Management of Suspected Nerve Injury UHL Anaesthesia Guideline

University Hospitals of Leicester NHS
NHS Trust

Trust reference: B12/2024 (formerly C11/2023)

1 Introduction

1.1 Nerve injury following surgery is a multifactorial condition with numerous possible causes. These can include anaesthetic and surgical causes, as well as intraoperative positioning or tourniquet use causing excessive tension or compression on a neural structure.

1.2 Regional anaesthesia refers to local anaesthetics (with possible additional analgesia) placed around nerves and acts to deliberately provide a transient period of sensory loss to ensure perioperative comfort and reduce systemic analgesia requirements. These include both peripheral nerve blocks and central neuraxial blocks. Peripheral nerve blocks include blocks of the upper or lower limbs. Neuraxial blocks involve the nerves of the central nervous system. Neuraxial blocks include spinal anaesthesia (intrathecal injections), caudal anaesthesia, epidurals (continuous infusions or patient-controlled boluses), paravertebral single shot blocks and continuous catheters and interscalene continuous catheters. Other than spinal anaesthetics, the variation of these blocks can be placed in both thoracic and lumbar regions.

1.3 The first presentation of suspected nerve injury may be on the ward several hours after the operative procedure, when it is noticed that the patient has areas of sensory or motor deficit that cannot be explained anatomically when considering the nerve block that has been performed or deficits that persist long past the anticipated duration of the nerve block. Prompt action by nursing and medical staff who recognise this as being abnormal and escalate to appropriate senior care is imperative to limiting the risk to the patient of long- term injury and disability.

2. Guideline Aims

2.1 The aim of this document is to provide support and guidance to healthcare professionals in management of suspected post- operative nerve injuries.

3 Guideline Scope

3.1 This guideline applies to both adult – including obstetric, and paediatric patients in whom nerve injury is suspected following surgery or in non-surgical settings where regional anaesthesia has been administered (obstetrics, pain clinic).

3.2 This guideline applies to all health care professionals working in clinical areas managing patients to guide the initial management of a suspected nerve injury.

3.3 It has been produced to:

- Detail the expected duration of regional anaesthetic blocks and highlights when persistent neurological deficit should be treated as an emergency
- Advise who can be contacted for support
- Serve as an aide memoire for more senior staff when called to review patients

4 Roles and Responsibilities

4.1 CMG Management Team (ITAPS Inpatient Acute Pain Lead Consultant, Lead Nurse, Head of Service, Matrons) are responsible for:

- Ensuring their CMG Staff are made aware of and comply with this guideline
- Address any concerns raised regarding practice through their CMG incident reporting systems

4.2 Healthcare Professional administering regional anaesthesia:

- Ensuring that the ward caring for or receiving the patient back from Theatre has suitably trained staff to care for a patient who has received regional anaesthesia.

4.3 Department Managers and Ward Sisters are responsible for:

- Ensuring all their clinical staff are competent to care for a patient who has received regional anaesthesia

4.4 Acute Pain Team are responsible for:

- Provide education and training for all healthcare professionals on all aspects of Ward Based post regional anaesthesia care
- Support with incident investigation and complaint management

5 Guideline Statements, Standards, Procedures, Processes and Associated Documents

5.1 Suspected Peripheral Nerve Injury

5.2 A nerve injury of the upper or lower limb may be suspected post- operatively if there is new onset of pain, weakness, numbness, paraesthesia or other abnormal sensation. This is especially if the effects are seen in a different anatomical distribution to that expected or to last beyond the usual duration; a single shot peripheral nerve block rarely lasts longer than 48 hours.

5.3 Start with reviewing the patient, with a full neurological history and examination. As part of the history- assess whether the patient has experienced any of the sensations described and other relevant history such as concurrent coagulopathy or if the patient is taking any anticoagulation medication. As part of examination try to identify a sensory level with examination of the motor, sensory and reflex components. Attempt to relate the deficit to a nerve root (dermatomal) or a peripheral nerve distribution. It is also important to observe the skin for any colour changes, swelling and check for the presence of peripheral pulses. Identify whether any further injury may have occurred following surgery.

5.4 Review all the intra- operative documentation and the anaesthetic chart. This can provide further information such as whether there was any potential surgical neuronal injury, anaesthetic nerve blocks performed, patient positioning and tourniquet duration and inflation pressure which may help explain the patient's presenting pathology. Use this to help ascertain the possible surgical and anaesthetic causes such as nerve transection or sutures/ clips/ screws that may have been inserted into the nerve itself or excessive traction on the nerve or compartment syndrome or compression from suture/ bone fragments/ haematoma.

5.5 It is important to contact the senior surgical team and anaesthetic team or acute pain team (in hours). With senior surgical support, consider loosening bandages, splitting the Plaster of Paris and gentle repositioning of the limb.

5.6 At this stage it must be ascertained whether this is a lesion that requires urgent intervention. A lesion is urgent if motor function is affected, if symptoms are complete, there is a progressive neurological deficit or the area of deficit is painful to the patient. If the lesion is identified to be urgent, it is important to seek urgent senior surgical support, with escalation possibly leading to:

- Surgical decompression/ reconstruction
- Neurology consultation
- Nerve conduction tests and EMG
- Urgent imaging- US/ MRI (advised by radiology to be done after surgical and/ or neurology review)

5.7 With mild or resolving symptoms or a sole persistent sensory deficit, this is deemed a non urgent lesion. Determine whether this could be block related or surgery related by if the distribution consistent with peripheral nerve block performed. Surgery related factors can include positional pressure related nerve injury, damage to the nerve at the surgical site, or damage due to prolonged/ excessive tourniquet time. If it is likely to be a block related lesion, or there is a deficit after a likely surgery related lesion offer re-assurance to the patient and explain what has happened. It is imperative to protect the limb (sling/ splint) and to advise care for the numb areas. The patient should be reviewed in 2- 4 weeks; advise return earlier if the symptoms progress or change. This follow up is through the anaesthetic team, with consideration of referral to the neurology team. Early involvement of the Chronic Pain team should be considered, especially if there is allodynia or hyperalgesia present.

5.8 <u>Suspected Neuraxial Injury</u>

5.9 If following any of the neuraxial blocks, there is onset of new sensory or motor deficit, a compressive lesion must be suspected. If any patient develops severe backache of sudden onset, particularly at the level of needle insertion, suspicion should also be raised. Urgent management is essential.

5.10 The compressive lesion could be either a haematoma or abscess which compresses the neurological structures within the confined space of the vertebral canal, causing irreversible neurological damage if left untreated. These are an exceedingly rare occurrence. They are usually associated with anticoagulation or an immunocompromised state, however haematomas can also occur sporadically. An abscess is probably more likely with a prolonged epidural catheterisation and may present as meningitis like symptoms (pyrexia, photophobia, neck-stiffness). Importantly, compressive lesions can occur while an epidural is in situ or after removal of the catheter.

5.11 This must be differentiated from the effects of local anaesthetic of the block. An isolated spinal anaesthetic has usually worn off 4- 6 hours following administration. There should be no residual block after 12 hours. Repeated dose epidurals and peri- neural infusions are less predictable and regression depends on length of infusion and drug concentration, however the effects of local anaesthetic of the block are generally seen to resolve within an hour of the infusion being stopped.

5.12 A motor deficit is a unilateral or bilateral motor block associated with delivery of local anaesthetic to specific nerve roots supplying the leg. The Bromage score can be used as an objective measure of power in the lower limbs:

Table 1 – Bromage Scale (Grade Criteria Degree of Block):

Score	Criteria	Degree of motor block
I	No block; full movement of knees and feet	Nil (0%)
II	Just able to flex knees; free movement of feet	Partial (33%)
III	Unable to flex knees, but with free movement of feet	Almost complete (66%)
IV	Complete block; unable to move legs or feet	Complete (100%)

A motor block results in a Bromage Score > 1.

5.13 With a persisting motor block compressive lesions should be suspected. This can present as:

- Increasing unilateral or bilateral leg weakness
- Leg strength Bromage score of 3 or 4
- New onset back pain, swollen or pus at site

5.14 For post neuraxial block monitoring, UHL to use a standardised monitoring for recognition of complications. The UHL Post Spinal Anaesthetic Monitoring chart SOP (appendix 1) is to be completed hourly. If the block is not recessing as expected, or there is out of character weakness or numbness persisting, or there are new symptoms after motor power and sensation had returned- consider a spinal haematoma. If patient remains to have a Bromage score of greater than 1 by the 4th hour after a spinal anaesthetic was performed, this is to be escalated urgently (Table 2) as advised per Algorithm 2.

5.15 All patients with epidurals in situ follow the UHL “Ward based Epidural Form” and “Ward Based Epidural Continuation Form” to have level of block, Bromage score and any numbness assessed regularly. It is completed as follows:

- 1/4 hourly observations for the first hour (Theatre Recovery), or after an epidural bolus
- Hourly observations for the first 24 hours
- Hourly thereafter

5.16 There are not currently any forms for assessing the other infusions, however caution is advised by gaining senior support early (Table 2).

5.17 Management of epidural infusion:

- Stop the epidural infusion to see if there is a change in the Bromage Score through cessation of local anaesthetic
- Contact the Acute Pain Team (in hours) or Emergency Anaesthetic Team (Table 2). Depending on duration the catheter has remained in and patient’s other parameters (suggestion of infection), they may advise to remove catheter. In this instance it is important to send off samples for microbiology and cover the patient with antimicrobial cover by contacting UHL microbiology team for advice.
- Monitor Pain and Bromage Score every 30 minutes for 1 hour

5.18 If there is return of motor function recommence epidural as soon as there is improvement in Bromage Score at a lower infusion rate (follow UHL “Epidural Analgesia Post Operative Ward Based For Non Obstetric Patients UHL Anaesthesia Policy” Trust Reference: B20/2003). If the patient is not comfortable or the catheter has been removed- escalate to the Acute Pain Team/ Anaesthetic team for alternative analgesia plan.

5.19 If there is NO return of motor function and no improvement of strength of legs is seen THIS IS URGENT- assume a compressive lesion, and manage following Algorithm 2.

5.20 The management for a suspected compressive lesion following any neuraxial block, now follows:

- Call the Surgical Registrar and the on-call Anaesthetic Team (Table 2) and inform them you think the patient may have a haematoma, they must review the patient in the next hour.
- Seek immediate advice from Spinal Consultant Surgeon or Orthopaedic Registrar On Call.
- Urgent MRI imaging is required; can be performed at all three sites out of hours. MRI to be performed within a 4- 6 hour period and should be done without delay. To be booked by the Surgical Specialty Registrar or Anaesthetic Registrar. To contact the oncall radiology Registrar to avoid delay. Agreement with UHL consultant radiologists; MRI imaging for suspected post neuraxial procedural haematoma to be performed within 4-6 hours.
- Urgent blood samples for clotting screen and FBC and CRP should also be completed

5.21 A haematoma or abscess has to be evacuated within 8 hours of onset of symptoms for patient to have the best chance of recovery of neurological function. DO NOT DELAY

5.22 It is important to note that neurological symptoms can also develop after an epidural catheter has been removed. In the case of abscesses, this can be up to several weeks afterwards. In this circumstance, to manage this with immediate escalation and imaging, as with spinal anaesthetic.

5.23 Ensure a critical incident form/ DATIX is completed.

5.24 As with peripheral nerve blocks, nerve root injuries can also be seen during neuraxial blocks. This can present as a dermatomal weakness or numbness. This is separate from a haematoma or abscess formation. If a compressive lesion is not suspected, and instead trauma is to a nerve root- then the management runs similar to peripheral nerve injury (algorithm 1).

5.25 **Guideline Standards and Procedures**

See algorithms on following pages:

Algorithm 1 Management of Suspected Injury Post Peripheral Nerve Block

Algorithm 2 Management of Suspected Injury Post Neuraxial Block (Suspected Space Occupying Lesion post spinal / epidural / paravertebral / interscalene blocks) with consideration for catheter in situ

Table 2 Contact points for UHL Anaesthetic Team

Algorithm 1 - Suspected Injury Post Peripheral Nerve Block

New onset neurological deficits:
- Paraesthesia (numbness/ tingling) or other abnormal sensation
- Weakness
- Unexplained excessive pain

OR

Effect of block lasting LONGER than expected (>48 hours after single peripheral nerve block injection)

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Inform responsible Surgical and on- call Anaesthetic teams/ Acute Pain Team (Table 2)

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Clinical examination by responsible Surgical team
- Full assessment of nerve function (motor, sensory, reflexes)
  - Attempt to relate deficit to nerve root (dermatomal) or a peripheral nerve distribution
- Observe skin for colour changes, swelling
- Check pulses

Review surgical and anaesthetic records

Note:
- Intra- operative patient positioning
- Tourniquet duration and inflation pressure
- Evidence of potential surgical neuronal injury
- Anaesthetic interventions

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Consider causes

Surgical
- Nerve transection
- Excessive traction
- Sutures/ clips/ screws on nerve
- Positioning

Anaesthetic
- Nerve block

Consider loosening bandages, splitting Plaster of Paris and gentle repositioning of limb

Positioning – common areas of entrapment include
- *Ulnar nerve*
- *Common Peroneal Nerve*
- *Lateral Cutaneous Nerve of Thigh*

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Is motor function affected and/ or symptoms progressive and/ or deficit painful

- Yes →
- No →

Urgent lesion

Yes → Complete or progressive neurological deficit or presence of motor deficit

↓

Is the distribution consistent with peripheral nerve block performed?

- Yes →
- No →

Yes → **Likely block related lesion**
Consider compression of nerve e.g. haematoma

No → **Likely Surgery related lesion**
Consider:
- Nerve trauma (cut, stretch)
- Compartment syndrome
- Compression (suture/ bone fragment/ haematoma)

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- Seek urgent Senior Surgical consultation
  - Surgical decompression/ reconstruction may be required
- Consider urgent imaging- US/ MRI
- Neurology consultation
  - Consider nerve conduction tests and EMG

No → **Non urgent lesion**
Mild or resolving symptoms or persistent sensory deficit

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Is the distribution consistent with peripheral nerve block performed?

- Yes →
- No →

Yes → **Likely block related lesion**
- Reassure patient
- Protect the limb (sling/ splint, advise care for numb areas)
- Review in 2- 4 weeks (advise return earlier if symptoms progress or change)
- Consider early involvement of Chronic Pain team (if allodynia/ hyperalgesia present)
- Neurology team referral

No → **Likely surgery related lesion**
Consider:
- Positional pressure related nerve injury
- Damage to nerve at surgical site
- Damage due to prolonged/ excessive tourniquet

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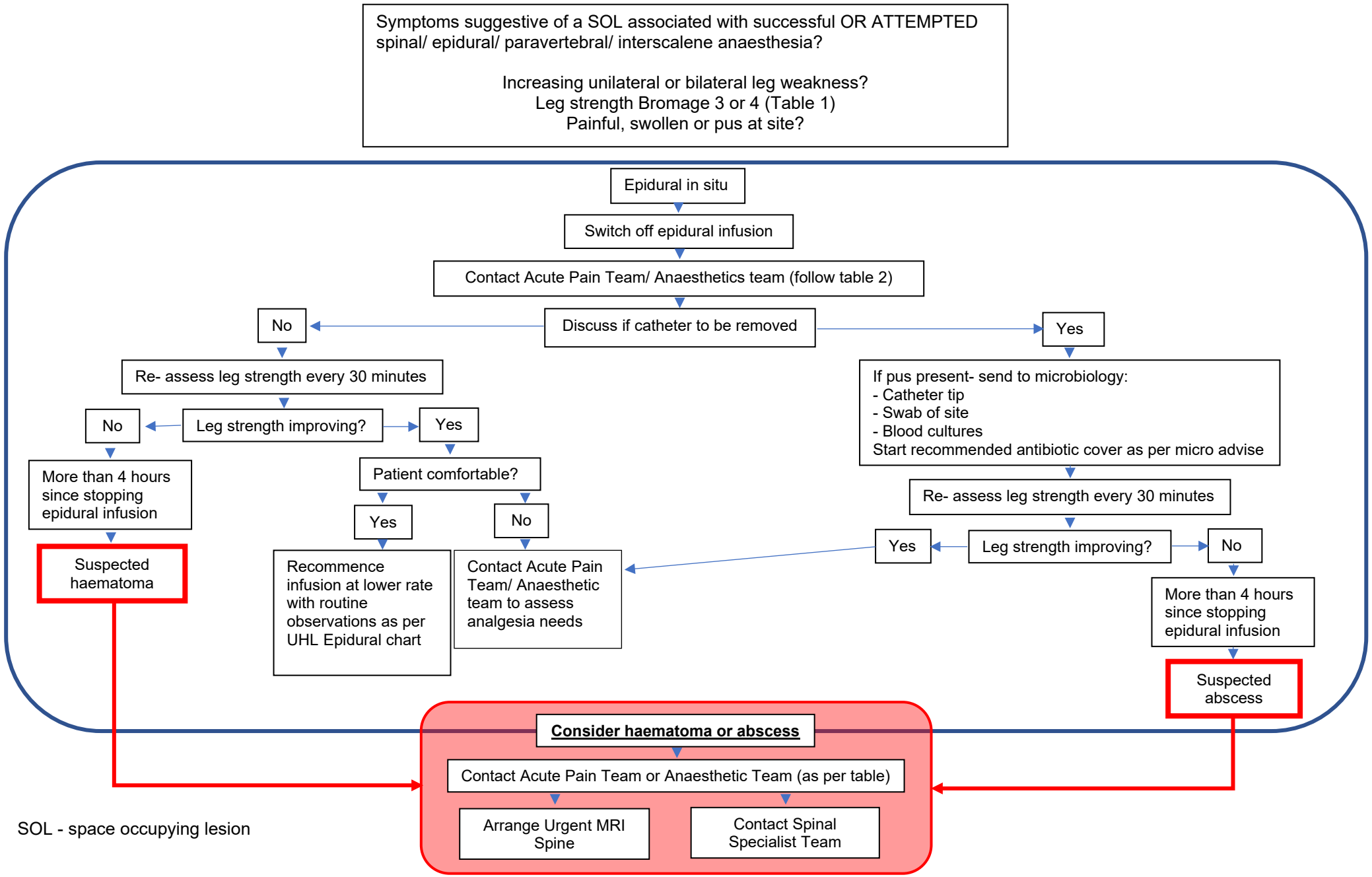
Deficit?
- Yes →
- No → No further follow up required

PNB - peripheral nerve block EMG - electromyography

Algorithm 2 - Suspected Injury Post Neuraxial Block



SOL - space occupying lesion

Table 2 - Contact points

Leicester Royal Infirmary:

- In Obstetrics- Obstetric anaesthetic team (bleep – 4127)
- In hours:
  - Acute Pain team (extension 16640)
  - Anaesthetic on call team:
    - Emergency Theatre Consultant Anaesthetist / SpR (bleep – 4058 / Theatre 6 extension - 15348)
- Out of hours:
  - Anaesthetic on call team:
    - Theatres Anaesthetic SpR (bleep - 4058)
    - 2nd oncall Anaesthetic SpR (bleep – 6104 / mob – 07971626267)
    - Oncall General Duties Consultant Anaesthetist (switchboard)

Leicester General Hospital:

- In Obstetrics- Obstetric anaesthetic team (bleep – 3481)
- In hours:
  - Acute Pain team (extension 14157)
  - Anaesthetic on call team:
    - Theatres Support "Emergency Troubleshooter" Consultant Anaesthetist (bleep 3200)
    - Emergency Theatre Consultant Anaesthetist/ CT (bleep – 3226 / Theatre 2 phone - 14503)
- Out of hours:
  - Anaesthetic on call team:
    - 2nd oncall Anaesthetic/ HDU SpR (bleep - 3200)
    - Anaesthetic CT (bleep - 3226)
    - Oncall General Duties Consultant Anaesthetist (switchboard)

Glenfield Hospital:

- In hours:
  - Acute Pain team (extension 13662)
  - Anaesthetic on call team:
    - 2nd oncall Anaesthetic SpR (bleep - 2617 / mob – 07773667158)
    - Emergency Theatre Consultant Anaesthetist/ Support Consultant Anaesthetist (Theatre 1 phone – 13541)
- Out of hours:
  - Anaesthetic on call team:
    - 2nd oncall Anaesthetic SpR (bleep - 2617 / mob – 07773667158)
    - Oncall General Duties Consultant Anaesthetist (switchboard)

6 Education and Training

6.1 Healthcare Professionals required in the undertaking the monitoring of ward based post-neuraxial and nerve block analgesia must:

- Hold a valid certificate of competence
- Successfully complete the Trust approved competency- based training and assessment programme in the form of Acute Pain Study Day in conjunction with the Acute Pain Service

6.2 The Acute Pain Management team provides formal competency- based training for UHL staff:

- A formal lecture and tutorial session provided on a regular basis. This provides standardised teaching across the trust and enables practice at any of the sites.
- Assessment: staff that undergo training will be formally assessed and judged competent in the care of patients with epidural analgesia.
- Ward Sisters are responsible for ensuring that sufficient numbers of their staff are trained and assessed, so that appropriately trained nurses are available for every shift.

6.3 Healthcare Professionals new to the Trust or employed through an agency must provide evidence of training and summative practical assessment to practice within this Trust. These Healthcare Professionals must then complete an equipment competency.

7 Process for Monitoring Compliance / Monitoring and Audit Criteria

7.1 Auditing of appropriate completion of Epidural and Post spinal Monitoring Charts:

- Epidural Chart – to be done by the ward nurse who disposes of it using the Epidural Chart
- Post Spinal Anaesthetic Chart – to be done by ward staff
- Information recorded on a database by the Acute Pain Team

7.2 Ensure clinical staff are competent to monitor patient's post spinal or with epidural and hold a valid competency certificate/ assessment

Element to be monitored	Lead	Tool	Frequency	Reporting arrangements	Lead(s) for acting on recommendations	Change in practice and lessons to be shared
Competency Assessments for all users	Acute Pain Nurse Specialist/ Relevant Clinical Area Managers	Audit is incorporated into HELM to check for compliance after the Acute Pain Study Day	The registers from the Acute Pain Study Day to be monitored against HELM every six months to monitor compliance	Senior Acute Pain Nurse Specialist to liaise with relevant Clinical Area Managers if issues raised around compliance	Senior Acute Pain Nurse Specialists raise issues with Clinical Area Managers and share best practice with the CMG Management teams for their action	Update study sessions, dissemination of information through clinical area management

7.3 Lead for this Section:

- Acute Pain Team collect and report on the data to the UHL Acute Pain Operational Group chaired by Lead Clinician for Acute Pain.
- Acute Pain Nursing Team to monitor nursing competency through HELM.

8 Equality Impact Assessment

8.1 The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.

9 Supporting References, Evidence Base and Related Policies

1 The National Institute of Academic Anaesthesia. *NAP3: Major Complications of Central Neuraxial Block in the United Kingdom*.

https://www.nationalauditprojects.org.uk/nap3_home?newsid=464

2 Regional Anaesthesia UK. *Algorithm for management of nerve injury associated with regional anaesthesia.* April 2015.

http://www.ra-uk.org/images/Documents/NERVE_INJURY_management_algorithm_RAUK_April2015.pdf

3 Regional Anaesthesia UK. *Peripheral Nerve Block Follow Up and Initial Management Of Postoperative Unexpected/ Persistent Neurological Dysfunction*

https://www.ra-uk.org/images/Documents/DEFINITIVE_RAUK_BOA_guidelines.pdf

4 Obstetric Anaesthetists' Association. *Epidural haematoma and abscess – Algorithm for management of leg weakness with epidural analgesia*

https://www.oaa-anaes.ac.uk/assets/_managed/editor/File/Guidelines/Epidural%20haematoma/leg_weakness_withepidural_Tuckey_bath.pdf

5 New York Society of Regional Anaesthesia. *Practical Approach to Management of a Patient with Neurological Deficit after Peripheral Nerve Block*. 2013.

http://www.nysora.com/updates/3106-neurologic-complications-of-peripheral-nerve-blocks.html

6 Epidural Analgesia Post Operative Ward Based For Non Obstetric Patients UHL Anaesthesia Policy Trust Reference: B20/2003. Version 5 (2019)

Key Words

Regional anaesthesia, Nerve Block, Epidural, Spinal, Neurological Deficit, Nerve Injury, Neuropraxia, Peripheral nerve block, Acute pain service, Space Occupying Lesion, Intrathecal Haematoma, Epidural Haematoma, Epidural Abscess, Bromage Score

10 Process for Version Control, Document Archiving and Review

10.1 The Inpatient Pain Operational Group is responsible for the review of this document every three years.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr Puspinder Kaur – Consultant Anaesthetist Dr Sunita Sanghavi – Consultant Anaesthetist	**Lead Committee or Executive Lead** Medical Director
Date of Next Review by Approval Committee: February 2026	**Approved Policy and Guideline Committee on 16 February 2024** **Details of Changes made during review: addition of appendix 1**

Appendix 1 – Post Spinal Anaesthetic Monitoring Chart Standard Operating Procedure

Post Spinal Anaesthetic Monitoring Chart

Spinal anaesthetic details				
Date:		Time of spinal:		
Injection level:				
Drug 1:		Dose:		
Drug 2:		Dose:		
Drug 3:		Dose:		
Initial Bromage score - Hour 0				
Time:	Score left leg		Score right leg	
Anaesthetist name:		Anaesthetist sign:		

A score of greater than 1 or inability to perform a straight leg raise <u>after 4 hours</u> may indicate the onset of complications, specifically epidural haematoma or abscess- follow guidelines and ALERT ANAESTHETIST IMMEDIATELY

On arrival to recovery – hourly monitoring

Date	Time	**Bromage score**		Print name and sign
		left leg	right leg	

On arrival to ward/ dept – hourly monitoring

Date	Time	**Bromage score**		Print name and sign
		left leg	right leg	

4 hours post insertion – if score greater than 1 inform anaesthetist
Once score 1 discontinue monitoring- ALERT ANAESTHETIST IF ANY DETERIORATION

Date	Time	Able to Straight leg raise?	
		left leg	right leg
	HOUR 4	Yes / No	Yes / No

4 hours post insertion – if unable to perform straight leg raise inform anaesthetist

Bromage Scale		
Score	**Criteria**	**Degree of motor block**
I	No block; full free movement of knees and feet	Nil (0%)
II	Just able to flex knees; free movement of feet	Partial (33%)
III	Unable to flex knees, but with free movement of feet	Almost complete (66%)
IV	Complete block; unable to move knees or feet	Complete (100%)