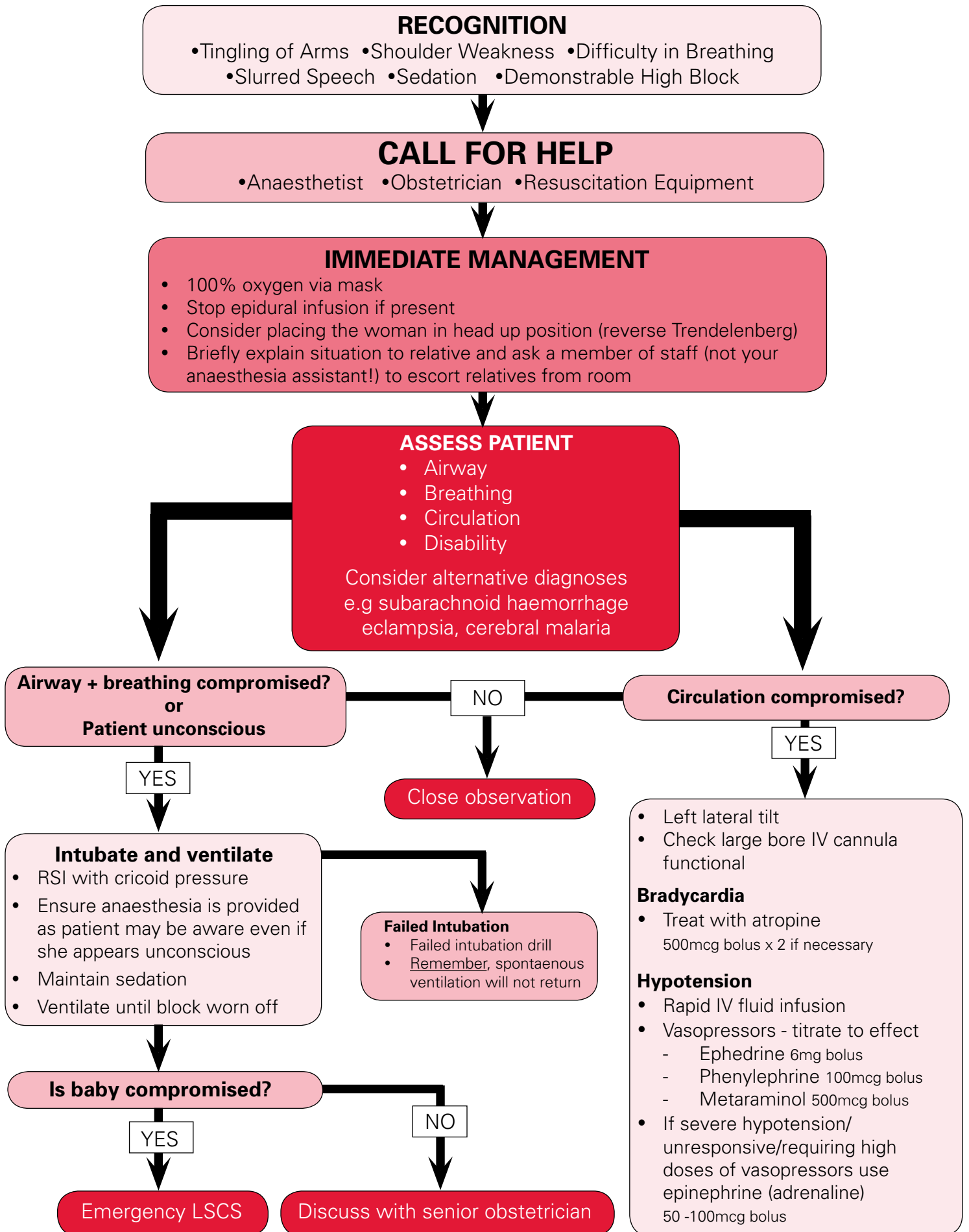


# Algorithm for the Management of a High Regional Block in Obstetrics



Adapted from Southampton University Hospital's High Spinal Drill

Figure 1. Available for download at: [www.update.anaesthesiologists.org](http://www.update.anaesthesiologists.org)

## Management of high regional block in obstetrics

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### INTRODUCTION

Traditionally, it has been the potentially catastrophic situation of 'can't intubate, can't ventilate' during induction of general anaesthesia that has preoccupied obstetric anaesthetists. The incidence of this was reported to be 1 in 885 in a survey of 60,000 anaesthetics for caesarean section in 1997,<sup>2</sup> and the Confidential Enquiries into Maternal Deaths in the United Kingdom have highlighted mortality due to failed intubation. This has led to an emphasis on algorithm-based training for this specific scenario. However, in our endeavours to be prepared for failed intubation, have we neglected another potentially catastrophic event – the high regional block?<sup>3</sup>

The reported incidence of high regional block varies considerably, but a large survey in 1997 demonstrated an incidence of 1 in 5334 for elective cases whilst for emergency cases the incidence reported was 1 in 2470 for epidural top ups, and 1 in 3019 for spinal anaesthesia.<sup>1</sup> In 2001, Kar and Jenkins reported an incidence of 1 in 27107 for high regional block following obstetric epidurals.<sup>4</sup> Clearly then, the incidence is much lower than that of failed intubation. However, the majority of obstetric procedures are performed under regional anaesthesia and thus the sheer volume makes it increasingly likely that an anaesthetist will encounter a high regional block. An additional factor is that concerns about achieving adequate anaesthesia (and the litigation consequences of inadequate anaesthesia) have influenced and elevated the planned level of block.

### DEFINITIONS

**High spinal** – spread of local anaesthetic block affecting the spinal nerves above T4. The effects will depend upon the nerves involved.

**Total spinal** – intracranial spread of local anaesthetic resulting in loss of consciousness.

Both of the above terms refer specifically to blocks from a spinal (subarachnoid / intrathecal) injection of local anaesthetic. However, both of these effects can also be seen from epidural infusions or epidural top ups. For this article the term high regional block will be used, defined as an excessively high block that may require tracheal intubation.

### PREVENTION IS BETTER THAN CURE!

So, what should we do? First, endeavour to reduce the incidence of high regional block. All anaesthetists undertaking spinal or epidural anaesthesia should have meticulous pre-procedure preparation to try and prevent a high regional block.

### Spinal (subarachnoid) anaesthesia

- Consider the *level required for adequate analgesia/ anaesthesia*. For example the level (and therefore local anaesthetic agent dose) required for removal of a retained placenta in less than that for caesarean section.
- *Local anaesthetic dose* – consider the volume and dose to be used as a number of factors can affect the spread of a block:
- *Patient position* – especially when using hyperbaric or “heavy” solutions of local anaesthetic. If head down position is used to establish a block, it should be reversed as soon as possible.  
Block height can be manipulated with positioning for 20-30mins when using hyperbaric solutions.
- *Patient characteristics* - height, age, weight.
- *Technique* - site of injection, direction of needle, speed of injection, use of barbotage.

### Epidural anaesthesia or analgesia

- Use *low concentrations* of local anaesthetic agent for labour analgesia.
- *Assess block* prior to giving a top up.
- Always *aspirate* using a 2ml syringe to check that the catheter is not in the CSF (or a vein). It is important to do this every time you bolus an epidural and not just on insertion.
- *Give a test dose* – ensure the volume you use is adequate to manifest a spinal block if the catheter is intrathecal.
- Consider giving large volumes of local anaesthetic in *divided dose* (weigh up the risk against the benefits, and clinical urgency of establishing a block rapidly)

### Summary

Ensure all staff on the maternity unit are aware of the risk.

Early recognition and treatment will prevent harm to mother and baby.

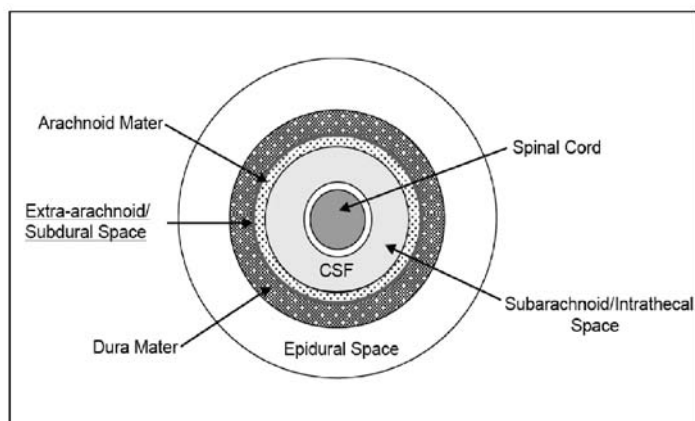
Communicate with the rest of the team, the patient and partner.

Be prepared – have a plan and practice a drill regularly.

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Subdural blocks occur when the arachnoid mater is separated from the dura mater (see Figure 2). This can occur with epidural catheters and it is potentially dangerous as a bolus injection may rupture the arachnoid mater converting it into a subarachnoid/intrathecal block. Suspect a subdural catheter if an assumed epidural block spreads high (but slowly), with patchy sensory loss and sacral sparing, and only mild hypotension. The epidural catheter should be removed and a new epidural sited.



**Figure 2.** The anatomy of an extra-arachnoid, subdural block. Adapted from Grady K, Howell C, Cox C. *Managing Obstetric Emergencies and Trauma: The MOET Course Manual*. 2nd ed. London: RCOG Press. 2007: 34; 3225

## EDUCATION

It is important that all staff recognise the potential for a high regional block, since early recognition will allow prompt management of an ascending block and prevent harm to mother and baby. Help should be called immediately, with simple interventions instigated in the meantime.

Anaesthetists should ensure that they are familiar with the recognition and management of a high regional block and should practice a drill regularly. Figure 1 is an algorithm for the diagnosis and management of a high regional block.

**Table 1.** Clinical effects resulting from ascending neuraxial block

Root level	System affected	Effects
T1-T4	Cardiac sympathetic fibres blocked	<ul style="list-style-type: none"> <li>• Bradycardia</li> <li>• Can result in severe hypotension as bradycardia compounds hypotension from vasodilation</li> </ul>
C6-C8	Hands and arms	<ul style="list-style-type: none"> <li>• Paraesthesia (tingling) and weakness</li> <li>• Accessory muscles of respiration affected</li> </ul>
C3-5	Diaphragm and shoulders	<ul style="list-style-type: none"> <li>• Diaphragmatic innervation – definite respiratory compromise that will require intubation and ventilation</li> <li>• Shoulder weakness is a warning sign of impending diaphragmatic compromise</li> </ul>
Intracranial spread		<ul style="list-style-type: none"> <li>• Slurred speech, sedation, loss of consciousness</li> </ul>

## COMMENTARY ON ALGORITHM

### Recognition and diagnosis

Early recognition is vital and allows appropriate management before either the mother or baby is harmed.

During labour, an epidural bolus, either at initial placement or as a top up that is followed by rapid analgesia that is excessive sensory or motor block and hypotension, should alert to the risk of accidental subarachnoid placement. If the patient complains of shoulder weakness this is a warning sign that diaphragmatic weakness may soon develop.

In theatre, regular checking of the block height and continuous communication with the mother in addition to monitoring of ECG, heart rate and oxygen saturations should help early detection of an ascending block.

The sensory level of a block can be checked by loss of sensation to ice cold (using ice cubes or ethyl chloride spray) or pin-prick. Altered sensation to light touch should also be demonstrated and this is usually one level lower. The clinical effects of spinal or epidural anaesthesia depend upon the spinal roots blocked and knowledge of this allows detection of an ascending block (see Table 1).

A high regional block often develops early and rapidly but it can have a later onset, so remain alert to the possibility. High regional blocks that occur in the postoperative period are particularly hazardous as the staff's attention may be focused elsewhere.

### Initial management

With careful monitoring an ascending block can be detected before it has risen to a level causing significant cardiovascular or respiratory compromise. In this situation, placing the patient in the head up/reverse Trendelenberg position can prevent the block from ascending further.

If a block is rapidly ascending it is important to reassure the partner but ask him to leave - try to give a brief explanation if time and the situation allow. Get a member of staff to escort him but do not send a skilled staff member whose help you will need. It will be a stressful

situation and your concentration needs to be focused on the patient not on reassuring her partner. A full explanation of events can be given at a later time.

### Circulatory compromise

A drop in maternal blood pressure of greater than 20% requires immediate action. Severe hypotension will compromise placental blood flow and if not treated will result in maternal cardiac arrest.

Relieve aorto-caval compression with manual uterine displacement or by left lateral tilt – this can be achieved using a wedge or pillow under the right hand side of the patient or by tilting the operating table.

Rapidly infuse one litre of crystalloid, unless otherwise contraindicated, and give vasopressors. Phenylephrine, ephedrine and metaraminol are all acceptable and in very severe or unresponsive maternal hypotension it may be necessary to use epinephrine (adrenaline). There is some evidence that phenylephrine preserves placental blood flow better than other vasopressors in maternal hypotension, but in a crisis use whichever vasopressor you have readily available. Repeated bolus doses should be given and titrated to the blood pressure. If high doses are required an infusion may be needed. See Table 2 for practical information on using vasopressors.

If cardiac arrest occurs follow the advanced life support guidelines discussed on page 62 in this edition of *Update in Anaesthesia*.

### Intubation and ventilation

If breathing or conscious level is affected tracheal intubation and ventilation will be necessary. As soon as you identify an ascending block ensure that drugs, an assistant and equipment for a rapid sequence induction (RSI) are prepared and close to hand. Ensure that your assistant knows how to apply cricoid pressure. It is important to administer drugs to provide anaesthesia for RSI, as the patient may be fully aware even if apparently unconscious. Assume that the mother is aware until drugs have been administered. Talk to her calmly and

explain what you are doing even if she appears unconscious.

If there is a failed intubation remember that spontaneous ventilation will not return. Proceed to a failed intubation drill for a paralysed patient. Management of a failed intubation in a pregnant woman is described on page 38 of this edition of *Update*.

The patient must be ventilated, by hand if necessary, until the block wears off – usually 1-2 hours for a spinal. This may be much longer if the high regional block is a consequence of intended epidural analgesia/anaesthesia due to the larger doses used. Sedation must be provided and the woman's spontaneous ventilation carefully evaluated to ensure it is adequate prior to extubation.

### Consider the baby

Stabilising the mother is in the best interests of the baby but once this is achieved consideration needs to be given to whether or not to deliver. If there is foetal compromise then urgent delivery via lower segment caesarean section (LSCS) is appropriate. If there is no foetal distress then a vaginal delivery may still be possible once the block has receded. Ensure a senior obstetrician is involved.

### FURTHER POINTS

#### Debrief

Ensure that all staff members involved have a chance to discuss the case and raise any issues or areas for concern. Consider if the drill worked well or if improvements could be made.

#### Ensure accurate documentation of events

It may not have been possible to document events as they happened so ensure that you record an accurate reflection of the incident with maternal observations and times of all drugs and interventions undertaken.

Don't forget to explain what happened to both the patient (when she has regained consciousness) and her partner. This will probably

**Table 2.** Preparation and use of vasopressors

Vasopressor	Standard neat concentration (check preparation)	How to dilute	Final concentration	Bolus dose (initial dose, titrate to effect)
Phenylephrine	10mg.ml <sup>-1</sup>	Take 1 ml and dilute with 0.9% sodium chloride to a total volume of 100mls	100mcg.ml <sup>-1</sup>	100mcg (1ml)
Ephedrine	30mg.ml <sup>-1</sup>	Take 1 ml and dilute with 0.9% sodium chloride to a total volume of 10mls	3mg.ml <sup>-1</sup>	6 – 9mg (2 – 3mls)
Metaraminol	10mg.ml <sup>-1</sup>	Take 1ml and dilute with 0.9% sodium chloride to a total volume of 20mls	500mcg.ml <sup>-1</sup>	500mcg (1ml)
Epinephrine 1 in 1 000	1mg.ml <sup>-1</sup>	Take 1ml and dilute to a total volume of 10mls	100mcg.ml <sup>-1</sup> (1:10,000 solution)	<b>UNDILUTED SOLUTION MUST NOT BE GIVEN INTRAVENOUSLY  DILUTE TO 1:10,000 AND USE AS BELOW</b>
Epinephrine 1 in 10 000	100mcg.ml <sup>-1</sup>	Use neat	100mcg.ml <sup>-1</sup>	50mcg - 100mcg (0.5 -1ml)

have been a distressing and frightening event for them and consider that she may have recall of some events when she appeared to be unconscious.

#### **FINAL COMMENTS**

High regional blocks requiring intubation are rare but the volume of obstetric procedures performed under regional anaesthesia is high. It is increasingly likely that it may happen to a patient in your care. Prompt recognition and treatment should prevent mother and baby coming to any harm - have a plan, practice the drill and make sure that all staff are prepared.

#### **REFERENCES AND FURTHER READING**

1. Obstetric Anaesthetists' Association Guideline Initiative – High Regional Block Guideline Examples - Southampton University Hospitals/Stockport NHS Foundation Trust/University Hospitals

Coventry and Warwickshire. Available at <http://www.oaa-anaes.ac.uk/content> (OAA membership required to access).

2. Shibli KU, Russell IF. A survey of anaesthetic techniques used for caesarean section in the UK in 1997. *International Journal of Obstetric Anaesthesia* 2000; **9**: 160-7.
3. Yentis SM. High regional block: the failed intubation of the new millennium? *International Journal of Obstetric Anaesthesia* 2001; **10**: 159-60.
4. Kar GS, Jenkins JG. High spinal anaesthesia: a survey of 81322 obstetric epidurals. *International Journal of Obstetric Anaesthesia* 2000; **10**: 172-6.
5. Grady K, Howell C, Cox C. Managing Obstetric Emergencies and Trauma: The MOET Course Manual. 2nd ed. London: RCOG Press. 2007: Ch 34; 322, 326-327. Preview available online at <http://books.google.co.uk/books?id=fAf1wCTRRCUC&pg=PA321>