gelatinosa.

Each spinal nerve is made up of two parts: an anterior and posterior root.

The **anterior root** is efferent and **motor** (concerned with movement). Sympathetic fibres arise from nerves T1 to L2 in the spinal cord.

The **posterior roots** are largely **sensory**. Each posterior root has a ganglion and carries fibres for pain, touch, heat, deep or muscle sensation from the bones, joints and tendons. They receive sensory or ‘afferent’ impulses from the peripheral nerves. It also carries fibres for sensory nerves from the viscera.
They are:

- **Pia mater** – the innermost membrane which closely covers the spinal cord
- **Arachnoid mater** – a delicate layer, separated from the pia by the subarachnoid space containing cerebrospinal fluid (CSF). It is usually applied to the inner surface of the dura mater.
- **Dura mater** – the thicker, outer membrane.

The spinal subarachnoid space is in direct contact with the cranial subarachnoid space via the foramen magnum. The subarachnoid space contains the CSF bathing the surface of the brain and cord, and it ends at the level of the second sacral vertebra.

The epidural space extends from the base of the skull to the sacral hiatus. It contains loose connective tissue, veins, arteries, lymphatics and nerves. It does **not** contain cerebro-spinal fluid.

Each pair of spinal nerves passes through the epidural space as they exit the spinal cord.

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**Why use an Epidural Infusion?**

The introduction of epidural analgesia/anaesthesia into post-surgical pain management has provided an option that allows for complete pain transmission block. The major advantage for using epidural analgesia compared to other forms of post-operative management is the ability to provide pain transmission block and reduce the subsequent catabolic stress response which is a result of acute pain transmission. This allows for a faster post-operative recovery and enables the patient to ambulate without pain. The risks involved with insertion of the catheter and those associated with the infusion can be outweighed by the patient being able
to deep breathe and cough, and ambulate in the early post-operative period. This should then reduce the potential for complications associated with prolonged bed rest and poorly managed pain, such as chest infection, deep vein thrombosis and pressure areas.

3 Factors for Epidural Success

An effective epidural depends upon three individual components, all working together to provide the optimum analgesia. They are:

- Catheter placement
- Medication used; local anaesthetic, opioid analgesia
- Volume of the solution in the epidural space

Occasionally a patient will receive epidural analgesia without an opioid (often referred to as a plain epidural). This will still provide some pain relief, although it may not be as effective as an epidural which contains both an opioid and a local anaesthetic. This may be chosen due to the patient experiencing undesirable side effects or if they have known allergies or sensitivities to opioids.

1) Catheter placement

![Positions for an epidural](anatomical-diagram)

The position that the patient needs to get into for the insertion of an epidural is illustrated above.

- The anaesthetist will require the patient to sit or lie absolutely still for the insertion, and to have their back fully exposed.
- The patient’s front needs to be adequately covered to maintain patient dignity.
- The patient must never be left alone and continuous reassurance must be given.
- If the patient is sitting up and leaning forward ensure they have a stool in front of them to place their feet on, and have a pillow on their lap so they can lean into it comfortably. Remember to have someone stand in front of the patient so they do not fall forward.
Record or epidural insertion attempts:
At what level?
How many attempts
Dural tap on insertion

Epidural analgesia
Surgical Site | Catheter placement
---|---
Thoracic (Thoracotomy) | T6-8
Upper Abdominal (Laparotomy) | T7-10
Lower Abdominal (Hysterectomy) | T9-L1
Hip and Lower limb (knee replacement) | L1-4

2) Medication

Pharmacology
Within this trust we use a combination of two drugs. A local anaesthetic called Bupivacaine and an opioid called Fentanyl. Combining a local anaesthetic with an opioid provides superior pain relief and helps reduce the need for high opioid doses (‘a synergistic effect’).

Opioid (Fentanyl)
When Fentanyl is infused into the epidural space it is absorbed by different methods. It crosses the dura mater and enters the CSF. Some opioid is absorbed into the epidural veins and enters the systemic circulation and part binds to epidural fat (see Fig 1). From the CSF it can enter the spinal cord directly and reach the dorsal column. Opioids work by attaching to the opioid receptors which are found in the substantia gelatinosa in the dorsal horn of the spinal cord. Fentanyl is highly lipid soluble this means it has a rapid onset of action because it can transfer quickly across fatty membranes such as the dura which allows access into the CSF. It also has a short duration of action. This makes Fentanyl one of the safest opioids to use in epidurals in terms of side effects and adverse events.

Side effects of Opioids
These side effects are common to all opioids. However they should be substantially reduced when given via the epidural route. Side effects can occur in some patients and we should remain vigilant at all times for these side effects.

- **Nausea & Vomiting** – opioids can cause nausea. Nausea is a common side effect of opioids. Vomiting is less common. However, general anaesthetic or the type of surgery may also be the reason for nausea or vomiting and therefore should be excluded before considering altering or stopping an epidural infusion.

- **Hallucinations** – Some patients may experience hallucinations. Establish if the hallucinations are causing distress. If they are it may be best to remove the opioid from the infusion. Some patients just require reassurance as this is a normal side effect with opioids. Remember it is often under reported so ask the patient when you are performing your observations

- **Urinary retention** – Patients are generally catheterised post operatively. If not, and you suspect the patient is in urinary retention, ensure the patient is catheterised.
• **Pruritus** – Feeling itchy with an epidural infusion is relatively common. This can be managed with administering an antihistamine. In very severe cases, the opioid can be removed from the epidural infusion.

**Adverse Effects:**

**Sedation and respiratory depression** – sedation and respiratory depression usually occur simultaneously, but sedation always comes first. If the patient does develop respiratory depression, stop the epidural infusion and follow the protocol for managing respiratory depression in the Epidural policy. Remember to always look for potential cause’s e.g. opioid sensitivity or a change in liver function.

**Local Anaesthetic (Bupivacaine)**

Local anaesthetics administered via the epidural route gain access to the nerve roots and the spinal cord by crossing the dura and the subarachnoid membranes. Part will be absorbed into the systemic circulation.

Local Anaesthetics work by blocking the transmission of impulses along the nerve. They bind to sodium channels (Na+) within the nerve to block the action potential of a nerve meaning it can no longer conduct (send it’s messages). This effect is reversible, the duration of action is dependent on the amount of drug used, its concentration and the rate at which it diffuses away from the injection site.

Stronger local anaesthetic solutions, such as Lignocaine 2% or Bupivacaine 0.5%, will block the larger fibres as well as the smaller ones, blocking both sensory and motor function. This makes assessment of haematoma development, seen with increasing numbness and loss of
movement, very difficult. It will also prevent ambulation, one of the major reasons for using an epidural infusion in the post-operative period.

Weaker solutions, such as Bupivacaine 0.1% will block only the smaller pain fibres (A-delta and C fibres), providing pain relief with minimal or no parasthesia or paralysis.

**Nerve Fibre Types**

<table>
<thead>
<tr>
<th>Type</th>
<th>Junction</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>alpha Motor to skeleton muscle</td>
<td>15 micron</td>
</tr>
<tr>
<td>A</td>
<td>beta Cutaneous touch &amp; pressure</td>
<td>8 micron</td>
</tr>
<tr>
<td>A</td>
<td>gamma Motor to muscle</td>
<td>6 micron</td>
</tr>
<tr>
<td>A</td>
<td>delta Pain, temperature, touch</td>
<td>&lt;3 micron</td>
</tr>
<tr>
<td>B</td>
<td>Sympathetic, pre-ganglionic</td>
<td>3 micron</td>
</tr>
<tr>
<td>C</td>
<td>Pain, temperature, touch</td>
<td>&lt; 1 micron</td>
</tr>
<tr>
<td></td>
<td>Sympathetic post-ganglionic</td>
<td></td>
</tr>
</tbody>
</table>

Pain transmission occurs via **A-delta** and **C fibres**, which are the smallest in size. These fibres also convey information about skin temperature and touch, hence the use of ethyl chloride spray or ice to assess dermatome or sensory levels.
Side-Effects of Local Anaesthetic:

**Hypotension**

There can be a loss of vascular tone (vasodilation) due to the blockade of the sympathetic nerves (from T1-L2) produced by the local anaesthetic. Other causes for hypotension should always be considered e.g. bleeding or dehydration. **DO NOT TIP THE BED HEAD DOWN.** The vasodilation usually responds well to volume expanding fluids but some patients may also require vasopressors such as Ephedrine.

**Bradycardia**

If the sympathetic nerves are blocked in a high thoracic epidural (T1-T5) bradycardia may be experienced. This will not respond to Atropine and will require the administration of ephedrine and usually a reduction in the epidural infusion rate. Ensure the patient is positioned upright to prevent the block from increasing in an upwards direction. Regular sensory block assessment should be undertaken in this instance until the sensory block is below to level of T4.

**Local Anaesthetic toxicity**

Can occur due to an unintentional overdose of Local anaesthetic or if local anaesthetics are administered intravenously by mistake e.g. an epidural infusion is connected to an intravenous cannula. Early signs of local anaesthetic toxicity are - numbness around mouth, light-headedness, tinnitus and twitching. Late signs of local anaesthetic toxicity are - convulsions, bradycardia, cardiac arrest.

**Muscle weakness**

Can occur due to the block causing muscle paralysis (inability to move legs or weight-bear). Should this occur ensure pressure areas are checked regularly, encourage movement to assess recovery and ambulate whenever possible.

**Urinary retention** – may occur if the local anaesthetic block is in the lumbar region.
3) Volume in the Epidural Space

When the epidural catheter is inserted it is not usually possible to control its position within the epidural space, so it may advance upwards, downwards or sidewards into the epidural space. It is considered however, that the solution instilled spreads from the catheter tip evenly within the space, e.g. 10mls would spread 5mls in an upwards and downwards direction.

As the solution used is absorbed a continuous infusion is required to maintain this level of spread of the opioid/local anaesthetic mixture. The amount of local anaesthetic in particular will determine the number of spinal nerves which will be blocked and hence the patient will not feel pain in the corresponding dermatomes.

Therefore, it is important to maintain the hourly rate of the infusion at a level that will keep the appropriate spinal nerves blocked. Depending on the position of the catheter, the rate will normally need to be at least 5mls per hour – any less will not usually provide an adequate blockade of the target nerves.

INDICATIONS FOR EPIDURAL ANALGESIA

- Post-op pain relief – thoracic surgery, abdominal surgery, lower limb surgery
- Pain relief following trauma – e.g.: Fractured ribs
- Analgesia during labour
- Alternative to a GA (combined spinal epidural (CSE))
- Palliative / Chronic Pain

Contraindications of epidural analgesia

- Infection at site of insertion or systemic infection
- Altered Coagulopathy / Coagulation therapy
- Lack of Trained Staff – epidurals should never go to a ward where staff have not been trained
- Spinal deformity / fractures – this is not an absolute contraindication, the anaesthetist may use their own clinical judgement
- Pre-existing neurology – not an absolute contraindication
- Allergy to LA’s or opiates
Advantages of Epidural analgesia

- **Reduced opiate requirements** – this means less side effects from opiates lower incidence of nausea and vomiting and sedation

- **Superior pain relief** – Some patients can achieve 100% pain relief which helps to significantly reduce the catabolic stress response from surgery or injury

- **Improved perfusion to lower limbs** – Can be beneficial pre operatively in vascular patients

Disadvantages of Epidural analgesia

- **Associated with some potentially severe complications**, e.g. epidural Haematoma, epidural abscess, catheter migration leading to total spinal, LA toxicity, dural puncture headache.

- **Requires competent and well trained nursing/medical staff for management**

- **Patient refusal / Inability to give consent** – Full patient information should be given prior to epidural insertion

COMPLICATIONS AND SIDE EFFECTS

<table>
<thead>
<tr>
<th>Common side effects</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Analgesia</td>
<td>Contact the On-call Anaesthetist or Pain CNS if the epidural infusion is running at the maximum prescribed rate and pain relief is not achieved.</td>
</tr>
<tr>
<td>Hypotension</td>
<td>If the systolic blood pressure is &lt;100mmHg inform medical team responsible for the patient. The Epidural infusion rate may also need to be decreased by 2ml/hr to establish whether the drop in blood pressure is related to the Epidural.</td>
</tr>
<tr>
<td></td>
<td>Systolic blood pressure &lt; 80mmHg is a medical emergency <strong>call 2222</strong>. Hypotension can be an indication of hypovolaemia but the possibility of post-operative bleeding must be excluded, increase frequency of observations.</td>
</tr>
</tbody>
</table>
Respiratory Depression
If the respiratory rate is <8 breaths per minute and/or sedation score 3, stop the epidural infusion. Administer 15 litres of oxygen via non rebreathing mask and inform medical team immediately, consider naloxone. **Call 2222**

Emergency boxes which contain Naloxone are kept on the clinical area that receives patient on epidural infusion.

Nausea and Vomiting
Administer antiemetic medication if nausea score 1 or above. If persistent nausea occurs consider a regular antiemetic. For further advice contact the Adult Inpatient Pain Service/ medical team responsible for patient

Opioid induced pruritus
Administer PRN Antihistamine. If symptoms persist consider regular antihistamine.

Urinary retention
Most patients should return from theatre with a urinary catheter. However if they are not catheterised and have not passed urine within 6 hours of surgery the medical team should be informed.

Sensory block above T4
If sensory block is higher than T4 ensure the patient is sat upright if normotensive.

Consider reducing the epidural infusion rate by 2ml/hr if patient is pain free.

Stop epidural and maintain an upright position if patient complains of dyspnoea and or bradycardia.

Contact the Adult Inpatient Pain Service/ On-call anaesthetist immediately.

**Motors block Bromage >2**
(The criteria guide for the bromage score is on pg 28)

**Bromage 2** Consider reduction in epidural infusion rate if patient is pain free. If patient is in pain contact the Adult Inpatient Pain Service/ On-call anaesthetist

**Bromage 3** Reduce epidural infusion by 2ml/hr and reassess in 1 hour. If the patient is in pain or there is no improvement contact the Adult Inpatient Pain Service/ On call anaesthetist

**Bromage 4 STOP EPIDURAL IMMEDIATELY** and contact the Adult Inpatient Pain Service/ On-call anaesthetist immediately.
Inadequate Analgesia - Unilateral, Patchy Sensory block

Check the sensory block level and bromage score.

Perform a full set of clinical observations.

Position the patient onto the side where there is no presence of sensory blockade. E.g. a patient is complaining of pain to the right side of their abdomen and there is no sensory blockade, therefore you position them onto their right side (Caution in patients who have had a total hip replacement or hip Hemiarthroplasty surgery due to risk of dislocation).

If the pain does not improve contact the adult inpatient pain service or on-call Anaesthetist.

If no or slight effect, the Anaesthetist or Pain CNS will check how much catheter remains in the epidural space. If greater than 4 cm is left in the epidural space, the attending anaesthetist or Pain CNS may pull back the epidural catheter. This procedure MUST be performed using an aseptic technique.

Catheter Disconnection

A witnessed disconnection from the filter:
- Wrap both ends (the anti-bacterial filter and the epidural catheter) in sterile gauze
- Temporarily stop the epidural infusion
- Contact the adult inpatient pain service/anaesthetist on-call out of hours via their bleep

The adult inpatient pain service or anaesthetist on-call will reconnect the epidural catheter only if the disconnection was witnessed and:
- The catheter does not appear to be contaminated
- Aseptic technique was used as per Infection Control Policy
- All actions documented in patients’ healthcare records

If the disconnection is not witnessed contact the Adult Inpatient Pain Service or on-call Anaesthetist as the epidural catheter and infusion should be removed with alternative analgesia arranged.

Suspected Epidural Haematoma /Abscess

Epidural haematoma is a rare complication of epidural anaesthesia. The epidural space is filled with a network of venous plexuses, and puncture of these veins, with bleeding into the confined epidural space, may lead to the rapid development of a haematoma.

Epidural infection is rare but a potentially serious complication. Pathogenic organisms can be introduced into the epidural space if strict asepsis is not observed.

Early signs and symptoms include:
• back pain/tenderness
• persistent motor block/neurological deficit
• bowel/bladder dysfunction or priapism
• redness, tenderness or exudate from epidural/spinal insertion site
• pyrexia (if source unknown)

The following steps should be taken in the presence of the above signs and symptoms:

• If the epidural infusion is in progress; **STOP** the infusion
• Contact a member of the Adult Inpatient Pain Service
• An Immediate neurological assessment must be performed by an anaesthetist. This is usually the on-call anaesthetist
• On-call consultant anaesthetist and the anaesthetist who performed the procedure must be informed of patient’s condition
• If there is no improvement to neurological function after 1 hour an urgent MRI must be arranged via a senior on site radiologist

**Please Note:** This should be treated as any acute neurosurgical epidural/spinal haematoma or abscess (spinal or supra-spinal)
Total Spinal Blockade
This is a rare complication occurring when the epidural needle, or epidural catheter, is advanced into the sub-arachnoid space without the operator's knowledge, and a continuous infusion of local anaesthetic is injected directly into the CSF. The result is a rapidly rising sensory block, and the development of a motor block. This may lead onto profound hypotension, apnoea, bradycardia, unconsciousness and dilated pupils.

The use of a test dose should prevent most cases of total spinal, but cases have been described where the epidural initially appeared to be correctly sited, but subsequent top-up doses caused the symptoms of total spinal.

Management of a Total Spinal Blockade
- Put out an emergency call Ext. 2222
- Airway - secure airway and administer 100% oxygen
- Breathing - ventilate by facemask and then intubate
- Circulation - treat hypotension with IV fluids and vasopressors: ephedrine 3-6mg

Metaraminol 1-2mg increments
0.5-1ml Adrenaline 1:10000 as required
- Perform a full set of clinical observations (blood pressure, pulse, temperature, respiratory rate and oxygen saturations)
- Continue to ventilate until the block wears off (2 - 4 hours)
- Remove the epidural catheter
- Document all actions in the patient's health care records

Post Dural Puncture Headache (PDPH)
The incidence of post dural puncture following epidural insertion is between 0.4%-24%. It is usually recognised by the immediate loss of CSF through the epidural needle (Candido and Stevens, 2003)

Characteristics of a PDPH:
- Severe headache, usually frontal, exacerbated by movement or sitting upright and relieved by lying flat
- Photophobia
- Nausea and vomiting
- Neck stiffness
Treatment Plan:
- Administer analgesics: paracetamol and NSAID’s (if not contraindicated). Avoid opioids wherever possible
- Encourage patient to drink caffeinated drinks or offer caffeine tablets (stocked by pharmacy for this indication)
- IV fluids
- Offer reassurance to patient and relatives as symptoms can be distressing
- When the symptoms are unresponsive to conservative measures, an epidural blood patch may be used to manage/resolve the symptoms

LA toxicity – Intralipid

Guidelines for the Management of Severe Local Anaesthetic Toxicity Signs of severe toxicity
AAGBI Safety Guideline 2009

| 1. Recognition | • Signs of severe toxicity:
|                |   • Sudden alteration in mental status, severe agitation or LOC +/- convulsions
|                |   • Cardiovascular collapse: bradycardia, conduction blocks, asystole and VT may occur
|                |   • Local anaesthetic (LA) toxicity may occur sometime 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
|                |   • Confirm or establish intravenous access
|                |   • Control seizures: 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 CPR using standard protocols
|             | • Manage arrhythmias using the same protocols
|             | • Consider cardiopulmonary bypass if available
|             | Give intravenous lipid emulsion
|             | • 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
|             | **Propofol is not a suitable substitute** for lipid emulsion
|             | Lidocaine should not be used as an anti-arrhythmic therapy
anti-arrhythmic therapy

<table>
<thead>
<tr>
<th>Follow-up</th>
<th>Details</th>
</tr>
</thead>
</table>
| 4         | - 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  
If Lipid has been given, please also report its use to the international registry at www.lipidregistry.org or www.lipidrescue.org |

Recovery from LA-induced cardiac arrest may take >1 h

- Please report all cases to the Irish Medicines Board and the LipidRescueTM
- Local copy of these The Association of Anaesthetists of Great Britain & Ireland 2007 guidelines

Treatment of cardiac arrest with lipid emulsion: (70kg)

- Give an intravenous bolus injection of Intralipid® 20% 1.5 ml.kg-1 over 1 min (100 ml)
- Start an intravenous infusion of Intralipid® 20% at 0.25 ml.kg-1.min-1(400 ml over 20 min)
- Repeat the bolus injection twice at 5 min intervals if necessary (x2 further boluses of 100 ml)
- After another 5 min, increase the rate to 0.5 ml.kg-1.min-1 if necessary (400 ml over 10 min)
- Continue infusion until a stable and adequate circulation has been restored

Continue CPR throughout treatment with lipid emulsion

NURSING MANAGEMENT

Although the incidence of complications during insertion of the epidural catheter and epidural infusion is relatively low, the patient needs to be monitored very closely during the post-operative phase, as complications can occur rapidly. If appropriate action is not taken such complications could potentially result in paralysis or death (Whiteman, 2010).

All the observations must be recorded on the Epidural observation chart. Schedule A observations need to be monitored regularly, whereas Schedule B observations need to be checked only periodically. See below for Instructions for the frequency of observations, these can also be found on the Epidural observation chart.
Epidural prescription

- To be placed on the PRN section of the drug chart
- When a patient is transferred from ITU/DHU a new epidural prescription sticker should be placed onto the ward drug chart prior to transfer

Epidural observations

Schedule A

<table>
<thead>
<tr>
<th>Observation</th>
<th>Parameters</th>
<th>Degree of block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>36-38.0 C</td>
<td></td>
</tr>
<tr>
<td>Pulse</td>
<td>51-90 beats per minute</td>
<td></td>
</tr>
<tr>
<td>Systolic BP</td>
<td>111-219 mmHg</td>
<td></td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>12-20 breaths per minute</td>
<td></td>
</tr>
<tr>
<td>(O_2) Saturations</td>
<td>&gt;95%</td>
<td></td>
</tr>
<tr>
<td>CNS (sedation) response</td>
<td>Alert</td>
<td></td>
</tr>
<tr>
<td>Pain score on movement 0-3 (0-No pain, 3 – severe)</td>
<td>1/3</td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Motor block</td>
<td>Bromage score 1</td>
<td></td>
</tr>
</tbody>
</table>

Motor block should be recorded using the Bromage scale as below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Criteria</th>
<th>Degree of block</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Free movement of legs and feet</td>
<td>Nil (0%)</td>
</tr>
<tr>
<td>2</td>
<td>Just able to flex knees and free movement of feet</td>
<td>Partial (33%)</td>
</tr>
<tr>
<td>3</td>
<td>Unable to flex knees, but with free movement of feet</td>
<td>Almost complete (66%)</td>
</tr>
<tr>
<td>4</td>
<td>Unable to move legs or feet</td>
<td>Complete (100%)</td>
</tr>
</tbody>
</table>
Schedule B

Sensory check
Ethyl chloride spray should be used to identify an area of sensory blockage. The upper and lower levels of the dermatomes for both lateral sides must be recorded on the observation chart. The safe upper limit of a sensory block level should be level to and no greater than T4. Patients who have a sensory block level above T4 should be discussed with the inpatient pain service or an anaesthetist.

Epidural insertion site
Observe for signs of:
- Redness
- Pus
- Tenderness
- Bleeding
- Leakage
- Epidural catheter displacement

Frequency of observations

<table>
<thead>
<tr>
<th>Schedule A- Temperature, Pulse, Blood pressure, Respiratory rate, O₂ saturations, Sedation, Motor block, Pain and Nausea scores</th>
<th>From Recovery (or in HDU/ITU if the patient does not go to recovery)</th>
<th>Every 15 minutes for the first hour. During this time the patient should not be transferred to the ward. Then 30 minutes for the 4 hours unless a change in clinical condition Then hourly thereafter After 24 hours of stable observations, the frequency can be reduced to 4 hourly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post removal of Epidural catheter</td>
<td>Continue as per NEWS score frequency of observation</td>
<td></td>
</tr>
</tbody>
</table>
### Schedule B - *Sensory block and Epidural catheter site*

<table>
<thead>
<tr>
<th>Situation</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery (or in HDU/ITU if the patient does not go to recovery)</td>
<td>Must be evaluated prior to discharge from recovery</td>
</tr>
<tr>
<td>On the ward</td>
<td>Must be checked at the start and finish of each shift. Motor block should be checked prior to mobility</td>
</tr>
<tr>
<td>Post removal of Epidural catheter</td>
<td>Monitor at least once per nursing shift for 48 hours</td>
</tr>
</tbody>
</table>

### Miscellaneous

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following a clinician bolus dose</td>
<td>Schedule A observations should be every 5 minutes for 15 minutes. Schedule B observations should be done before another bolus is required or if a patient is pain managed. Then normal observations can be recommenced.</td>
</tr>
<tr>
<td>Increase in Epidural Infusion rate</td>
<td>Schedule A &amp; B observations to be done an hour after the increase</td>
</tr>
<tr>
<td>Leakage from epidural site</td>
<td>Schedule A &amp; B observations to be done If good pain control, continue epidural If poor pain control, stop epidural and remove catheter and commence alternative mode of pain relief</td>
</tr>
</tbody>
</table>
### Other Observations

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescription must be checked against infusion at the commencement of each shift</td>
<td>To ensure correct solution and rate of infusion</td>
</tr>
<tr>
<td>Catheter insertion site should be dressed with a large clear occlusive dressing over the Lockit epidural fixation device.</td>
<td>To provide a viewing window and protect the insertion site</td>
</tr>
<tr>
<td>Catheter mark at skin level should be checked with each site check (see notes on Epidural observation chart)</td>
<td>To ensure stability of catheter</td>
</tr>
<tr>
<td>Catheter should be taped up and over patient's shoulder</td>
<td>To secure the catheter</td>
</tr>
<tr>
<td>filter should be taped to chest wall on opposite side to any central venous catheter; line (yellow) and filter should be labelled 'EPIDURAL'</td>
<td>To ensure epidural infusion line is not mistaken for a CVC line; To provide clear identification of the epidural line</td>
</tr>
<tr>
<td>Only dedicated epidural pumps to be used (yellow front).</td>
<td>To distinguish the Epidural infusion from any intravenous infusions</td>
</tr>
<tr>
<td>Emergency equipment must be available and in working order.</td>
<td>In case of respiratory depression or severe hypotension or bradycardia</td>
</tr>
<tr>
<td>Naloxone must be available on the ward</td>
<td></td>
</tr>
</tbody>
</table>
Patients receiving epidural analgesia can sit out of bed or walk but this should be done gradually with assistance because of the risk of leg weakness, loss of proprioception or postural hypotension.

The rate of infusion should be recorded on the Barts health epidural and PCA NEWS chart at time of observations and following any change.

Within the first hour of every nursing shift, the named nurse should carry out “pump checks” to verify:

- The pump is turned on and in operational order
- The epidural fluid and rate are appropriate and match those prescribed for that patient and recorded on the charts.
- The pump is of the correct type and the giving set is correctly labelled
- As soon as practically possible, the epidural site and integrity of circuit should also be inspected NMC (2008), NPSA (2007)

Patients must be informed that limb weakness is abnormal with an epidural. Patients should be encouraged to self-report should they experience any leg or arm weakness.

Early diagnosis and treatment of a haematoma is crucial to avoid permanent neurologic deficits. A high index of suspicion should be maintained and careful and repeated clinical examinations are necessary to assess symptoms, especially if there is gradual worsening (Whiteman, 2010). Any discrepancies should be rectified as a matter of urgency.

**Communication and handing over**

**BEFORE LEAVING THE CLINICAL AREA THE HEALTHCARE PROFESSIONAL SHOULD CHECK THAT:**

The drug being administered via the epidural corresponds with the drug prescribed on the medication chart.

- The pump programming has been checked and corresponds with the programme on the epidural assessment chart / prescription
- The epidural is working and patient has a pain score of less than 2/3 at rest and movement
- The epidural site is clean and dry and there is no swelling, redness or tenderness
- There is no leakage around the site
- Check the Bromage score
- The drug chart has been completed correctly; Epidural infusion and concurrent drugs (e.g. paracetamol +/- NSAID's) are prescribed on the regular side of the chart
- Naloxone, Chlorphenamine and an anti-emetic are prescribed on the ‘as required’ section of the drug chart
- **All other opioids and sedatives have been stopped unless indicated otherwise by Anaesthetist/Adult Inpatient Pain Service**
- The epidural assessment chart has been completed correctly, including details of bolus doses administered
- The patient is not excessively sedated
- The patient is not experiencing nausea, vomiting or pruritus
- The patient has IV access
- The line clamps on the Epidural giving set are released and open

**Discontinuing an epidural infusion**

- A regular weak opioid and a PRN strong opioid must be prescribed on the prescription chart and administered prior to discontinuing an epidural infusion. Epidural infusions should not be weaned. This may be in addition to simple analgesics that may be already prescribed. Intramuscular injections must be avoided wherever possible if the patient can tolerate oral fluids, as this is not a stable or predictable route of administration for analgesics
- Continue regular pain assessment after the Epidural has been discontinued
- The pump must be returned clean to theatre department (signed and dated with a sticker attached)
- Pumps must be cleaned as per Trust policy (Environmental cleaning and decontamination of medical and non-medical devices – Infection Control Policy)
- All unused epidural infusion solution containing an opioid must be disposed of following the Trusts Controlled Drugs Policy below:
Destruction or return of controlled drugs

Only CDs which are prepared but not administered or only partly administered (e.g. patient controlled analgesia intravenous preparations that are taken down) or part contents of ampoules that are wasted, should be destroyed on the ward/department in the presence of a second person.

One person must be a registered nurse/midwife. The other may also be a registered nurse/midwife, or a third year student nurse/midwife, nursing assistant, a permanent/trainee ODP/ODA, a pharmacist, pharmacy technician or a doctor.

A record of the wastage and the reason for this must be documented in the Epidural Observation Chart or in the medical notes and signed by the two staff members.

For small amounts of CDs, the CD should be rendered irretrievable by emptying it onto a paper towel before placing in a sharps bin. The emptied vial or ampoule should then also be placed in the sharps bin. When the bin is sent for destruction it should be labelled “mixed pharmaceutical waste and sharps-for incineration”.

For part used bags of Epidural infusion that are no longer required these should be destroyed on the ward or in the clinical area using a denaturing kit, e.g. DOOP kit (available through NHS Logistics).

If a pump lockbox has become damaged or broken and therefore no longer secure to house a controlled drug, it is the responsibility of the ward or department to report this to the Inpatient Adult Pain Service. Any necessary repair or replacement will therefore be charged to that department.

Removal of Epidural catheter

The longer an epidural catheter remains in situ, the greater the risk of infection. If an epidural catheter remains in place for 72 hours following its insertion, the Adult Inpatient Pain Service and Consultant Anaesthetist for the Adult inpatient Pain Service must be informed to ensure appropriate management of the catheter.

An Epidural Catheter can remain in situ for a maximum of 5 days. If it is deemed suitable for an epidural catheter to stay in longer than 5 days, a benefit outweighs risk statement should be placed in the patients’ healthcare records as to why, and the inpatient pain service should be made aware.

Prior to removing the epidural catheter, check the following:

- INR blood test result – needs to be 1.4 or less
- Platelets equal to or greater than 75
If outside of these ranges **DO NOT REMOVE THE EPIDURAL CATHETER** – discuss with Adult Inpatient Pain Service/Anaesthetist. Refer to Appendix 4 in the epidural policy for Recommendations related to drugs used to modify coagulation and regional anaesthesia.

The epidural site should be:
Inspected prior to removal for any bleeding, inflammation or discharge. This must be recorded in the patient’s healthcare records and communicated to the Adult inpatient Pain service/On Call Anaesthetist immediately. In the presence of inflammation or discharge from the epidural site or if infection is suspected, the entry site must be swabbed and the epidural catheter tip must be sent for culture and sensitivity.

The epidural catheter must only be removed by:
- A Healthcare Professional trained and competent in epidural analgesia
- A Pain CNS
- An Anaesthetist

Equipment needed:
- Plastic apron,
- Non-sterile gloves,
- Dressing pack, including sterile gloves,
- Chlorhexidine 0.5% w/v in 70% v/v,
- Small sterile dressing/spot plaster,
- Sterile scissors.

Procedure:
- Ensure the epidural infusion is stopped
- Explain to the patient the procedure
- Put on plastic apron and wash hands thoroughly.
- Position patient comfortably either on their side or sitting upright (depending on type of operation)
- Put on gloves
- Remove the mefix and transparent occlusive dressings
- Gently pull the catheter applying firm constant pressure until the catheter has been pulled out and the blue tip of the catheter is visualised and intact
- Dry with sterile gauze
- Apply small dressing/spot plaster
- Dispose of used equipment according to the waste policy
- The plaster should remain in situ for at least 24 hours after which time the site should have closed over
- Send any swabs or specimens to the laboratory for investigation
- Record the removal of the catheter on the front of the epidural observation chart and in the patient’s health care records
- Patient to be given an Epidural Discharge leaflet
If the site looks infected trim off 5cm from the end of the catheter using sterile scissors. Put into a sterile pot and send for MC&S. Ensure the sample is labelled as an 'epidural tip' and not a ‘catheter tip’ as this may be mistaken by the lab as an intravenous tip. Swab the entry site if it looks red or swollen and send for MC&S.

Any damages/incomplete catheters should be recorded and the Adult inpatient Pain Service/On Call Anaesthetist informed immediately. (The removed portion of catheter should be retained for inspection).
Self-directed study
SELF-DIRECTED LEARNING ACTIVITY 1 – EPIDURAL ANALGESIA / RARE COMPLICATIONS

What types of surgery would epidural analgesia be indicated for?
1. ........................................ 2. ........................................
3. ........................................ 4. ........................................
5. ........................................

What are the contraindications for inserting an epidural?
1. ........................................ 2. ........................................
3. ........................................ 4. ........................................

What are some of the advantages of epidural analgesia?
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

What are the signs and symptoms of a spinal haematoma and epidural abscess?
1. .................................................................................................................................

2. .................................................................................................................................

3. .................................................................................................................................

4. .................................................................................................................................

Following assessment of a patient’s motor block, what signs would warrant reporting to the Adult inpatient pain Service?
1. .................................................................................................................................

2. .................................................................................................................................

3. .................................................................................................................................
SELF-DIRECTED LEARNING ACTIVITY 2 - PHARMACOLOGY

Name the two types of drugs utilised for epidural analgesia?

1. .................................................. 2. ..................................................

How can epidural drugs be administered?

1. .................................................. 2. ..................................................

What effect do local anaesthetics have?

1. ..................................................
2. ..................................................
3. ..................................................

What clinical signs may be observed if local anaesthetic is erroneously injected systemically/intravascularly?

1. .................................................. 2. ..................................................
3. .................................................. 4. ..................................................
5. ..................................................

Why is fentanyl a good opioid to be delivered epidurally?

..................................................

..................................................

List the four potential side effects of opioids given epidurally.

1. .................................................. 2. ..................................................
3. .................................................. 4. ..................................................
Describe the difference between SENSORY deficit and MOTOR deficit.

Under what circumstances would you consider stopping an epidural infusion?

What factors should be taken into consideration prior to removing an epidural catheter?