



## Guideline

# Safety guideline: neurological monitoring associated with obstetric neuraxial block 2020

A joint guideline by the Association of Anaesthetists and the Obstetric Anaesthetists' Association

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## Summary

Serious neurological lesions such as vertebral canal haematoma are rare after obstetric regional analgesia/ anaesthesia, but early detection may be crucial to avoid permanent damage. This may be hampered by the variable and sometimes prolonged recovery following 'normal' neuraxial block, such that an underlying lesion may easily be missed. These guidelines make recommendations for the monitoring of recovery from obstetric neuraxial block, and escalation should recovery be delayed or new symptoms develop, with the aim of preventing serious neurological morbidity.

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## Recommendations

- 1 During labour, the anaesthetist should be alerted if a woman is unable to straight-leg raise (being able to raise the heel off the bed against gravity, even if not sustained). Although minor degrees of motor block are common, even with modern low-dose techniques, any woman with profound motor and sensory block should be assessed by the anaesthetist and where there is concern, management should be further escalated.
- 2 During the recovery phase after a spinal anaesthetic or epidural top-up for a procedure, straight-leg raising should be used as a screening method to assess motor block. If the woman is unable to straight-leg raise at 4 h from the last dose of epidural/spinal local anaesthetic, the anaesthetist should be called to assess whether the woman's care should be escalated to investigate the possibility of reversible causes of neurological injury.
- 3 Women should be informed of the likely timescale for resolution of their neuraxial block and encouraged to alert staff should this be delayed.
- 4 Each maternity unit should have a guideline/policy in place to guide the escalation of care, depending on local resources/referral pathways. There should also be a guideline/policy for the assessment and management of postpartum women who present with neurological deficit after discharge from hospital.

## What other guidelines are available on this topic?

The Royal College of Anaesthetists' Faculty of Pain Medicine has published guidance on management of continuous epidural analgesia, with input from several multispecialty and multidisciplinary groups – but these specifically exclude the obstetric setting [1]. This guidance already sets out the need for regular sensory and motor block assessment in the non-obstetric population. The National Institute of Health and Care Excellence (NICE) guidance on intrapartum care refers to the monitoring of women receiving epidural analgesia, but only includes monitoring of sensory block, which should be performed hourly [2]. Recent guidance on care in labour, published by the Royal College of Midwives, defers to other guidance [3].

## Why was this guideline developed?

Neuraxial analgesia/anaesthesia is widely used in the obstetric setting. Serious neurological complications are rare, but early detection is important to reduce or prevent permanent harm. This document has been produced to guide the neurological monitoring of obstetric patients who

receive neuraxial analgesia or anaesthesia, in order to support earlier detection and minimise harm.

## How and why does this publication differ from existing guidelines?

Other guidance on management of neuraxial block or intrapartum care either do not include the obstetric setting, or do not include or focus on neurological monitoring. These guidelines cover the period from establishment of neuraxial block until its resolution and include the management of women whose neuraxial blocks do not resolve in a timely manner.

## Introduction

Neuraxial analgesia is widely available for pain-relief during labour, and neuraxial anaesthesia is the preferred choice for operative delivery and other obstetric procedures [4]. Like all interventions, there are risks associated with obstetric neuraxial blockade, and these are well characterised (see <http://www.labourpains.com/home>). Unexpectedly dense or persistent motor or sensory block may indicate serious underlying complications such as unintended intrathecal placement of an epidural catheter or very rarely, neurological pathology. The Cardiac Arrest in Pregnancy Study identified extensive regional block as a leading anaesthetic cause of maternal cardiac arrest [5]. Although most complications are relatively minor, amongst the most feared are rare, serious neurological ones such as vertebral haematoma, infection and arachnoiditis [6, 7]. In particular, neurological impairment caused by an acute space-occupying lesion may become permanent if not detected and managed rapidly – within 8–12 h in the case of epidural haematoma [8–10].

Detection of serious complications after obstetric neuraxial blockade is problematic, first, due to their rarity compared with the large number of uncomplicated women passing through maternity units, and second, due to many other things going on at the same time that might distract attention, such as obstetric/midwifery intrapartum care (in the case of epidural analgesia in labour) and standard postpartum care including looking after a new baby. The mounting pressure on hard-pressed maternity units is another increasingly worrying factor [11]. A recent UK survey, focusing on monitoring of recovery after neuraxial anaesthesia, found that practice varied widely across the UK, with only 56% of respondents' units having a formal policy in place and many of these not undertaking any neurological assessment before the first postoperative day after delivery. There was also a very variable response to an

abnormally prolonged block, with most units not having a protocol in place [12].

Recent national guidance on intrapartum care includes only very limited recommendations for the monitoring of women receiving neuraxial analgesia during labour [2, 3], although guidance on the management of patients receiving epidural analgesia in hospital wards specifically excludes obstetrics [1]. The Association of Anaesthetists and Obstetric Anaesthetists' Association therefore convened a Working Party to consider neurological monitoring associated with neuraxial block in obstetrics, and to issue guidance to ensure that obstetric patients who have had a neuraxial block are managed to the same standard as patients receiving neuraxial blocks for other indications.

## Definitions and scope

*Neuraxial analgesia* or *neuraxial anaesthesia* here refer to any epidural, spinal or combined spinal–epidural (CSE) performed for an obstetric indication. The latter may include analgesia during labour, or analgesia/anaesthesia for operative delivery or for other obstetric indications, for example, insertion of a cervical suture in the antenatal period or removal of a retained placenta after delivery – irrespective of where the procedure takes place.

This document aims to provide guidance on the monitoring and management of recovery from obstetric neuraxial block, rather than acute complications such as extensive regional block, hypotension or local anaesthetic toxicity. The issue of postpartum neurological deficits presenting after resolution of a neuraxial block will also be covered briefly.

For women in hospital, the most likely acute condition causing unexpectedly extensive (high or total) neuraxial block is unintended intrathecal or subdural block [13], although the most likely time-critical serious condition preventing full recovery from neuraxial block is a vertebral (usually epidural) haematoma [7, 14]. For those presenting after discharge, epidural haematoma or abscess may be involved (an abscess typically taking several days to develop).

## Guidance

### **Analgesia during labour**

The mainstay of epidural analgesia during labour is with 'low-dose' solutions combining low concentrations of local anaesthetic and an opioid [15], regardless of the method of delivery to the epidural space, for example, intermittent bolus, continuous infusion, etc. Although frequently referred to as 'mobile' epidurals, the degree of mobility that a woman experiences can be highly variable. Significant motor block can develop with 'low-dose' regimens,

although less commonly than with traditional, higher-dose regimens [16]. It is, however, unusual for the mother to develop profound, progressive, combined motor and sensory block with modern low-dose techniques.

The Royal College of Anaesthetists' third National Audit Project highlighted that leg strength may be used as a critical monitor of spinal cord health, and this is recommended (above sensory block monitoring) for assessment in non-obstetric patients receiving continuous epidural analgesia [17]. The Working Party recommends that the same strategy should be applied to obstetric patients. The NICE guideline on intrapartum care makes recommendations about monitoring when an epidural block is established, stipulating that the sensory block should be assessed hourly and in conjunction with monitoring other cardiovascular parameters [2]. The Working Party recommends that the degree of motor block is also monitored alongside sensory block. Due to the limited time available to salvage serious lesions, and the fact that midwifery staff are already required to monitor the sensory block hourly to be compliant with NICE guidance, hourly motor block monitoring is therefore recommended. (This should be applied with a degree of flexibility, e.g., if a low-risk woman with uncomplicated epidural analgesia, with no motor block when assessed at 02:00, is due for her next vaginal examination at 03:30, it would be reasonable to defer the 03:00 test of motor block until 03:30, just before the vaginal examination, to allow her to catch up on sleep). Furthermore, as a simple screening test, given the relatively common occurrence of minor degrees of motor block in labour with epidural analgesia, straight-leg raising (being able to raise the heel off the bed against gravity, even if not sustained) is recommended as the method of monitoring during labour. The anaesthetist should be alerted if a woman is unable to straight-leg raise; this may not require further escalation/management depending on the individual circumstances of the case (e.g. other features of the block, nature and timing of epidural top-ups, etc.) but should be kept under review.

In most patients, unexpected extensive block during labour is caused by a misplaced epidural catheter. Where concern exists about the degree of motor and sensory blockade in a woman receiving epidural analgesia in labour, the anaesthetist should be called to assess the patient; immediate management may involve:

- discontinuing the epidural infusion/withholding of the next top-up;
- removing/resiting the epidural, depending on local policy and considering other risk factors (see below) and

bearing in mind the need to provide analgesia during the rest of labour.

After delivery, observations to ensure resolution of an extensive neuraxial block should follow the same pathway as that described below.

**Anaesthesia for procedures**

Neuraxial anaesthesia for an obstetric indication most frequently involves spinal/CSE anaesthesia or extension of an existing labour epidural with local anaesthetic drugs of a higher concentration and volume than that used in labour. In these situations, the presence of a significant motor block may be used, along with height of block, as an indicator of adequate anaesthesia. It is during the recovery from such blocks – which may take several hours – that existing or developing serious neurological complications may be masked, the motor block being put down to the neuraxial anaesthesia.

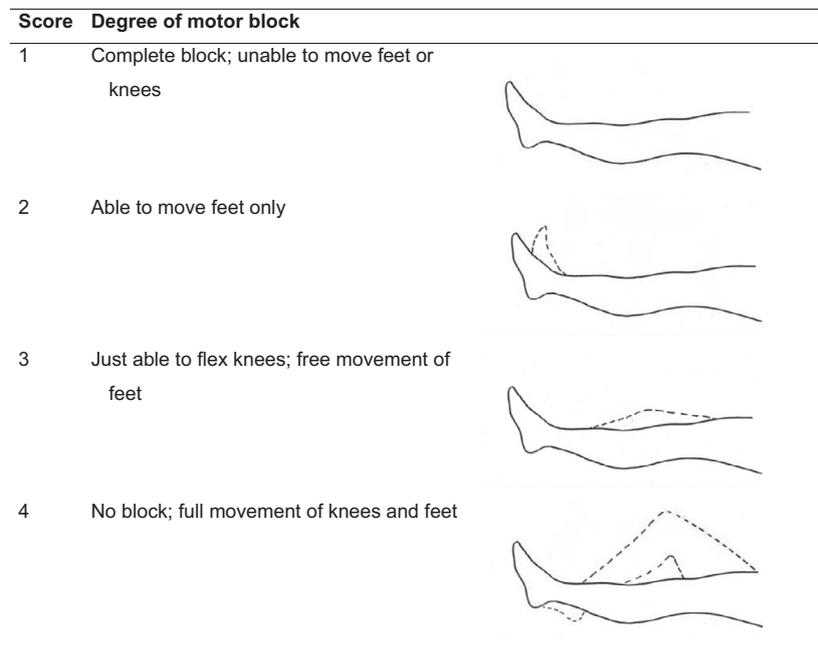
Recovery of sensorimotor block after caesarean section has been reported as typically taking 2–3 h after intrathecal bupivacaine [18, 19] and 3–5 h after epidural bupivacaine and/or lidocaine [19–21], although definitions vary considerably, and recovery can be highly variable. Furthermore, unexpectedly and dramatically prolonged blocks (up to 24–48 h) may occur rarely in otherwise routine cases and with no explanation found [22]. As a screening tool, the Working Party recommends that all women

recovering from neuraxial anaesthesia should be tested for straight-leg raising at 4 h from the time of the last epidural/spinal dose of local anaesthetic. This assessment can be aligned with other routine post-delivery observations. If a woman is unable to straight-leg raise at 4 h, the anaesthetist should be called, to make a full assessment. In addition, women should be informed of the likely timescale for return of motor and sensory function, and encouraged to report any delay.

If a more detailed method of assessment of motor block is required, for example, to allow formal documentation and mapping of the resolution or persistence of motor block, the Bromage scale is recommended as an existing standardised method [23], as for the non-obstetric population [1]. However, it is important that the correct scale is used (Fig. 1) as there is evidence of frequent misinterpretation/incorrect application in clinical practice [12, 17, 24].

**Escalation**

An epidural haematoma can cause irreversible neurological damage if not evacuated within 8–12 h [8–10]. Delayed detection of symptoms and signs may be exacerbated by delay in clinical diagnosis and referral for appropriate imaging, especially in a busy unit and out of hours [22]. The inability to straight-leg raise at 4 h might not necessarily suggest any underlying pathology, for example, if there has been steady resolution of sensory and/or motor block

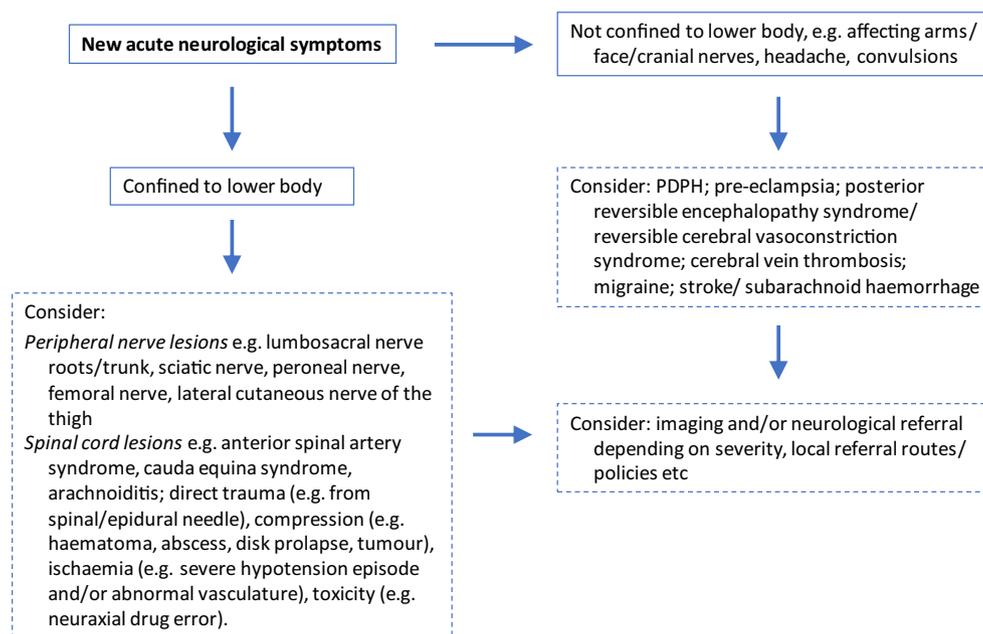


**Figure 1** Bromage scale for motor block resulting from neuraxial anaesthesia. Redrawn from [23].

**Table 1** Risk factors for development of epidural haematoma or abscess. They may be present before neuraxial block or develop after epidural/spinal instrumentation (including catheter removal).

Increased risk of haematoma	Coagulopathy including thrombocytopenia; anticoagulant drugs Abnormal vasculature/vessel fragility. Possibly <sup>a</sup> multiple attempts at neuraxial block with bleeding.
Increased risk of abscess	Immune suppression or deficiency. Sepsis. Possibly <sup>a</sup> prolonged insertion/siting of block/compromise of sterility.
Increased risk of delayed diagnosis	Prolonged immobility for surgical/other reasons, preventing detection of weakness. Language/communication difficulties. Busy unit; multiple changes of staff with reduced/poor continuity ± handover.
Increased risk from lesion	Pre-existing spinal pathology for example, spinal stenosis.

<sup>a</sup>n.b. anecdotal; no evidence base.

**Figure 2** Summary of postpartum neurological deficits. See also [28–31].

during that period, albeit without meeting this target, especially if large doses of local anaesthetic have been used. However, if there is concern over the extent of the neuraxial block, for example, no resolution of block or increasing motor block, the anaesthetist should consider urgent escalation of care including urgent imaging of the spine. This may require formal neurological, neurosurgical or radiological referral before it can be done, depending on local arrangements [12, 22], and each unit/Trust should have guidelines/policies in place to enable rapid escalation and referral in order to achieve this, including outside office hours. Such guidelines/policies should reflect acceptance by all teams that prompt investigation of women with delayed recovery after neuraxial block will, by necessity,

include a significant number of women in whom no pathology is found and who go on to make a full recovery, with no cause found for the delay.

Magnetic resonance imaging (MRI) of the spine is the preferred imaging modality for suspected cases [25–27], even though computerised tomography has been advocated as it may be more easily accessible, especially out of hours [22]. Policies should therefore account for the ease of local access to MRI and the possible need for further referral.

### **Risk factors**

It is impossible to create a diagnostic algorithm that will reliably distinguish a prolonged block that is a 'normal

**Table 2** Presentation of epidural abscess or haematoma after resolution of initial block [28].

Feature	Comments
Fever	Present in only about one third of patients (abscess).
Localised back pain	In most patients, often the first symptom. May be described as deep-seated but can be associated with localised tenderness.
Radiculopathy	May cause radiating or lancinating pain, including chest or abdominal pain.
Spinal cord syndromes	Typically paraparesis with prospective progression to paraplegia (lesions at the level of the cauda equina cause symptoms consistent with cauda equina syndrome rather than a spinal cord syndrome). May be a relatively late presentation and investigations should not be delayed if other features suggest the possibility of abscess or haematoma.

variant' from one that represents a serious complication, because the latter is so rare and the two extremes have overlapping features. The severity of the condition, however, requires that it should be at least considered in any patient meeting the criteria defined above. Crucial to the appropriate decision making in each case is the consideration of associated risk factors, such that a similar clinical presentation might lead to different management pathways depending on their presence or absence (and combination). These are summarised in Table 1.

### Women presenting postpartum with neurological deficits

This topic has been covered in detail elsewhere [28–31] so is not discussed in depth here. Most neurological problems after delivery should be detected before a woman leaves hospital. However, it is possible that a woman develops or becomes aware of abnormal neurology after discharge from hospital [7]. All women who present with acute motor or sensory loss after delivery require urgent review, particularly if there is associated headache (see Fig. 2). Hospitals should have local protocols to facilitate the re-admission of women postpartum to enable necessary investigation and treatment, whether they present to maternity services, the emergency department, or via other routes. There is potentially a broad differential diagnosis of abnormal neurology postpartum (Fig. 2). It is essential that hospitals have strategies to identify reversible pathology and clear referral pathways to ensure effective treatment (Table 2).

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\*Within MBRRACE-UK: Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK.

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