Nottingham University Hospitals NHS
NHS Trust

Guidelines for the Practice of
Obstetric Anaesthesia

Nottingham City Hospital
Queen's Medical Centre

First edition - February 1990
First revision - June 1990
Second revision - April 1991
Third revision - January 1992
Fourth revision - April 1993
Fifth revision - March 1994
Sixth revision - October 1996
Seventh revision - January 2000
Eighth revision - November 2004
Ninth revision – January 2008

Smiths Medical are delighted to have been able to provide an educational grant to support this publication.
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ABOUT THESE GUIDELINES

The consultant obstetric anaesthetists in Nottingham have prepared these guidelines. Please familiarise yourself with them before you start your obstetric module or are on-call. Copies are available on request from the directorate secretaries at the City Hospital (CHN) and Queen's Medical Centre (QMC).

These Guidelines are not to be construed as standards of medical care. Standards of medical care are determined on the basis of all clinical information available for an individual case, and are subject to change as knowledge advances. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in light of the clinical information presented and the diagnostic and treatment options available.

You will find many unequivocal statements about our recommended practices. We feel that significant deviation from these practices may be detrimental to your patient. Therefore, if you wish to not adhere to any of these policies, please contact one of us first. If you follow these guidelines, or get prior approval for any deviation, you will have our full support. There is no substitute for common sense!

Nottingham Consultant Obstetric Anaesthetists
Lead Clinicians in bold type

City Hospital	QMC
Chris Hutter	Mark Luxton
David Bogod	Malcolm Reid
Lesley Woods	David Levy
Anup Biswas	Perm Bachra
Neil Hawkins	Andy Norris
	Sam Bharmal

THE RESPECTIVE HOSPITAL SWITCHBOARDS HOLD HOSPITAL BLEEP, HOME PHONE AND MOBILE PHONE NUMBERS.

If consultant help is needed out of hours, your first port of call should be the general on-call consultant, who is welcome to contact one of us for advice.

Any corrections or suggestions for improvement will be welcomed. Please e-mail contributions to **neil.hawkins@nuh.nhs.uk.**

We all hope that you enjoy your time with us.

COMMUNICATION

We are proud of the high standard of care that we give to our mothers in Nottingham and this in no small way is due to the excellent level of communication between the groups involved with their care. We would be grateful if you could ensure that you maintain this high level of communication while you are here. Many of our staff are very experienced, so please listen to and seek their opinion. Please treat everyone with respect.

ALERT PAGE

Please note that important information concerning a patient's medical condition is recorded on the Alert Page, which can be found at the front of the patient notes and on the maternity computer system. It is wise, however to always have an updated Alert Page printed off from the computer when the patient is admitted.

DAILY DUTIES

a) **Equipment Checks** - check both anaesthetic machines and the difficult airway trolley.

b) **Pagers** - ensure that the bleep is working properly. If you leave the unit it is of paramount importance that you ensure that your bleep is working and that the midwives know how to contact you. Tell the senior midwife where you are going, and contact her again on your return.

c) **Handover/ Communication** - ensure handover is comprehensive and check the Labour Suite board with a senior midwife so that you may acquaint yourself with all of the women on the delivery suite who may need your attention, be it for assessment and treatment of peri-partum disease, epidural analgesia or those at high risk of operative delivery. Re-check regularly.

d) **Obstetric Ward Rounds** - If you are not otherwise employed, we expect you to join the obstetricians on the delivery suite ward rounds. This improves staff relations, knowledge and patient management.

e) **Follow-up Forms** - collect these forms and visit the women. At the City Hospital, if there are no significant complications please file the completed form in the patient notes. At the QMC, once the form has been completed, input the information into the computer. Refer any significant problem to a consultant.

f) **Entering Rooms** - always knock and wait for an answer before entering a delivery room.

CONSENT

Legally and ethically, the explanation given to a patient whose consent is being sought should include all the risks and benefits which that patient would reasonably want to know in order to make an informed choice. In the hurly-burly of a labour ward, however, this advice needs to be tempered with pragmatism, and the following guidance reflects this balance.

Verbal Consent - is necessary for any intervention, including regional analgesia in labour or anaesthesia for Caesarean section. You should make a record of the risks/benefits that you have discussed with the woman. Women in the throes of labour may not be particularly amenable to a detailed discussion, but should be offered the chance to be given information concerning common and serious complications. If the woman is clearly distressed, keep explanations short and simple and record the circumstances in the case notes (e.g. “only brief explanation before epidural as woman too distressed”, “patient did not want to know about serious complications”). Any problem regarding consent must be referred to a consultant obstetric anaesthetist, unless prevented by extreme clinical urgency.

Regional Analgesia in Labour - consent

You must tell the woman about: -

- **Post-dural Puncture Headache** - quote the incidence in your hands if you know it, otherwise ‘about 1%’ for an epidural and 0.2% for a spinal. If it occurs, >80% likelihood of blood patch.
- **Imperfect Analgesia** – is common, particularly in the later stages of labour when the women can experience strong rectal pressure. Possible need to re-site catheter (about 5% of cases).
- **Weak Legs –** walking is not permitted.
- **Hypotension** - although rare with low doses of local anaesthetic.
- **Instrumental Delivery** – risk increases by about 5%. Caesarean section rate is not affected. The Comparative Obstetric Mobile Epidural Trial (COMET) **ref** [1]
- **Neurological Problems** - temporary neuropathy occurs in about 1 in 2000 cases, permanent in 1:10,000. Vertebral canal haematoma, abscess, or spinal cord injury extremely rare – possibly ~ 1:50-150,000.

Consider telling the woman about: -

- ⊙ **Confinement** - to bed/chair.
- ⊙ **Continuous Fetal Monitoring.**
- ⊙ **Blood Pressure Measurement.**
- ⊙ **Pyrexia in Labour** - risk of ~15% attributable to epidural analgesia, and consequent need for specimen cultures and antibiotics for both mother and baby.
- ⊙ **Localised Backache** - for about 48 hours due to bruising. Should it worsen or swelling/ discharge occur at the entry site, then they should phone the labour suite immediately.

You do not need to tell the woman about: -

- ⊙ **Long Term Backache -** not caused by regional analgesia/anaesthesia.

<u>Regional Anaesthesia for Caesarean Section - consent</u>

You must tell the woman about: -

- ⊙ **Hypotension -** and nausea.
- ⊙ **Sensations** – per-operatively (pulling, pushing, tugging, pressure).
- ⊙ **Pain** - the possibility of pain during the operation can be treated quickly with i.v. analgesics and ultimately general anaesthesia if necessary.
- ⊙ **PR Drugs**
- ⊙ **Post-dural Puncture Headache** - ~ 0.2% after spinal with 25 g Whitacre needle, less with a 27g and usually mild to moderate in severity.
- ⊙ **Itching** - if neuraxial opioids are used.
- ⊙ **Localised Backache** - for 48 hours due to bruising.
- ⊙ **Neurological Problems** - temporary neuropathy occurs in about 1 in 2000 cases, permanent in about1:10,000. Vertebral canal haematoma, abscess, or spinal cord injury extremely rare – possibly ~ 1:50-150,000. Please stress that this is far safer than a GA.

You do not need to tell the woman about:-

- ⊙ **Long Term Backache** - not caused by regional analgesia/anaesthesia.

General Anaesthesia for Caesarean Section - consent

You must tell the woman about:-

- ⊙ **Neonatal Sedation** –increased v regional
- ⊙ **Blood Loss** – increased v regional.
- ⊙ **Post-operative Pain** – increased v regional.

Consider telling the woman about:-

- ⊙ **Awareness** – increased chance as no opiates prior to delivery (although overall risk still very low). For those patients for whom there is no choice other than GA, it would be wiser to not mention awareness.
- ⊙ **Risk** – to maternal wellbeing increased. If mentioned you should ensure that the patient fully understands this, but it would not be wise to overemphasise as a means of persuading a woman to have a regional anaesthetic.

The Mother Who Refuses Operative Delivery -consent

a) **Best Interests** - in general, medical treatment can be undertaken in an emergency without consent, provided the patient is not competent at the time. The treatment must be a necessity and should do no more than is reasonably required in the 'best interests' of the mother - meaning that the operation/treatment will save life or ensure improvement in/prevent deterioration of physical/mental health.

b) **Competent Refusal** - treatment must not be given if the woman refuses treatment and is competent (understands the treatment options and consequences of refusal and can retain the information), or has previously refused the treatment when competent. A mentally competent parturient has an absolute right to refuse to consent to medical treatment for any reason, rational or irrational, or for no reason at all. This holds true even though the consequence may be her own death, or the death or serious handicap of the child she bears.

c) **16-18 years** - between these ages, a person is regarded as an adult for the purpose of medical treatment and consent must therefore be sought directly from the patient. It is still possible to override a refusal of consent in the best interests of a patient in this age group, but this is not a decision to be taken lightly and must involve senior consultation.

d) **Under 16 years** - anyone under the age of 16, may consent to treatment, as long as you are happy that they understand the proposed treatment, can weigh up the risks and can retain the information. They cannot refuse

treatment that is in their best interests. Parents / guardians should still be involved in these decisions, even if the child is regarded as competent.

EATING & DRINKING IN LABOUR

a) **Low Risk** – these women can have a light or low redidue diet as per the Labour Suite protocols

b) **High Risk** – these women should only have water & be given regular ranitidine as per the Labour Suite protocols.

THROMBOPROPHYLAXIS

Thromboembolism is the leading cause of maternal death in the UK.[ref 2]
Please refer to the NUH Obstetric guidelines (intranet/ hard copy on Labour Suite) for more detail on thromboprophylaxis in pregnancy.

Labour

a) **High Risk** – the following are often indications for antenatal prophylaxis with low molecular weight heparin (LMWH). BMI is also taken into account. Women should be advised that when they go into labour they should withhold the next dose until after regional analgesia has been established.

- ⊙ **Thrombosis -** history or family history of
- ⊙ **Thrombophilia**
- ⊙ **Antiphospholipid Syndrome**
- ⊙ **Protein C or S or Antithrombin Deficiency**
- ⊙ **Factor V Leiden**

b) **Timing** [ref 2a]- women advised to have LMWH during labour and the puerperium should undergo epidural analgesia blockade (if indicated/requested) early in labour and receive LMWH 4 hrs later. The catheter should be removed at least 12 hrs after the last dose and the next LMWH dose given at least 4 hours after catheter removal. Those patients having been anticoagulated with heparin by infusion must wait until the APTT ratio has returned to normal. Analgesia can be provided by opioid, either as I.V. injection by the anaesthetist, or by PCA .

c) **Vertebral Canal Haematoma** - cases of VCH are often associated with technical difficulties during regional blockade. It makes sense that the most senior available anaesthetist should undertake the procedure in women likely to have significant anti-Xa activity. Logically, there is less risk of VCH with spinal compared to epidural blocks. After delivery, continued vigilance for signs of VCH is essential. Advise the woman to seek medical help if symptoms of weakness, numbness, unusual back pain, or bowel/bladder dysfunction develop (onset can be delayed beyond 24 hours). Document that you have given this advice. If there is suspicion of a VCH, obtain neurological/neurosurgical input without delay. MRI will be the emergency radiological investigation of choice.

Caesarean Section

a) **Intermittent Calf Compression -** compression leggings or boots, should be fitted to all women.

b) **Enoxaparin** (Clexane®) - women should receive enoxaparin as below:

- ⊙ **40 mg s.c. -** 20 mg if <50 kg. In recovery after GA or single-shot spinal block.
- ⊙ **Epidural Anaesthesia** - withhold first dose of Clexane® until 4 hrs after catheter removal.
- ⊙ **Daily** - for the time nearest to the initial dose, but not >24hours later, until 5 days post operation.

c) **Women Receiving Regular LMWH –**

- ⊙ **Regional Anaesthesia** - is generally not recommended until >12 hrs after the last dose, but discuss individual cases with a consultant obstetric anaesthetist. The risk-benefit analysis may well favour regional block (risk of VCH) over GA (risk of succinylcholine anaphylaxis, failed intubation etc).
- ⊙ **Epidural Catheter Removal** - 12 hours after the last dose of enoxaparin, and > 4 hrs before the next dose.
- ⊙ **Treatment Doses of Enoxaparin** - ideally, 24 hrs should have elapsed before regional anaesthesia is contemplated.

REGIONAL ANALGESIA FOR LABOUR

a) **Epidural Service** - both hospitals offer women in labour a 24-hour, on-request epidural service. The time from being informed to attending the mother should not normally exceed 30 min. If you have a request for urgent epidural analgesia when you are busy in theatre, approach another member of the anaesthetic on-call team for assistance.

b) **Approach** - Establish the rationale for the request for a regional block and enquire as to when the woman was last examined by the midwife or obstetrician. Sudden escalation of pain is often symptomatic of imminent delivery (especially in the parous women). If there is a strong likelihood that the woman will proceed to an operative delivery, it is worth explaining that her analgesia for labour can be converted to anaesthesia to facilitate forceps or Caesarean delivery.

c) **Infusion** - continuous epidural infusion of a low-dose (levo)bupivacaine/ fentanyl mixture is the standard (see below).

d) **Combined Spinal-Epidural (CSE)** – this technique may be appropriate for women with unusually intense pain who require analgesia of particularly rapid onset.

e) **Previous Administration of I.M. Opioid** - is not a contra-indication to epidural analgesia. Increased risk of itching should be mentioned.

f) **Light Diet -** is acceptable for women without obstetric risk factors. Women with risk factors can drink water and should be prescribed oral ranitidine 150 mg 6-hourly.

Contra-indications – regional analgesia

1. **Anticoagulation/ Coagulopathy**
2. **Hypovolaemia** - or on-going haemorrhage.
3. **Sepsis –** local or systemic (pyrexia ≥37.8º C not treated with antibiotics)
4. **Patient Refusal**.
5. **Lack of Trained Midwives -** for continuous care and monitoring of mother and fetus for the duration of epidural blockade.
6. **Imminent birth.**

Performing an Epidural

a) **Patient Co-operation** - before starting you must secure the woman's co-operation to maximise the likelihood of success and to avoid an accidental dural puncture. Almost all parturients can sit still enough to enable the epidural to be sited. Explaining why this is necessary is usually all that is required. In exceptional circumstances fentanyl 50 mcg i.v. may be considered for the woman unable to keep still on account of intense pain.

b) **Intravenous Access** –

- ⊙ **14 g or 16 g Cannula**
- ⊙ **Crystalloid Infusion** - should be started.
- ⊙ **+/- Preload** - high dose epidurals cause maternal hypotension, which is minimised by pre-loading. Low dose epidural studies have been underpowered to identify anything other than large numbers suffering from hypotension. There is also a tendency towards more fetal heart rate abnormalities when no pre-load is given [ref 3,4.] Therefore a crystalloid preload may be given, if desired.

c) **Full Blood Count & Coagulation Studies** – an FBC is required if there is evidence of pre-eclampsia, HELLP syndrome, Fatty Liver of Pregnancy, ante-partum bleeding has occurred, or thrombocytopenia is suspected. If the platelet count is normal, a coagulation screen is not necessary in mild pre-eclampsia or if intra-uterine death has occurred less than 2 weeks previously. If the time of the intra-uterine death is questionable, which it often is, then proceed to FBC and coagulation studies.

d) **LMWH Thromboprophylaxis** – **see pages 8-9.**

e) **Full Aseptic Precautions -** gown, gloves, hat and mask are essential.

f) **Loss of Resistance** - loss of resistance to saline for the identification of the epidural space is recommended. Use of air is associated with an increased incidence of dural tap and patchy block. Distinction between saline and CSF can be made on the following grounds:

	CSF	Saline
Temperature	Warm	Cold
Protein	Present	Absent
Glucose	at least a trace	Absent
PH	≥7.5	<7.5

g) **Catheter Length/ Aspiration –** there is some evidence to suggest that 3-3.5cm the optimum length of catheter to leave in the epidural space. Greater lengths have been shown to increase the number of patchy blocks. Following placement of the epidural catheter, aspirate to confirm absence of blood or CSF. If blood is aspirated, flush with saline and withdraw the catheter by one centimetre. If frank blood is still present, you may repeatedly withdraw by 1cm and re-check until 2.5-3cm is left in the epidural space. Beware, if short lengths of catheter are left in the epidural space catheter migration can occur and re-siting at another inter-space for those patients at high risk of an instrumental/ caesarean delivery may be sensible. If there is concern that the catheter is intra-venous, but aspiration negative, a test dose of lidocaine + 1:400,000 adrenaline may be used (2ml) and the pulse felt (unless there is a contraction!). There should be no significant rise in the pulse rate over the next 30 seconds. Management of accidental dural puncture – **see pages 17-20.**

h) **Initial Dose –** a bacterial filter must always be present at the end of the epidural catheter and every dose injected down an epidural catheter should be regarded as a test dose with the potential for high spread.

- ⊙ **9 ml (2.5mg/ml) 0.25% (levo)bupivacaine + 50 µg fentanyl (1ml)**
  - **Test dose** - the first 5 ml of (levo)bupivacaine (2.5mg/ml) 0.25% constitutes a test for intra-thecal placement. Allow at least 5 minutes to establish that the blood pressure is stable before giving more drug. There should be no significant loss of motor power in the legs and sensation to touch should be maintained. Possibly, one of the better indicators that the catheter is in the correct place is that the patient will feel as if cold water is running down her back during the 2nd 5ml increment. Remember that the catheter meniscus will drop even if the catheter is intravenous if held at shoulder level.
  - **Intravenous catheter** - if the test dose is intravenous the patient may become light headed with circum-oral tingling. Maintain a dialogue with the woman, enquiring about symptoms of LA toxicity. They may fit.
- ⊙ **15 ml of the infusion (below)** – use a 7.5 ml test dose.

i) **Infusion –** following the initial epidural dose, start the pre-mixed infusion of dilute (levo)bupivacaine + fentanyl (see below). Pre-mixed 50 ml syringes of (levo)bupivacaine (1mg/ml) 0.1% and fentanyl 2 mcg ml^{-1} are available in both hospitals. Ensure that the syringe is correctly labelled and start the infusion at 10 ml per hour (range 0-15ml hr^{-1}).

In the event of non-availability, use the 'recipe' below.

Add 100 µg fentanyl + 10 ml (5mg/ml) 0.5% (levo)bupivacaine to 38 ml 0.9% saline (total volume 50 ml/ 0.1% + 2mcg ml^{-1}).

The Comparative Obstetric Mobile Epidural Trial (COMET)[1] found that low-dose infusion epidurals and combined spinal epidural analgesia were both associated with a lower incidence of instrumental vaginal delivery compared with conventional bolus top-up epidurals. However, the low dose systems still showed an increased incidence over no-epidural, for instrumental delivery. The Caesarean section rates were similar in all three groups.

j) **Block Testing** – spread and completeness of the block should be checked with a cold stimulus (ice/ethyl chloride) rather than a needle. However, the best indicator of an adequate block is the smile on the patients face and her indication that she is satisfied!

k) **Patient Positioning** - the patient must be positioned to avoid aorto-caval compression throughout labour, with the intravenous infusion maintained until after delivery. If she wishes to lie supine, at least 15 degrees of lateral tilt should be applied by wedging under the hips.

l) **Hypotension/ High Block** - if the systolic blood pressure falls below 75% of baseline, below 100mmHg systolic in the normotensive patient, or if the patient becomes symptomatic, administer O_2, turn the patient on her side and give 500 ml of crystalloid rapidly. If the blood pressure remains low, consider the possibility of a subarachnoid block; vasopressor is preferable to more fluid. Remember that upper limb weakness/ grip and loss of sensation over the mastoid process may occur at the same time as diaphragmatic paresis develops.

m) **CTG Abnormalities** - (bradycardia, decreased variability, decelerations) during epidural analgesia should prompt a recording of the maternal blood pressure. Recognition and correction of hypotension may correct CTG abnormalities and can prevent an urgent Caesarean section.

n) **Neurological Deficit -** persisting >4 hours after the last top-up, or discontinuation of an infusion must be followed up immediately and reported to a senior SpR or consultant obstetric anaesthetist.

Performing a Labour CSE

Principles as for performing an epidural, above.

a) **Vertebral level** – a CSE should not be undertaken above L2/3.

b) **CSEcure® kit -** contains a 26 g spinal needle that will protrude 15 mm beyond the tip of the 16 g Tuohy needle.

c) **Intrathecal dose -** (levo)bupivacaine (2.5mg/ml)0.25% 1 ml + fentanyl 25 mcg is the recommended intra-thecal dose. When this begins to wear off, a loading epidural bolus can be administered (by an anaesthetist) from the low dose solution. A continuous infusion can then be started.

Documentation on Drug Prescription Card - epidural

Use the pre-printed sticky label or write out the prescription on the drug card. These should read as follows:

a) **Epidural Infusion:** Pre-filled syringe, (levo)bupivacaine 0.1% + fentanyl 2 mcg/ml, run as per protocol at 0-15 mls/hour

b) **Top-up Escape Doses:** 5 mls (2.5mg/ml) 0.25% (levo)bupivacaine, (‘max 10mls/hour)
OR 5-10 mls from the 50 ml (levo)bupivacaine/ fentanyl syringe (min. interval as above). In “as required” section of the drug card.

c) **Instrumental Delivery/Suturing**: (5mg/ml) 0.5% (levo)bupivacaine 5 mls + 5mls if required, as per midwife protocol. In “once only” section of the drug card.

Block Adjustments - epidural

a) **Bilateral block to T10 -** should relieve the pain of uterine contractions.

b) **Block above T6** - the infusion should be stopped.

c) **Re-starting the Infusion** - the midwife should be reminded that if the infusion is restarted only when the woman is once again in pain, analgesia will not be restored instantaneously. Therefore, the infusion should be restarted (at a lower rate than previously) as soon as the block height has regressed to T10.

d) **Block Failing to Relieve Pain** - may be too low, unilateral or has a 'missed segment' and should be treated accordingly. Assess the distribution of the block using ethyl chloride spray or ice and observe the woman during several contractions and try to establish the site and nature of the painful sensations. Many of the problems with an inadequate epidural block are due to there being too much catheter left in the epidural space. One manoeuvre that you can try is to withdraw the catheter back until only 3-3.5cm is left in the epidural space before topping-up.

- ⊙ **Low block** - should be managed by increasing the infusion rate to a maximum of 15 mls per hour. An 'escape' dose of 5 ml (2.5mg/ml) 0.25% (levo)bupivacaine or 5-10 ml (levo)bupivacaine/ fentanyl solution from the infusion pump may be required.
- ⊙ **Missed segment** - try increasing the concentration of local anaesthetic, e.g. (5mg/ml) 0.5% (levo)bupivacaine or 2% lidocaine while lying the patient on the affected side.
- ⊙ **Unilateral block** - pull the catheter back so that only 3-3.5 cm remains in space and try a further dose. Re-siting the catheter at a different space may help, but the patient should be warned that truly unilateral blocks are sometimes due to epidural membranes and therefore impossible to cure.

- ⊙ **Patchy block** - try a stronger dose, as above and consider the possibility of a subdural block **(see page 16)**.
- ⊙ **Strong perineal pain/ pressure** - can sometimes be helped by 50 mcg of epidural fentanyl in 5ml of 0.9% saline and/ or by giving the 5-10ml of (2.5mg/ml) 0.25% (levo)bupivacaine as a "top-up" in the sitting position. Finally, (5mg/ml) 0.5% (levo)bupivacaine can be utilised.
- ⊙ **Pain breaking through good block** - consider the possibility of uterine scar dehiscence (risk for women attempting VBAC – Vaginal Birth After Caesarean) and ask for an obstetric review immediately.

e) Itching - the woman can be offered an opioid-free infusion, following clear explanation that inferior analgesia will be the trade-off for eliminating pruritus and that the elimination of the itching may take several hours. Intractable symptoms can be relieved by i.m. naloxone 0.4 mg, or try 40 mcg titration doses I.V.

f) Intra-uterine Death - in the event of labour induced after intrauterine death, the concentration of fentanyl may be increased if pain is inadequately controlled by the standard regimen. Maternal monitoring must be no less intense just because the fetus is not alive. However, it may be more appropriate to utilise PCA opioid analgesia in this situation rather than epidural, so discuss this option with the patient.

g) Caesarean Section – conversion from analgesia to epidural anaesthesia is required. The infusion should be stopped, capped off and a suitable epidural top-up given, preferably in theatre with full monitoring **(see pages 31-2).** If it is deemed necessary to top-up the epidural on Labour Suite then the anaesthetist must stay with and monitor the patient.

<u>Important Points</u> - epidural

a) Catheter Migration - remember that the catheter may have worked it's way out of the epidural space, especially if the block was previously working well. If in doubt, check the catheter marking at the skin and check against the insertion record and check the insertion site for evidence of leakage.

b) Parenteral Opioids - ensure that parenteral opioids are not prescribed in an attempt to improve analgesia when epidural opioids have been administered.

c) Need to Re-site - if adequate analgesia has not been established within 60 min of attending to troubleshoot persistent pain, the epidural should be re-sited, if this is what the woman wishes.

d) Senior Help - if the above approaches fail and the woman is still unhappy, seek senior help. Persistent pain should be managed with sympathy and explanation.

e) **High Risk Patient** - if a woman labouring with an epidural is at significant risk of proceeding to Caesarean section, it is of paramount importance that she has a good block to allow establishment of effective surgical anaesthesia, if required. Poor regional analgesia in labour predicts poor surgical anaesthesia, however, many less than perfect blocks will convert adequately with the surgical anaesthetic top-up mixture.

f) **Catheter Disconnection –** you should re-site the epidural.

Subdural Block[ref 5]

Separation of the arachnoid from the dura by the catheter. The subdural space has more potential capacity posteriorly and laterally. Since the arachnoid and dura are attached together on the ventral nerve root, the anterior nerve roots (which transmit motor and sympathetic fibres) are relatively spared. In contrast to the extra-dural space, which terminates at the foramen magnum, the subdural space extends cranially. Have a high index of suspicion if an epidural block has a bizarre distribution. Stop the infusion and seek advice of a senior SpR/consultant obstetric anaesthetist.

a) **Characteristics**

- ⊙ **High Spread** – a block spreading unexpectedly high over 20-30 min, sometimes as high as the cervical dermatomes.
- ⊙ **Patchy Sensory Block** -often with missed segments/ persisting pain.
- ⊙ **Relative Sacral Sparing.**
- ⊙ **Minimal Motor Block.**
- ⊙ **Nasal Stuffiness**
- ⊙ **Horner's Syndrome**.
- ⊙ **Blood Pressure** - can be well-maintained (severe hypotension rare).
- ⊙ **Frequent –** more than originally thought (up to 2% of epidural catheterisations).

b) **Management -** The arachnoid is easily torn, so a subdural catheter may rupture through following a bolus dose, changing the block from a subdural to a subarachnoid block. This may result in a total spinal. In addition, a post-dural puncture headache may occur. Therefore, the catheter should not be left in situ. The catheter should be removed and the epidural re-sited at a different space.

Accidental Dural Puncture

Either the needle or the catheter can breach the meninges. Usually there is obvious CSF leak, however, post-natal headache may be the first manifestation.

Procedure

a) **Needle Tap** - thread the catheter into the sub-arachnoid space by 2-3cm. Do not persist if there is any paraesthesia. Clearly label the catheter and filter as "Spinal/ Subarachnoid Catheter". Inform the midwife, obstetric staff and the patient and document this in the notes, including a management plan. Ensure handover to the on-coming anaesthetist. At QMC, give the woman a copy of the relevant information sheet. We do not recommend a prophylactic blood patch before a headache develops.

b) **Catheter Tap** - leave the catheter in the CSF and then treat as above (needle tap).

c) **Anaesthetist Only Top-ups** – when there is a spinal catheter in-situ, only the anaesthetist should administer top-ups and they should remain with the patient for at least 10 minutes following the top-up to ensure any hypotension is treated promptly.

d) **Do Not Use an Infusion**

e) **Labour Analgesia** - (levo)bupivacaine (2.5mg/ml) 0.25% 1-2 ml flushed slowly through with 2 ml 0.9% NaCl. 15-25µg fentanyl may be given with the first dose. Expect to repeat the intrathecal local anaesthetic dose 1-2 hourly. Further fentanyl can be given cautiously, if required, after 6 hours.

f) **Caesarean Section** - titrate 0.5 ml increments of (5mg/ml) 0.5 % (levo)bupivacaine. Also inject diamorphine 0.25-0.4mg (or preservative free morphine 0.1mg, if diamorphine unavailable).

g) **Re-site the Catheter** - if you are not happy to manage a sub-arachnoid catheter you can re-site the epidural at another inter-space. If this proves to be technically difficult, or if you are at all unsure, request more experienced help. Remember, in the presence of a meningeal tear the amount of local anaesthetic required for the re-sited epidural may be significantly less than for analgesia with intact meninges, therefore initial top-ups must be given by the anaesthetist. This is particularly important if an epidural is being topped up with large doses of local anaesthetic for Caesarean section. If a further tap occurs, consultant input must be sought.

h) **Re-sited Epidural Infusion** - an infusion regimen can be considered after a catheter has been re-sited at another inter-space, only if several bolus top-ups have not exhibited excessively fast onset or unusually extensive block (suggesting tendency of drug to reach CSF). Discuss this with a senior SpR or consultant obstetric anaesthetist first.

i) **Elective Instrumental Delivery** - is advisable only if headache arises during labour.

j) **Recumbency -** there is no evidence that enforced recumbency (lying flat) is of any use in the prevention of post-dural puncture headache (as opposed to relief of symptoms).

k) **IV Fluids** - continue intravenous fluids for 24 hours. Aim for total daily fluid input of 3 litres.

l) **Review Daily** - ensure that the woman is reviewed on a daily basis by verbal and written handover (see below). If symptoms develop, explain that they are attributable to the leakage of spinal fluid. Explain that the meningeal tear will heal spontaneously in the majority of patients, but raise the possibility that an epidural blood patch may be required to enable early mobilisation.

   ⊙ **NCH -** write the woman's name and ward on the whiteboard in the obstetric anaesthetic office and enter the details into the "post dural puncture headache" book.

   ⊙ **QMC –** write the details on the "whiteboard" in the obstetric theatre coffee room.

m) **Analgesia** - prescribe paracetamol + diclofenac regularly and either oral morphine solution (NCH) or dihydrocodeine (QMC) on the PRN side. A laxative such as ispaghula husk (Fybogel®), or lactulose should be prescribed to prevent straining.

n) **Blood Patch** - if a postural headache persists beyond 24 hours (and restricts mobilisation or is delaying discharge from hospital), consider a blood patch (see below). Perform only after consultation with senior SpR/consultant obstetric anaesthetist.

o) **Follow-Up -** all women who have had an accidental dural puncture should be referred to the Obstetric Anaesthetic Clinic 6-10 weeks postpartum. The ward midwives will arrange this on request. If the patient develops a postural headache prior to the appointment they should phone Labour Suite to arrange an anaesthetic review.

Epidural Blood Patch

A blood patch should be considered for any woman with symptoms of a post-dural puncture headache (PDPH). PDPH is characterised by a throbbing frontal or retro-bulbar pain, which is relieved by lying flat and worsened by sitting or standing and by bright light. It is often accompanied by occipital pain, 'buzzing' in the ears and photophobia. However, all sorts of neurological symptoms have been ascribed to dural taps and cured by blood patching; atypical presentations are well described. Once symptoms have been attributed to CSF leak, current practice is to patch early (48 hours), especially if the symptoms are debilitating or preventing discharge. Success rate after 24 hours is about 80-90%, but only around 30% when performed earlier [ref 6].

Procedure

a) **Senior Supervision** – a blood patch must always be undertaken under the direct supervision of a consultant or senior SpR, in the theatre suite, with an ODP to assist.

b) **Informed Consent** - give a full explanation of the cause of the headache and the reasons for performing a blood patch. Explain that it is successful on the first occasion in up to 80% of cases, but that a subsequent procedure may be necessary. Some pain, or pressure symptoms may be referred to the back, hip or leg during or immediately after the procedure, and backache may develop and persist for up to two weeks.

c) **No infection** - the woman must be apyrexial and free from other signs of systemic infection, or infection of the skin at the proposed vertebral level. There is no need to do blood cultures routinely when performing a blood patch.

d) **Recumbency** - there is some evidence that lying flat for an hour before the procedure may improve its efficacy (by reducing the volume of CSF in the extradural space).

e) **Technique**

- ⊙ **Two anaesthetists -** are required, both scrubbed, gowned & gloved.
- ⊙ **IV access**
- ⊙ **Vertebral level -** MRI studies have shown that spread of the clot is principally cephalad, therefore identify the epidural space at or below the original puncture site. Some anaesthetists thread an epidural catheter (in order that the woman's position might be varied during injection); others inject through the Tuohy needle. Note, it is not possible to inject blood through a bacterial filter.
- ⊙ **Take 20 ml blood** - aseptically and inject over approximately 1 minute. If back or leg pain (due to arachnoid irritation) or pressure occurs, stop injecting and wait a few seconds. If the pain or pressure symptoms persist,

then abandon the procedure. If a catheter has been used, remove it immediately after injection is complete.

- ⊙ **Recumbency** - for 1- 2 hours and then mobilise cautiously.
- ⊙ **Review** – if the symptoms have not completely resolved, refer to a consultant - a repeat blood patch may be required. All women who have had a blood patch should be referred to the Obstetric Anaesthetic Clinic 6-10 weeks postpartum.
- ⊙ **Documentation** - record the procedure in the notes and also in the "blood patch book" **(NCH).** and on the "white board" in the Obstetric Theatre coffee room **(QMC)**

Total Spinal

Total spinal anaesthesia is the rapid onset of hypotension and analgesia with widespread paralysis and apnoea due to the effects of the local anaesthetic within the subarachnoid space to a high level (C3 for apnoea). It has occurred with the first dose of local anaesthetic when the epidural catheter was wholly or partly intra-thecal, but no CSF was apparent on aspiration. It has also been reported following several top-ups, several hours after the initiation of the epidural block. Inadvertent subarachnoid block can also occur where the dura has been punctured and the epidural catheter then re-sited at another interspace. It can also occur during normal spinal anaesthesia.

a) Precautions to Avoid Total Spinal

- ⊙ **Aspiration** - epidural catheters must be carefully aspirated prior to any injection of local anaesthetic. Every top-up should be considered as a test dose and has the potential for high spread.

- ⊙ **Test Dose** - a suitable initial 'test' dose of local anaesthetic should be given **(page 12)**. Rapid, profound analgesia, hypotension, or evidence of a dense motor block are suggestive of intrathecal injection.

- ⊙ **Anaesthetist Top-ups -** all top-ups following accidental dural puncture must be administered by an anaesthetist.

b) Management of a Total Spinal

- ⊙ **Call for the resuscitation trolley, senior help and an ODP**

- ⊙ **Oxygenate -** apnoea will be preceded by respiratory distress due to intercostal and phrenic nerve involvement. Administer oxygen and position the woman on her side. If necessary, assist ventilation by bag and mask, with application of cricoid pressure, while preparations are made for tracheal intubation. An induction agent and muscle relaxants may not be required in this situation, but should be drawn up.

- **Correct hypotension** - profound hypotension is treated with a generous fluid infusion and intravenous ephedrine or an α agonist (phenylephrine or metaraminol). Atropine or glycopyrrolate may be required to treat any bradycardia. Avoid aorto-caval compression. Cardiac massage may be required in extreme cases **(see page 47)**. An infusion of vasopressors may be required until the block resolves.

- **Obstetric management** - following initial resuscitative measures, further management decisions should be made by senior obstetric and anaesthetic staff. Caesarean section may be indicated, particularly if aorto-caval compression is thought to be interfering with cardiovascular resuscitation.

- **Critical Care** – a total spinal anaesthetic will resolve over a few hours. Cerebral, motor and cardiovascular function will return as long as the respiratory and cardiovascular systems are adequately supported during this period. Even with a decreasing level of block, sedation may occur due to sensory deprivation and therefore Critical Care should be involved with the management of the women until the block has fully receded. Death of mother or fetus due to total spinal anaesthesia should be totally preventable.

LABOUR ANALGESIA – OPIOIDS/ PCA

I.M or I.V Opioids

Diamorphine, morphine or pethidine can be given by a midwife. Diamorphine is the better option (maternal effect, reduced ½ life in neonate and not pro-epileptogenic as is norpethidine).

PCA

PCA is not as useful in labour as post-operatively due to the peaks of pain caused by the contractions. With diamorphine, pethidine & fentanyl the patient must be informed not to activate the PCA with every contraction(long half lives). With remifentanil they must activate with each contraction and should try to pre-empt the contraction or the peak drug effect will occur after the contraction has subsided and they may become apnoeic. Remifentanil should be used only with the explicit agreement of a consultant obstetric anaesthetist and advice sought re supplementary oxygen, monitoring, midwife observations, etc (see below).

Intravenous PCA in labour [ref 7]

	Diamorphine	Pethidine	Fentanyl	Remifentanil
Initial loading/starting dose	2.5-7.5mg	50 - 75 mg	50 µg	35 µg
Bolus	0.5 - 1 mg	20 - 25 mg	25 - 30 µg	50 - 75 µg
Lock-out period	5 minutes	5 minutes	5 minutes	2 – 3 minutes
Suggested 4 h dose limit		300 mg	400 µg	

For fentanyl, dilute 1000 µg (2 × 10 ml ampoules) up to 50 ml with saline. This gives a 20 µg ml^{-1} concentration. After the loading bolus, set 1.5 ml bolus with a 5 min lockout.

CAESAREAN SECTION

NICE and the National Collaborating Centre for Women and Children's Health have published a guideline for the NHS in England and Wales on Caesarean section: **http://www.nice.org.uk/page.aspx?o=113190**

The OAA and RCOG categorisation is based on descriptions of urgency as opposed to 'decision-delivery' time intervals. [ref 8]

Category/ Grade	Definition (at time of decision to operate)
Cat 1/ Emergency	**Immediate threat to life of woman or fetus**
Cat2/ Urgent	**Maternal or fetal compromise, not immediately life-threatening**
Cat3/ Scheduled	**Needing early delivery but no maternal or fetal compromise**
Cat4/ Elective	**At a time to suit the woman and maternity team**

Drugs for Caesarean Section – see pages 42-44

Anaesthesia for Caesarean Section – spinal - see pages 24 – 38
- **epidural/ CSE – see pages 31-33**
- **GA – see pages 34-38**

Elective Caesarean Section

a) Pre-operative visit – a normal anaesthetic history and examination should be performed. Take note of the indication for the section and the placental site from the scan to ensure that a placenta praevia has not been missed. Protracted deprivation of food and oral fluid should be avoided.

b) Investigations

- **FBC** - pregnant women are often anaemic, because of disproportionately increased plasma volume relative to red cell mass. Pre-operative transfusion should not normally be considered if haemoglobin concentration is greater than 9 g dl^{-1}.

- **Blood Group/Antibody Screen** - do not start an elective case until the group & antibody screen has been confirmed on the computer or by phoning blood bank. Confirm that the patient's blood does not have any antibodies that would affect crossmatching. If they do have antibodies, you will almost certainly require blood to be sent from Sheffield. If possible, the procedure should be delayed until the blood has arrived in the hospital.

- **Cross Match** – for cases with a high risk of major haemorrhage, red cells should be cross-matched and delivered to the theatre in an insulated box before starting anaesthesia and the red blood cell saver set up if appropriate.

- **Urea and Electrolytes -** these are requested only if specifically indicated.

c) Starvation – no one should be 'nil by mouth' from midnight.

- **Solid food** - 6 hours pre-theatre.

- **Drinks** - 2 hours pre-theatre. Squash with no particulate matter and tea/coffee made with semi-skimmed are acceptable.

- **Sips of water** - unrestricted until operation

d) Antacid regimen

- **Ranitidine** - elective women should have two doses of oral ranitidine 150 mg, approximately 8 hours apart (22:00 and 07:00 for a.m. cases).

- ⊙ **Sodium Citrate** - 30 mls sodium citrate 0.3M on the table **(NCH),** or immediately before transfer to theatre **(QMC).**

Non-Elective Caesarean Section

a) **Documentation** - it is recommended that the anaesthetist documents the following for every non-elective Caesarean section.
   - ⊙ indication
   - ⊙ declared urgency
   - ⊙ time that he/she was notified

b) **Ranitidine 6 hourly -** identify with the obstetricians/ midwives those women at high risk of operative delivery (maternal disease or acute/ chronic fetal compromise). These women are least likely to have normal deliveries, and should receive regular oral ranitidine 150 mg 6-hourly.

c) **Which Anaesthetic Technique?** - the choice of anaesthetic in the emergency situation is a judgement based on the balance of risk to either the mother or the fetus, or both, from the obstetric condition presenting and the mode of anaesthesia. Usually the choice of anaesthetic will be determined by the urgency of the obstetric problem. Bear in mind that your duty of care is always to the mother. Generally, the order of rapidity of readiness for surgery is in the order of, general anaesthetic, epidural top-up and then de-novo spinal. A labour epidural can be topped up and be ready for surgery very quickly if topped up in the labour room. However, it must be borne in mind that the anaesthetist must stay with the patient and that there will be little monitoring during the transfer, so a balance of risk assessment must be made prior to topping up in the labour room.

   - ⊙ **General Anaesthesia** - placental abruption, uterine scar dehiscence and prolonged fetal bradycardia are indications for immediate, category 1 CS. The vast majority of cases will demand that a general anaesthetic be given.

   - ⊙ **Cord Prolapse** – this is not necessarily a category 1 emergency (i.e. epidural can be topped up), provided the cord is decompressed (someone's hand in the vagina pushing the baby's head up into the uterus) and the fetus is not compromised.

   - ⊙ **Failure to Progress/ Dystocia** - LSCS for this indication should allow plenty time for an epidural to be topped up or a spinal anaesthetic to be administered.

Intra-uterine Fetal Resuscitation [ref 9] - in the event of a Category 1 CS, the following measures to improve fetal well-being should be considered in conjunction with the midwifery and obstetric team: - **SPOILT**

- ⊙ **S**yntocinon off
- ⊙ **P**osition full left lateral
- ⊙ **O**xygen
- ⊙ **I**.v. - infusion of 1 litre crystalloid
- ⊙ **L**ow blood pressure - i.v. vasopressor
- ⊙ **T**ocolysis - terbutaline 250 mcg s.c.(or slow IV), GTN 2 × 400 μg puffs (sublingual), repeat after 1 min until contractions stop; max 3 doses. (Not if abruption/antepartum haemorrhage) - **see page 43**.

ANAESTHESIA FOR CAESAREAN SECTION
SINGLE-SHOT SPINAL ANAESTHESIA

Compared with epidural anaesthesia, spinal anaesthesia has less need for intra-operative analgesic supplementation/conversion to GA. Unless there are contra-indications, this should be the technique of choice for most Caesarean sections.

General Principles

a) Needle size - The smallest available pencil-point (Sprotte or Whitacre) needle should be used, preferably a 27 gauge. The incidence of headache with these needles is far less than with Quincke types**.**

b) Vertebral level - because it is now appreciated that the conus medullaris can extend lower than previously recognised (and anaesthetists often misjudge the inter-space), spinal needles should not be inserted above L2/3 **ref** [10]. However, one of the commoner reasons for the trainee to fail in locating the CSF is attempting to gain access too low, such as at L4/5 or even L5/S1. In this situation the spinal insertion is often successful one space up. It may be safer to use an incremental advancement technique, where the spinal needle is advanced about 3mm at a time once the needle is in the interspinous ligaments. CSF is searched for by removing the stylet after each advancement [ref 11]. Even in a 27 gauge the CSF refluxes quickly in this group of patients.

c) Paraesthesia - if there is pain or paraesthesia in association with needle placement, or injection, stop and withdraw the needle.

Principles of Safe Management

a) Antacid regimen – 30ml of 0.3 molar sodium citrate **(see page 24).**

b) Avoid Aorto-caval Compression – there should be at least a 15 degrees of left tilt to the table when the patient is supine. If this is not possible for any reason, then place a wedge under the patients' right hip.

c) Have Vaso-active Drugs Prepared - atropine and phenylephrine and/or ephedrine should be drawn up, with drugs for general anaesthesia readily available.

d) Establish I.V. Infusion - Hartmann's or N.Saline, 14 or 16 g cannula as a minimum. It is wise to insert two cannulae if you feel that the patient is at higher risk of heavy bleeding (e.g. pl. praevia). One to two litres of crystalloid per-operatively is usually given in the uncomplicated case. Limit this to 0.5-1 litre in severe pre-eclampsia.

e) Sterility - a subarachnoid injection is a sterile procedure and gown, hat, gloves and mask are to be worn. All drugs that are to be injected into the subarachnoid space must be drawn up through a particulate filter (either integral to a 'drawing-up' needle or a separate item interposed between needle and syringe). This must be done in a sterile manner.

f) Check BP Before Starting - as a general rule, try to maintain systolic arterial pressure around the pre-operative level (check recent ante-natal records in the Part 1 document) and definitely above 100 mmHg.

Intrathecal Drug Doses

Diamorphine is the preferred intra-thecal opioid for LSCS. It has been shown that patients receiving it have a lower incidence of unpleasant sensations per-operatively when compared to morphine. This is a function of the drugs lipophillicity and thereby the onset of action.

a) Opioids

- ⊙ **Diamorphine 0.25 – 0.4 mg** - dilute 5 mg powder with 5ml saline to give 1mg/ml. Ref 12
- ⊙ **Morphine 0.1 mg** - this must be preservative-free, available as 'morphine for epidural injection' (2 mg in 10 ml). Use 0.5 ml of this solution.
- ⊙ **Fentanyl 15-20mcg** – this drug is preservative free and lasts about 6 hours.

b) Hyperbaric (heavy) Bupivacaine 0.5% - 2.5 ml is appropriate for most women. Pre-term women (28-35 weeks) have a requirement for more local anaesthetic compared to those at term (>38 weeks), probably because of reduced caval compression and displacement of the dura by engorged epidural veins.[ref 13] There is a tendency for high blocks in the obese subject and following an epidural. Some clinicians will use the same dose but inject very slowly, others will reduce the dose.

c) Intrathecal Injection - barbotage is not recommended, but it is important to confirm that CSF can be aspirated during and on completion of injection of the solution.

Vasopressors

a) Vasopressor Use – maternal hypotension is unpleasant for the women and leads to inadequate placental perfusion.

b) Phenylephrine - is the vasopressor of choice. There is evidence that its use is associated with less fetal acidosis compared to ephedrine [ref 14.] However, when there is a maternal bradycardia, or when the response to phenylephrine seems inadequate then ephedrine is useful. Some clinicians use infusions of phenylephrine to prevent any BP drop. However, it should be borne in mind that a bradycardia produced by a vasoconstrictor is suggestive of excessive vasoconstriction and could potentially affect placental perfusion.

c) Vasopressor Doses

- ⊙ **Phenylephrine bolus** - 50-100 mcg. Phenylephrine 100mcg ml^{-1} solution should be used. If this concentration is not available, dilute the 10 mg ml^{-1} preparation.
- ⊙ **Ephedrine bolus** - 3-6 mg
- ⊙ **Phenylephrine infusion** – the dose range is around 40 to 80mcg/min from moment of injection of the spinal to the clamping of the umbilical cord **[ref15.]**
  - **NCH** – 2mg (2000 mcg) to 50 ml with crystalloid and run through a Graseby syringe driver at 60-120 ml/hr.
  - **QMC** - 5mg (5000mcg) of phenylephrine to 500ml 0.9% saline and run through Graseby 500 administration set and volumetric pump at a rate of 250-500ml/hr (40-80mcg/min). It is better to add phenylephrine to the bag before running it through. Start immediately after the spinal injection, ensuring you have some form of heart rate monitoring. Titrate to heart rate and BP. Stop when BP has stabilised, post oxytocin bolus.

d) Vasopressor Timing - vasopressors should be administered for recorded hypotension and consideration given for treatment in the following circumstances:

- ⊙ **Following Intrathecal injection** - to prevent hypotension – 50-100mcg
- ⊙ **Maternal symptoms** – if the mother feels sick, faint, dizzy, becomes pale and sweaty or begins to yawn, then they are probably hypotensive, particularly if these symptoms are associated with a tachycardia.
- ⊙ **Tachycardia** – or a rising heart rate is frequently the first sign of vasodilatation developing. Reversal of the tachycardia is a good sign that the blood pressure is being restored.

- ⊙ **Oxytocin delivery** - an α-agonist given 30 seconds before the administration of oxytocin helps minimise the development of a significant tachycardia.

e) Bradycardia & Hypotension – ephedrine is the drug of choice (α agonist + anticholinergic is an alternative)

- ⊙ **Cardio-accelerator nerve blockade –** the pulse tends to sit steady at 50-60 bpm despite hypotension.

- ⊙ **Bezold-Jarisch Reflex** - a paradoxical response to decreased atrial filling from significantly reduced venous return. It can occur rapidly, the BP may not be recordable and the patient is at risk of losing consciousness. Prompt treatment with fluids, ensuring left lateral tilt, vasopressors and an anticholinergic agent (as required) must be instituted quickly.

Block Testing

Perception of pain during regional anaesthesia for LSCS is the commonest cause of complaint in obstetric anaesthesia. It is essential that you check your block to at least two modalities (cold/ motor), and preferably three (+light touch) prior to giving permission for surgery to commence. This should always be documented.

a) Motor Block – inability to raise the knees or heels from the bed should be confirmed. Movement of the toes is usually the last element to be eliminated and should not prevent surgery from beginning.

b) Block to Cold - using ethyl chloride or ice. Spinal anaesthesia, unlike epidural anaesthesia, virtually guarantees complete sensory loss below the most cephalad level. However there are case reports of patients having dermatomal sparing during spinal anaesthesia and so it is prudent to check the block from S5 to T4 bilaterally and to document the finding.

c) Block to Light touch – using the drop of the ethyl chloride or the roughness of gauze. If the block to cold is satisfactory then you will only need to check the cephalad extent of this block, which should be to T6 bilaterally. However, it should be borne in mind that a few patients find it hard to differentiate between blocked and unblocked regions using this modality. Therefore, if block of the other two modalities is good, proceed.

d) Inadequate Block – do not attempt a second intrathecal injection without having sought the advice of a senior SpR or consultant. Estimation of an appropriate safe dose is difficult. If time permits, site an epidural catheter and top up cautiously with (levo)bupivacaine 0.5%, or the rapid top-up mixture. In the event of fetal compromise (discuss with obstetrician how much time is available), general anaesthesia may be indicated.

Mobilisation

Post-operatively, the woman should be mobilised in the usual manner. Bed rest will not prevent the development of a spinal headache. If a headache does develop, the initial treatment comprises bed rest, analgesics and increased fluid intake. If the headache is disabling or severe, consider an epidural blood patch. Consult first with a senior SpR or consultant obstetric anaesthetist **(see page 17-18).**

Post-op Opioids

After intrathecal opioid, no further parenteral opioids should be routinely administered for 12 hours after diamorphine or morphine, and 6 hours following fentanyl. Oral morphine solution **(NCH)** (0.3-0.6mg/kg hourly, i.e. ~20-40mg) is acceptable within this period, as is dihydrocodeine **(QMC) see page 44.** If this is inadequate, i.v. morphine should be titrated by an anaesthetist and the respiratory rate documented hourly, with review if they should drop below 10 per minute.

ANAESTHESIA FOR CAESAREAN SECTION
EPIDURAL & COMBINED SPINAL-EPIDURAL ANAESTHESIA

Indications for Epidural

a) **Epidural in Situ** - having been successfully established during labour.

b) **Failed/ Contra-indicated Spinal –** e.g. in cardiac disease

c) **Prolonged Surgery** - when it is thought that surgery may be prolonged, such as in a patient having had multiple laparotomies in the past. LSCS with sterilisation is not an indication in most patients.

d) **Primary Technique** – CSE's are now sometimes utilised to minimise the initial spinal dose of local anaesthetic to limit BP change (see below).

Epidural Rapid Top-up

a) **Mixture** –

⊙ **NCH** - 'rapid top-up' mixture is as follows:

- **10 mls 0.5% bupivacaine with 1:200,000 adrenaline**
- **10 mls 2% lidocaine**
- **2 mls 8.4% sodium bicarbonate** - add the bicarbonate last or the mixture will precipitate.

These drugs are available in a box kept in theatre and at the midwives' desk. 15-22 mls of this solution should be given over 5 minutes. An adequate block for surgery should be obtained in around 7-10 minutes.

⊙ **QMC** - 'rapid top-up' mixture is as follows:

- **20 ml (5mg/ml) 0.5% (levo)bupivacaine**
- **OR 10 ml (5mg/ml) 0.5% (levo)bupivacaine + 10 ml 2% lidocaine.**

b) **Where to Top-up** - the majority of the top-up should be administered in theatre, with monitoring attached. Administration of the entire dose in the delivery room risks development of a high block and unmonitored hypotension/ fetal distress whilst in transit to theatre. This practice would probably be

indefensible should a major problem arise. If it is deemed necessary to top-up on Labour Suite then the anaesthetist must stay with the patient.

c) **IV Fluids -** as the block is established, 500 ml Hartmann's solution should be infused through a 14 or 16 g cannula (not in pre-eclampsia). If hypotension develops, and in women with pre-eclampsia, use vasopressors rather than resort to colloid substitutes such as Gelofusine® or Haemacel®.

d) **Block Testing** - be aware that epidural anaesthesia may leave normal sensation in the most caudal (sacral) dermatomes. Block of the sacral roots is important to prevent pain during visceral traction and pressure on the vagina. All dermatomes from S5-T4 should be tested on both sides, and the upper and lower limits of the block (and any missed segments) documented. It should be borne in mind that the zone of differential sensitivity to touch and cold may be two to four dermatomes wide.

e) **Epidural Opioids** - improve the quality of the block during surgery. Epidural fentanyl in labour does not preclude a further peri-operative dose up to 100 µg e.g. 50 mcg during establishment of the block and a further 50 mcg after delivery. Alternatively, 2.5mg of diamorphine can be given, which will prolong the post-operative analgesia.

f) **Breakthrough Pain** - look out for surreptitious delivery of the uterus through the abdominal wound, which can cause sudden extreme discomfort. Enquire as to the necessity of the manoeuvre and request that they replace the uterus as soon as possible.

- ⊙ **Alfentanil** - in 0.25-0.5 mg increments can be used to control any breakthrough pain, and should not be withheld for fear of depressing the fetus. Inform the neonatologist.

- ⊙ **Ketamine** - in 10-30mg increments can be very useful in avoiding having to proceed to a GA and if used in conjunction with alfentanil (or midazolam) seems to have a low incidence of unpleasant side effects.

- ⊙ **Entonox** - a 50% oxygen/50% nitrous oxide mix administered by the anaesthetic breathing system is a useful approach. Do not add an anaesthetic vapour, as this risks loss of the airway reflexes.

- ⊙ **General Anaesthetic** - unrelieved, persistent pain must be discussed with the patient and a GA offered, and this should be documented.

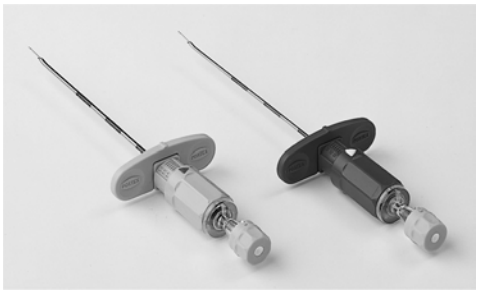
Combined Spinal-Epidural Anaesthesia

Why Use a CSE?

a) **Reduced Intrathecal Dose** - the initial subarachnoid injection can be deliberately conservative (1.5mls local anaesthetic intrathecally, +/- 10- 20mls N.Saline via the epidural to push the intrathecal block to T4), to minimise the risk of a dangerously high block (e.g. in the morbidly obese, or in a women with a difficult airway). In addition, the haemodynamic consequences of spinal anaesthesia will be minimised.

b) **Prolong the Block** - the subarachnoid block can be augmented by subsequent epidural top-ups (particularly useful if protracted surgery is anticipated). However, it should be borne in mind that the initial spinal dose means that intrathecal catheter placement cannot have been excluded (i.e. the epidural catheter is untested).

c) **Post-op Pain Relief** - the epidural catheter can be used to provide optimal analgesia (continuous epidural infusion) in the postoperative period (e.g. severe pre-eclampsia, cardiac disease).



Portex CSEcure®
Combined spinal-epidural
system
with locking device,
available from Smiths Medical.

ANAESTHESIA FOR CAESAREAN SECTION
GENERAL ANAESTHESIA

Pre-operative

a) **Pre-operative Visit** – a normal anaesthetic history and examination should be performed, with particular attention paid to the airway (failed intubation 1:300 versus 1:2000 in normal population). Rapid sequence induction should be explained. If you anticipate difficulty, summon help before starting. An awake fibre-optic intubation should be considered if airway difficulty is anticipated and sedation should not be omitted on the grounds of fear of fetal depression.

b) **Equipment Check** - ensure that you are familiar with the available equipment for the management of the difficult airway (McCoy laryngoscope, LMA Classic™ or Proseal™, cricothyroidotomy device). NB Never reach for an unfamiliar device for the first time in a crisis!

c) **Partners** - are not normally allowed in theatre when the mother is having a GA. However, provided there is a dedicated trained midwife, a partner may (once the maternal airway has been secured) be escorted in to witness the baby's birth.

Induction of General Anaesthesia for a Category 1 Emergency

a) **Patient Transfer** - women should be transferred in left lateral position (see intra-uterine fetal resuscitation, **page 25**).

b) **Skilled Assistance** - ensure that the ODP has been contacted. Skilled assistance (and access to the drug cupboards) is essential and no anaesthetic should commence until assistance is available.

c) **Sodium Citrate** – 30ml 0.3 Molar.

d) **IV Access** - establish a free-running i.v.i. via a 16 or 14 gauge cannula.

e) **Patient Position** – 15° left lateral tilt.

f) **Head & Neck Position** - optimise head and neck position for intubation prior to induction (sniffing the morning air – neck flexed, head extended).

g) Pre-induction - start 100% O_2 via close-fitting facemask, at sufficient flow to prevent re-breathing. Ensure that the gas analyser is switched on and the sampling line is connected to the filter. Confirm the presence of a CO_2 trace. Pre-oxygenate for three minutes, or until the end-tidal oxygen concentration reaches 90%. The ODP should attach the ECG, NIBP and pulse oximeter probe during this period. Make sure the suction is working and close to hand. When the surgeon is ready, instruct the ODP to apply cricoid pressure (lightly). Ensure that pressure is being applied correctly and that the head and neck are optimally positioned for intubation.

h) Induction Drugs

- **Thiopentone** - 5 mg kg^{-1} or **etomidate** 0.3 mg kg^{-1} (avoid propofol if possible as there is a higher incidence of awareness).
  - **QMC** – pre-mixed thiopental syringes are kept in the theatre fridge. This is on a named patient basis and the form next to the drugs must be completed to ensure continuation of the service.

- **Succinylcholine** – 1-1.5 mg/Kg.
  - **QMC** - Suxamethonium minijets are kept in the theatre fridge.

- **Opioids** - for the mother with pre-eclampsia, cardiovascular or cerebrovascular disease, do not withhold an opioid at induction for fear of neonatal respiratory depression (easily antagonised by naloxone). See guideline for GA in pre-eclampsia **(page 62)**.

i) Induction -when the jaw is fully relaxed, intubate and inflate the cuff. Attach the breathing system (still delivering 100% O_2) and inflate the lungs several times, listening for bilateral breath sounds and checking for the regular appearance of CO_2 on exhalation. Check that there is no audible leak around the cuff before ordering the cricoid pressure to be removed.

Difficult Tracheal Intubation - hints

a) **Smaller tracheal tube than usual** - especially if there is a history of upper respiratory tract infection or pre-eclampsia, both of which predispose to laryngeal oedema.

b) **Pre-stiffened tracheal tube/ bougie** - many practitioners prefer to have the tracheal tube pre-stiffened by the insertion of a stylet. Remember to have the stylet well lubricated, and not to over flex it, otherwise removal can be difficult. An anterior larynx, just out of reach of the tube, can usually be cannulated with a well-lubricated gum-elastic bougie. When railroading the tracheal tube, rotation of the tube as you advance helps the tube bevel slip past the vocal cords.

c) **Different laryngoscope** – a McCoy laryngoscope can convert a Grade 3 view into a Grade 2 view.

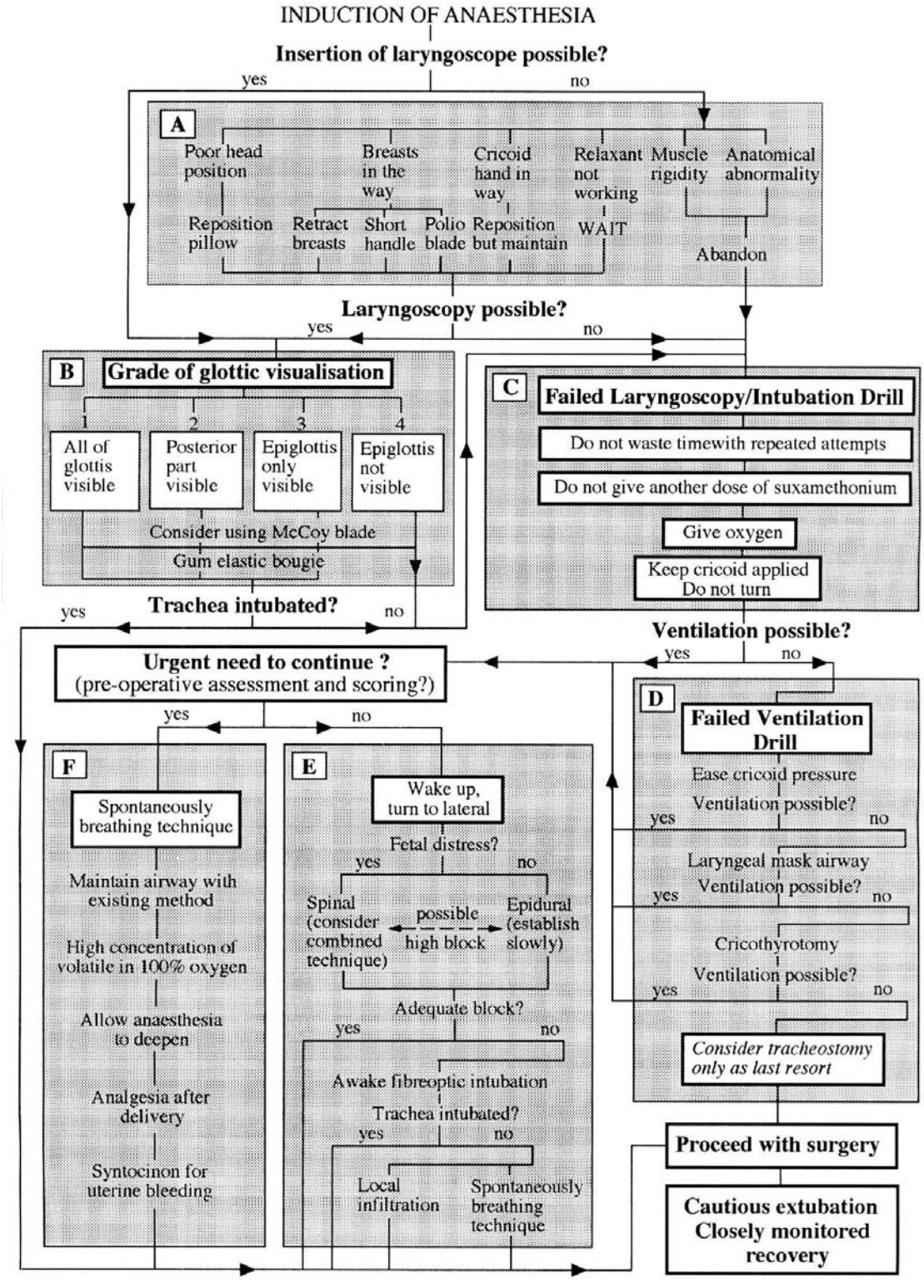
d) **Head and Neck Position** – reassess.

e) **Re-direct cricoid pressure** - an unexpectedly poor laryngoscopy grade is often due to wrongly applied cricoid pressure, particularly if the ODP has not allowed for the fact that woman is tilted when calculating the direction of force. Careful re-adjustment can transform the view. Obstruction to insertion of the laryngoscope by the woman's breasts, or the ODP's hand, can be overcome by using the Polio blade or by inserting the ordinary blade before attaching the handle.

DO NOT MAINTAIN CRICOID PRESSURE AT THE EXPENSE OF OXYGENATION. HYPOXIA IS FATAL, BUT ASPIRATION IS NOT INEVITABLE, NOR IS DEATH FROM ASPIRATION.

REMEMBER - WOMEN DO NOT DIE FROM FAILURE TO INTUBATE. THEY DO DIE FROM PROLONGED ATTEMPTS TO INTUBATE IN THE FACE OF HYPOXIA AND FROM UNRECOGNISED OESOPHAGEAL INTUBATION. IF IN DOUBT, TAKE IT OUT and VENTILATE WITH BAG AND MASK.

Difficult Intubation Algorithm



Reproduced courtesy of Professor Mike Harmer, with the permission of Harcourt Brace & Co. Ltd.[ref 16]

Maintenance and Reversal

a) **$ETCO_2$** - keep the end tidal CO_2 ~ 4.0 kPa.

b) **Anaesthetic Agents** –

- ⊙ **Oxygen** - use 33 - 50% O_2 in N_2O
- ⊙ **MAC** - add approximately 0.75 MAC [end-tidal] of volatile agent (isoflurane or sevoflurane) to the N_20/O_2 mix.[ref 17]
- ⊙ **Over-Pressure** - can be used initially e.g. 2-3% isoflurane (inspired) for the first minute or two to ensure an end tidal MAC of at least 1.3 [ref 18,19]. However, remember there is an increased risk of awareness that comes from the absence of opioid analgesia. Do not hesitate to increase the volatile agent if needed, guided by measured end-tidal vapour and N_2O concentrations, pupil size, tachycardia, hypertension, sweating and tear formation. The effect on uterine contractility of increased concentrations of volatile agents is rapidly reversible and the anaesthetic concentrations can be reduced to give a MAC of 1.0, soon after the IV opioids are given, following cord clamping. In the event of life-threatening haemorrhage, discontinuation of the volatile agent may be considered as a measure to improve uterine tone. In such a situation, ketamine (1mg/kg) can be used to maintain anaesthesia (with sympathomimetic and strong analgesic effects).

c) **Muscle Relaxants** - increments of a non-depolarising relaxant e.g. atracurium or rocuronium should be given, guided by the response to peripheral nerve stimulation. Reversal of suxamethonium is prolonged in pregnancy due to lowered levels of plasma cholinesterase. At the end of surgery, reverse neuromuscular block using a peripheral nerve stimulator to confirm full recovery. This is particularly important if magnesium sulphate has been given.

d) **Analgesia** - after the umbilical cord has been clamped, give i.v. morphine 10-15 mg. If there is an epidural is in situ, top up with 0.25% (2.5mg/ml)(levo)bupivacaine (assuming no major blood loss) and diamorphine 2.5 mg, otherwise set up a PCA. Transversus Abdominis blocks can be inserted under ultrasound guidance.

e) **Blood Loss** - estimation of blood loss is difficult because of mixing with liquor.. Haemocue estimation of the haemoglobin concentration is useful.

f) **Extubation** – extubation should occur when there is return of the airway reflexes and the patient recovered in the lateral, head down position until fully awake. Supplementary oxygen should be administered until SpO_2 is >95% breathing air. Pain should be treated with intravenous morphine.

ANAESTHESIA FOR CAESAREAN SECTION
IMMEDIATE POST-OPERATIVE CARE

Recovery

All women who have undergone Caesarean Section must remain fully supervised in the recovery area for a period of at least 30 minutes or until discharge criteria have been met **(see below).** The anaesthetist should be immediately available during this period and should not leave the unit.

a) After Regional Anaesthesia - Remember that a previously stable block can rise when the woman is moved. Make sure that the blood pressure is stable in recovery and, if there is any doubt, re-check the level of block before discharge.

b) After General Anaesthesia – Transversus Abdominis blocks can be inserted by those proficient at the technique.

c) Before Discharge - ensure the following:

- ⊙ **Vital signs stable**
- ⊙ **Pain free**
- ⊙ **Drugs prescribed** - post-operative fluids, analgesia and LMWH **(see pages 8-9, 43-44).**
- ⊙ **Midwife handover -** regarding post-operative observations and restrictions on further opioid administration **(see page 44).**

d) Oral fluids - A drink of tea/coffee or squash may be offered to women who have undergone uncomplicated delivery under regional block, as long as the uterus is well contracted and there is no evidence of significant post-partum bleeding.

Post-op Observations

Caesarean Section Observation Protocol

ALL OBSERVATIONS LISTED BELOW ARE MANDATORY FOR ALL CASES

On return to the ward all patients are to have their vital signs recorded on the following observation sheets. These are to be kept at the end of the patients bed at all times.

1. **OBSTETRIC EARLY WARNING SCORE**
2. **FLUID BALANCE CHART**

A functioning intravenous cannula must be left in-situ until 24 hours post-surgery and I.V. fluids given as prescribed

EARLY WARNING SCORE (Example, below)

OBSERVATION	FREQUENCY	DURATION
RESPIRATORY RATE & NEURO RESPONSE (AVPU)	HOURLY	12 HOURS
	4 HOURLY	24 HOURS POST SURGERY
PULSE & BP	HOURLY	4 HOURS
	4 HOURLY	24 HOURS POST SURGERY
TEMPERATURE	4 HOURLY	24 HOURS POST SURGERY

FLUID BALANCE CHART

URINE OUTPUT & BLOOD LOSS	HOURLY	12 HOURS
FLUID INPUT	END OF EACH FLUID BAG	12 HOURS

Follow-up

A follow-up form should be completed/ generated at the time of the LSCS. The duty obstetric anaesthetist should make a visit around 24 hours after the operation and complete the follow-up form.

a) **NCH -** follow-up forms that indicate that there has been no problem with the anaesthetic care should be filed in the patient notes as evidence of this.

b) **QMC –** the doctor following up the patient should input the details into the obstetric database.

c) **Consultant referral** - the following problems should be reported to a consultant anaesthetist:

- **Awareness**
- **Pain** - during regional anaesthesia
- **Neurological deficit**
- **Significant headache** – i.e. that keeps them in bed, or is worsening or associated with neurological deficit , fever or vomiting
- **Any complaint** - concerning the anaesthetic care

DRUGS FOR CAESAREAN SECTION

Peri-operative Drugs

a) Antibiotics – for prophylaxis

- **Co-amoxiclav** - for all cases give 1.2g after the peritoneum has been closed. The baby will not be exposed to antibiotic needlessly, and if the mother has an adverse reaction her treatment will not be compromised by the ongoing surgery or attempts to control bleeding.

- **Penicillin Allergy** [ref 19a] **-** the BNF states that " *individuals with a history of anaphylaxis, urticaria or rash immediately after a penicillin…..should not receive a penicillin, a cephalosporin or another beta-lactam antibiotic. Individuals with a minor rash (non confluent rash restricted to a small body area), or a rash that occurs more than 72 hours after administration are* ***probably*** *not allergic to penicillin and in these individuals a* ***penicillin should not be withheld for serious infections****, however an allergic reaction should be borne in mind."* Please note that the antibiotics given to the routine LSCS are for prophylaxis only.

- **Clindamycin** – For penicillin allergy. 600mg diluted in the intravenous infusion.

b) Oxytocics

- **Oxytocin Bolus** - **5 units** should be given by slow i.v. bolus at every CS as soon as the cord has been clamped (the last cord if multiple pregnancy). Oxytocin can cause transient, but severe vasodilatation, hypotension and tachycardia.[ref 20.] Dividing the dose into two 2.5iu boluses and giving the second bolus after the initial tachycardia begins to subside can minimise the tachycardia and decrease the risk of precipitating a more dangerous arrhythmia or myocardial ischaemia in the at risk or susceptible patient. A small dose of phenylephrine (50-100 mcg) given immediately prior to the oxytocin can control the tendency to tachycardia well. Precipitous drops in blood pressure can occur in the hypovolaemic or patients with fixed cardiac output. A further 5 units can be given if necessary.

- **Oxytocin Infusion** - all women are given an oxytocin infusion as prophylaxis against post-partum haemorrhage from uterine atony. This should be started immediately after the oxytocin bolus.

	Dilution in N.Saline	Infusion Rate
NCH	**40iu to 50ml**	**10ml/hr**
QMC	**40iu in 500ml**	**125ml/hr**

Use NCH protocol if fluid restriction applies e.g. pre-eclampsia.

⊙ **Ergometrine** - If the uterus fails to contract adequately, ergometrine in 0.25 mg i.v. increments is indicated, except in pre-eclampsia (beware of its vasopressor effect). Expect nausea/vomiting in the awake woman.

⊙ **Carboprost** - the third-line pharmacological approach is carboprost (prostaglandin F2α, Hemabate®) 0.25 mg by deep i.m. injection. Side effects include vasodilatation and bronchospasm. It should not be injected IV, nor into the myometrial wall due to the risk of severe bronchospasm. Maximum 8 doses at least 15 minutes apart (ref BNF).

⊙ **Misoprostol PR** – this is "off-licence", but is given as 800 mcg (4 x 200 mcg) PR, once.

c) Vasopressors - see page 28-9

d) Tocolysis - this may be requested to facilitate procedures such as delivery of a second twin.

⊙ **GTN** - 50 μg increments of i.v. glyceryl trinitrate (GTN). Hypotension does not seem to occur in women already venodilated by a regional block. GTN can alternatively be given by metered dose (400 μg) sublingual spray as two sprays and can be repeated.

⊙ **Terbutaline** – 250 mcg by slow IV injection.

⊙ **Salbutamol** – as inhaled doses.

<u>Post-op Drugs</u> - all cases (unless contra-indicated)

a) Analgesics

⊙ **Diclofenac** -100 mg suppository should be administered at the end of surgery. Record dose on 'once only' section of drug prescription chart. Prescribe 50 mg 8-hourly on the "regular" prescription area as PO/PR.

Contraindications to Diclofenac

- **Hypovolaemia** - or continuing bleeding (risk of renal hypoperfusion).
- **Renal impairment** - including poor urine output in pre-eclampsia).If diclofenac is withheld, review after 24 hours. If oliguria has resolved, then prescribe.
- **Coagulopathy**
- **Asthma with history of sensitivity to NSAIDs** - it is alright to prescribe if the woman has previously taken other NSAIDs without adverse effects.
- **Peptic ulceration** – if the history is for Helicobacter pylori, then NSAIDs can be prescribed.
- **Hypersensitivity to NSAID**

- ⊙ **Paracetamol** -1 g suppository can also be administered at end of surgery or 1g IV per-operatively. Record dose on 'once only' section of drug prescription chart. Prescribe 1g 4-6 hourly, max 4g/day on the "regular" prescription area as PO/PR.
- ⊙ **Oral Morphine Solution (NCH)** – 0.3-0.6mg/kg (20-40mg) hourly on the PRN side of the prescription chart. The patient can receive this at anytime.
- ⊙ **Dihydrocodeine (QMC)** - 30-60 mg orally, 4-hourly (max 240 mg/24 hr) on the PRN side of the prescription chart.

b) Anti-emetics

- ⊙ **Cyclizine** - 50mg 8 hourly PO/IM/IV on the PRN side of the chart.
- ⊙ **Ondansetron** - 4mg 8 hourly PO/IM/IV on the PRN side of the prescription chart.

c) Thromboprophylaxis

- ⊙ **Enoxaparin** – 40mg in recovery after uncomplicated spinal/ GA and 4 hours following removal of an epidural/ CSE catheter. 40mg S.C. daily as a regular prescription. Ensure that the 2nd dose is timed to be given ≤ 24 hours later. **See pages 8-9**.

- ⊙ **TED Stockings –** for all patients

d) Intravenous Opioids - parenteral administration of opioids by midwives is prohibited for 6 hours after fentanyl and 12 hours after morphine or diamorphine. If a woman is in severe pain within these periods, titrate morphine intravenously. Unlike recovery staff, midwives are not empowered to do this. Ensure that appropriate hourly monitoring of respiratory rate and sedation is in place before you leave the ward.

e) Intravenous Fluids - post-operative fluids should be prescribed to ensure that the IV access is maintained for at least 12-18 hours post-surgery in case post-partum haemorrhage occurs. This can be achieved by the slow infusion of 1-2 litres of crystalloid. With an uncomplicated CS under regional anaesthesia most woman should be drinking within a short time. Be wary of fluid overload, particularly in pre-eclampsia **(see page 60)**.

ANAESTHESIA/ ANALGESIA FOR OTHER OPERATIVE PROCEDURES

Apart from Caesarean section, you may be asked to provide anaesthesia for:

- **Insertion of cervical suture**
- **Trial of instrumental delivery**
- **Suturing of third degree tears**
- **Delivery of retained placenta**
- **Evacuation of retained products of conception**
- **Laparotomy**

General Principles

a) **Reflux** - regard every woman from 20 weeks of pregnancy, until 2 days postpartum, or any woman with symptoms of gastro-oesophageal reflux as being at risk from reflux. All women should have H_2 antagonists (if time permits) and antacid premedication, and if a GA is chosen, induction by rapid sequence (with cricoid pressure).

b) **Anaesthesia** - most women can routinely be offered spinal anaesthesia. The above procedures should be performed in the operating theatre rather than the delivery room. Beware of the forceps/vacuum delivery that can turn into a Category 1 emergency Caesarean section (the attempted instrumental delivery can exacerbate fetal compromise). Ensure there is an adequate block to T4 before the procedure starts. Apart from laparotomy and trial of instrumental delivery, all of the other procedures can be anaesthetised with 1.5 – 2.0 ml hyperbaric bupivacaine 0.5%, which should ensure cold sensation blockade to T10 or higher with minimal cardiovascular instability[ref 21] Note, hypotension in the course of regional anaesthesia for retained placenta can be related to the extent of maternal blood loss rather than block height.

c) **Laparotomy** - pregnant women not uncommonly present with abdominal pain and require procedures such as appendicectomy or ovarian cystectomy. These are best performed under general anaesthesia. The risk of precipitating abortion/ premature labour is attributable to surgical activities rather than anaesthesia.

d) **NSAIDs** - avoid if the fetus remains in-utero owing to possible detrimental effects on the child. Opioids and paracetamol are the mainstay of post-operative analgesia.

Late Termination of Pregnancy

This procedure is sometimes carried out on Labour Suite, usually for severe fetal abnormality. These patients have labour induced and augmented and therefore often require epidural or PCA analgesia.

Some anaesthetists may wish to exercise their right, under the terms of the Abortion Act 1967 (section 4) and the Human Fertilisation Act 1900 (section 37) to not be involved with the provision of anaesthetic services for these patients, and this position must be respected and therefore the following guideline applies:

a) **Trainees –** any trainee not wishing to become involved with these patients should notify the on-call consultant as soon as possible.

b) **Drs Curran/ Heining –** if either of these consultants are on-call, and there is a patient requiring a late termination of pregnancy, please inform one of the obstetric anaesthetic consultants (Biswas, Bogod, Hawkins, Hutter, Woods) so that an alternative anaesthetist can be arranged to attend.

c) **Emergency Care –** such as resuscitation, anaesthesia for bleeding etc, of patients having a late termination of pregnancy must not be compromised, no matter what the belief of the attending anaesthetist.

COLLAPSE IN THE PARTURIENT

Collapse, with or without seizure, may result from

- **Massive blood loss - (see pages 48-51)**
- **Eclampsia**
- **Epilepsy**
- **Pulmonary thromboembolism**
- **Amniotic fluid embolism (see below)**
- **Intracerebral pathology (e.g. aneurysm, AV Malformation)**
- **Myocardial infarction**
- **Local anaesthetic toxicity**
- **Total spinal block - (see pages 20-21)**
- **Sepsis**
- **Medical conditions**

a) **Resuscitation equipment** - make sure you know where resuscitation equipment and drugs are kept on the delivery suite, and that you are familiar with the latest UK Resuscitation Council algorithms.

b) **Oxygenate** - tracheal intubation should be instituted as early as feasible.

c) **Displace the uterus** – manually, or rotate the woman by at least 15° (whole body or at the hips) and secure the position with a wedge or pillow.

d) **Raise the legs.**

e) **Cardiac arrest -** external cardiac massage will be ineffective unless steps are taken to minimise aorto-caval compression as above (without making chest compression impossible).

f) **Caesarean section** - this is indicated if there is no response to advanced life support within 5 minutes.

Placental Abruption – **see page 49**.

Amniotic Fluid Embolism (anaphylactoid syndrome of pregnancy)

Thought to be an anaphylactoid reaction triggered by maternal exposure to fetal antigens from the amniotic fluid. The syndrome can occur at Caesarean section as well as in labour and during 2nd trimester terminations. Left ventricular dysfunction and pulmonary hypertension follow pulmonary vasoconstriction.

a) Signs

- ⊙ **Hypoxia**
- ⊙ **Bronchospasm**
- ⊙ **Haemodynamic collapse**
- ⊙ **Coagulopathy**

b) Treatment

- ⊙ **100% O_2,**
- ⊙ **Restoration of cardiac output**
- ⊙ **Correction of coagulopathy.**
- ⊙ **Critical Care**

Major Obstetric Haemorrhage

Obstetric haemorrhage can be primary or secondary (associated with coagulation failure). Placental abruption can fall into both categories (see below).

Primary	Secondary
Uterine atony	**Pre-eclampsia/HELLP**
Placental abruption	**Placental abruption**
Placenta praevia (see page 52-3)	**Intrauterine sepsis/septicaemia**
Retained placenta/products of conception	**Amniotic fluid embolism**
Genital tract trauma	**Pre-existing coagulopathy**
Uterine rupture	**Incompatible blood transfusion**
Uterine inversion	**Retained dead fetus**

a) **Placental abruption** - is the premature separation of a normally situated placenta. Intrauterine death implies that a large abruption has occurred; a sizeable covert haemorrhage can occur into the uterine myometrium. Coagulopathy can be expected in one to two thirds of women in whom intrauterine death has occurred, but is most unlikely if the fetus has been delivered alive. A significant abruption complicated by pre-eclampsia can lead to renal failure very quickly and if oliguria persists in this group for > 4 hours consider utilising a CVP line to allow controlled fluid replacement. A CVP of 1-2 is usually sufficient to ensure restoration of renal function. Do not overload the pre-eclamptic patient.

b) **Uterine inversion** - is when the fundus of the uterus becomes displaced, usually in the 3rd stage of labour. It is classified as 'complete' if the fundus passes through the cervix. Haemorrhage can be severe, although the clinical signs of shock can be out of proportion to the blood loss. A reflex bradycardia can be mediated by the effect of traction on the ligaments supporting the uterus. Treatment involves restoring the uterus to its rightful position and the correction of any hypovolaemia or bradycardia.

Major Haemorrhage Resuscitation

a) **Alert Appropriate Staff** - as soon as massive blood loss is evident, assumed, or can be predicted, summon or alert all extra staff:

- most senior available anaesthetist
- obstetric SpR/consultant
- senior midwives.
- transfusion laboratory
- on-call biomedical scientist (BMS)
- on-call haematology SpR or consultant.
- porters

Ask for the "Major Haemorrhage Box". Ensure that it is understood that blood is needed without delay. Make sure porters are always available for repeated transit of samples and blood products. (do not trust samples to the air tube system).

b) **Oxygen** - a high concentration of oxygen should be given to the mother.

c) **Two IV Lines** - at least two peripheral infusion lines will be necessary. The cannulae used should be 14 g (brown) or 16 g (grey).

d) **Invasive Monitoring** – this will not be necessary at the outset and can waste valuable time and can deviate attention from the resuscitation. When stable, consideration may be given to CVP monitoring. Unless the mother is septic or

has a cardiac problem, the BP will respond to fluid/ blood therapy and an arterial line will usually not be required.

e) Blood Samples

⊙ **Purple Top**	- 3 ml / EDTA / **FBC**
⊙ **Pale Blue Top**	- 4.5 ml / citrate / **coagulation screen & fibrinogen**
⊙ **Pink Top**	- 7 ml / EDTA / **cross-match**
⊙ **Green Top**	- 7ml/ heparin/ **U&E's**

f) Volume Replacement - initial volume replacement should be with 2 litres of Hartmann's (or N Saline, but beware of hyperchloraemic acidosis with large volumes), followed by colloid until blood is available. Whole blood is the treatment of choice, but if more than 3 units of plasma-reduced blood have been given, additional colloid will usually be necessary.

g) Cross Match/ Transfusion –

⊙ **Blood** - a minimum of 6 units should be ordered. The woman's blood group and the presence of abnormal antibodies should have been ascertained during pregnancy and this information should be available in the casenotes.

⊙ **Group Specific** - group and Rhesus compatible blood should be requested and issued with minimal delay.

⊙ **Warming Device** - ideally, blood should be administered through a warming device and high-pressure infusion devices are essential.

⊙ **Clotting Factors & Platelets** - while blood is gushing out, blood may be given and is in fact essential, however, it is useless and wasteful to give clotting factors or platelets. Once surgical haemostasis has been more or less achieved, continued oozing may be due to blood factor deficiencies. Further blood samples (see above) should be sent, but this should not delay the giving of FFP or cryoprecipitate. The sample sent to the lab will inform the haematology staff as to the likelihood of any additional requirements that you may have. Calcium is rarely required.

h) UN-CROSSMATCHED GROUP (O RhD-NEGATIVE) CAN BE LIFE-SAVING. This is stored in the obstetric theatre fridge at CHN, and in the fridge outside blood bank (west block, A floor) at QMC. At QMC you must phone Blood Bank and request the O neg blood.

i) Cell Salvage - this should be considered in cases of actual or anticipated major haemorrhage **(see page 55-56)**.

j) Use of Factor VIIa - can be lifesaving (and avert hysterectomy) and is accepted by most Jehovah's Witnesses (from rabbit kidney cell lines).

⊙ **Indications** - when surgical and/ or radiological (embolisation) opportunities for haemostasis have been exhausted and bleeding continues, consider recombinant factor VIIa (Eptacog alfa, NovoSeven®). It can save lives and is now indicated to prevent hysterectomy.

⊙ **Other Blood Products** - ensure that RBC's, FFP, cryoprecipitate, and platelets are given rapidly and aim to correct clotting and acidosis wherever possible.

⊙ **Supply** - this factor is stocked in the City Hospital and QMC Blood bank.

- **Contact On-call Haematology SpR** - to confirm FVIIa is appropriate treatment.
- **Haemostasis Consultant** - should be informed by the haematology SpR, but do not delay for further confirmation from consultant.
- **Blood Bank** – page the on-call technician, confirm haematology authorisation, and request dose as follows:

Weight	**Dose**
<55 Kg	4.8mg (1x4.8mg vial)
55-75kg	6mg (i.e. 1 x 4.8mg vial + 1 x 1.2mg vial)
>75kg	7.2mg (i.e. 1 x 4.8mg vial + 1 x 2.4mg vial)

k) NB: use booking weight as guide - this one-off dose is given as an IV bolus. It is unlikely that any further doses would be necessary; this should be discussed with the on-call haemostasis consultant.

l) High Dependency/ITU care – see pages 65-69.

Local Anaesthetic Toxicity [ref 21a]

Local anaesthetic toxicity can occur immediately or some time after following bolus dosing or during a maintenance infusion and can lead to cardiovascular collapse. Resuscitation may take > 1 hour

a) **Symptoms**
   - ⊙ **Lightheadeness**
   - ⊙ **Tinnitus**
   - ⊙ **Anxiety**
   - ⊙ **Circumoral tingling**
   - ⊙ **Abnormal taste**

b) **Signs**
   - ⊙ **Confusion & drowsiness/ Unconsciousness**
   - ⊙ **Hypotension** – vasodilatation and myocardial depression
   - ⊙ **Tachycardia/ bradycardia/ arrhythmias/ cardiac arrest**
   - ⊙ **Respiratory depression/ arrest**
   - ⊙ **Fitting**
   - ⊙ **Metabolic acidosis**

c) **Treatment** – this is based on the A,B,C,D,E algorhythm
   - ⊙ **Call for help**
   - ⊙ **Secure the airway/ 100% O_2**
   - ⊙ **Support the breathing –** hyperventilation may help
   - ⊙ **Support the CVS** – vasopressors alone may suffice, but you may require inotropes such as ephedrine (3-9 mg boluses) or adrenaline (10 mcg boluses & titrate upwards. 1ml of 1:1000 diluted to 10ml. Take 1ml of that solution & dilute to 10 ml to give 10 mcg/ml solution). Anti-arrhythmics & CPR may be required as per standard resuscitation guidelines. Consider cardiopulmonary bypass.
   - ⊙ **Stop the fitting** – diazepam 0.2-0.4mg/kg IV or 10 mg rectally. Alternatively, thiopentone 1-4mg/ kg or propofol. Equipment to support the airway/ ventilation must be to hand.
   - ⊙ **Intralipid** – 20% solution. 1.5ml/kg (100ml) & start an infusion at 0.25ml/kg/min (400ml/20 mins). Repeat the boluses twice more every 5 minutes & increase the infusion to 0.5ml/kg/min if adequate circulation not restored.
   - ⊙ **Blood samples –** plain & heparinised tube, pre-lipid administration & hourly after that. Measure LA & triglyceride levels

- ⊙ **Replace Intralipid stock**
- ⊙ **Report case** – to www.npsa.nhs.uk & **www.lipidrescue.org**.

JEHOVAH WITNESSES

See obstetric guideline for greater detail (hard copy, or on hospital intranet under obstetric guidelines)**.** The principles of treating members of the Jehovah Witness group, and other patients refusing blood products are as follows:

a) Patient Autonomy- adult patients have the right to refuse any treatment as long as they are deemed competent, even if this refusal would lead to their demise. You must follow their wishes and respect their decisions, even if you do not agree with them yourself.

- ⊙ **Patient Competency** - for the patient to be deemed competent you must be happy that they can
  - **Understand** – the information that you give them.
  - **Retain** - the Information that you give them.
  - **Weigh Up the Choices –** that are available to them.

- ⊙ **Under 18 Years** - in England, a patient under the age of 18 years, cannot refuse a treatment that is beneficial to them, nor can a parent, or guardian, consent for refusal of treatment on their behalf. However, if a conflict arises between parents / guardians and treating clinicians, consultant involvement is essential.

b) Refusal of Treatment – ascertain which products the patient refuses. Also, make sure that they understand that if they refuse blood, then it would be against the law for anyone to give them blood, even if that meant that they would not survive.

- ⊙ **They Usually Refuse**
  - **Blood** - be it homologous or pre-donation by themselves.
  - **Platelets**
  - **Clotting factors**
  - **Albumin**

- ⊙ **Will Often Accept:**

- **Cell salvage** – as long as they understand that the blood will remain in continuity with them.
- **Activated factor VIIa** - produced from rabbit kidney cell lines.
- **Blood patch**.
- **Organ donation**
- **Cardio-pulmonary bypass**

⊙ **They Will Accept :**

- **Crystalloids**
- **Artificial colloids**

c) Antenatally – inform the Antenatal Clinic sister who will arrange for regular checks on their haemoglobin to be done. Make sure they are started on Fe, folic acid and B12 and given appointments to see a Consultant Obstetric Anaesthetist and Obstetrician. If their Hb is below 10g/dl contact Dr Bethan Myers (Consultant Haematologist ext 66625, Bleep 80-6676)) to discuss the need for IV iron +/- erythropoietin.

d) Documentation – document clearly the discussion that you have had with the patient, the products that they refuse and the treatments that they accept. Have this witnessed in writing. Take a copy of their "Advance Directive", which you should have them sign and date for the day of your discussion and place this in the notes. Write on the patients "Alert" page on the computer (ask a midwife to show you how) recording the essentials. Ask the patient to inform the staff that they are Jehovah Witness/ refuse blood products as soon as they arrive in hospital to have their baby.

e) Communicate with Staff – in the acute situation inform the on-call anaesthetic consultant, the obstetric and midwifery team and arrange with theatres for them to identify a cell saver operator, which you may call upon.

f) Active Management of Labour – check the patient's haemoglobin, ensure that 3rd stage oxytocics have been given and that any post-delivery suturing is done promptly after delivery. It is wise to start all patients on a post-delivery infusion of oxytocin (10 iu/hr) for 4 hours.

g) Surgical Techniques – great attention to haemostasis is required and techniques such as B Lynch suture/ arterial ligation/ vessel embolisation (radiology) can be employed to stop blood loss. Consideration should be given to the pre-LSCS placement of intra-ileac balloon catheters (radiology).

h) Severe Anaemia – this may need to be treated by ventilation on 100% oxygen and possibly hyperbaric chamber therapy. They will require intravenous iron and erythropoietin therapy (haematology).

CELL SALVAGE

This guideline should be followed in conjunction with 'Trent intra-operative cell salvage standard operating procedures' The use of cell salvage is a clinical decision and each case should be considered individually. In some situations the benefit to the patient may outweigh the risks of usual contra-indications, particularly in situations of life-threatening haemorrhage.

Indications in Obstetrics

a) **Actual/ anticipated major haemorrhage** - during Caesarean section. e.g. placenta praevia - **(see page 58-62)**.

b) **Jehovah Witnesses** – and others who are undergoing a Caesarean section and refuses donor blood transfusion.

c) **No Blood Available** – such as when there is difficulty in the provision of cross-matched blood e.g. rare blood type.

Contra-indications

a) **Infection -** in the operative field.

b) **Malignant tumours -** in the operative field

c) **Sickle cell disease.**

Cautions

a) **Blood from the vagina** - potential for significant bacterial contamination from normal resident bacteria, so a balance of risk assessment should be made prior to salvaging & re-infusing blood collected from the vagina.

Rules for Use in Obstetrics

a) **Consent** - whenever possible the use of cell salvage should be discussed with the patient in advance and this discussion should be documented.

b) **Training** - the responsible clinician must be familiar with the clinical aspects of cell salvage particularly in the obstetric situation. The cell salvage machine operator must have undergone training, be competent, and understand cell salvage in the obstetric situation.

c) **Amniotic Fluid/ Fetal Squames** - aspiration of amniotic fluid into the cell salvage collection reservoir must be minimised, therefore, blood recovery should not take place during removal of the amniotic fluid. Re-infused blood needs to be passed through a PAL leucocyte depletion filter to minimise the risk of infusing fetal cell debris.

d) **Re-infusion** - salvaged blood for re-infusion must be clearly labelled with the following:-

- ⊙ **patient's name**
- ⊙ **hospital number**
- ⊙ **date of birth**
- ⊙ **'use-by' time**

The blood must be prescribed by medical staff, according to standard operating procedures and salvaged cells should be infused within six hours of the start of collection.

e) **Jehovah Witnesses -** usually require that the blood be circulated back to them with no break being made in the continuity of the collection and giving sets, so all blood must be given while in theatre and the lines connected to the cell salvage machine.

DIABETES MELLITUS

Women with diabetes should have been seen by the diabetic team and have a plan written in the notes or ALERT page. There is also a "Pregnancy Insulin Prescription Chart for Women with Diabetes" that is available on Labour Suite/ wards, which has nearly all the information that you may need, including infusion regimens. If you need advice, contact the following members of the Diabetic Team:

	NCH	**QMC**
Consultant	**Dr Renee Page** Sec 57929/ Office 56197	**Dr Tasso Gazis** Bleep nos: 80-6763
Sister	**Liz Houghton**	**Pat Clark**

Bleep nos: 80-7792 Bleep nos: 80-6516

Aim to maintain blood glucose measurements between 4 and 8 mmol/l during labour/ C. section to reduce the risk of neonatal hypoglycaemia.

There is a detailed obstetric guideline concerning diabetes that you may consult, either as hard copy on labour suite, or on the intranet.

PLACENTA PRAEVIA

a) Pathology - a placenta praevia is a placenta wholly or partially situated in the lower uterine segment. Grades I and II may allow vaginal delivery but grades III and IV necessitate Caesarean section. The risk of major peri-operative haemorrhage is significantly increased by previous Caesarean sections and age >35, which are risk factors for placenta accreta (placenta adherent to the myometrium).[ref 22]

Nos of Previous LSCS's	Incidence of Praevia %	Incidence of Praevias with Accreta %
0	0.26	5
1	0.65	24
2	1.8	47
3	3	40
4	10	67

b) Regional anaesthesia - is not contra-indicated.[ref 23] There is a distinction between performing a regional block in a women who has bled and is dependent on sympathetic tone to maintain her BP, and a woman who is normovolaemic and bleeding is anticipated. The woman should be made aware that significant blood loss may ensue, and that being awake while large quantities of blood are rapidly infused might not be a pleasant experience. In the event of serious difficulty securing haemostasis, general anaesthesia may have to be induced and the women should be informed of this risk.

c) Blood - ensure that at least 4 units of red cells are available in theatre prior to allowing surgery to commence. Two i.v. lines (14 or 16 g cannulae) should be established with devices for rapid infusion available and fluid warmers should be set up from the outset. Cell salvage is indicated **(see page 55-56)**. A senior anaesthetist and obstetrician should be present in theatre.

d) Post-partum haemorrhage - placenta praevia is a risk factor.

e) **MRI & intra-ileac balloon catheterisation** – if time permits, it is worth discussing with the obstetricians the use of MRI to try and identify those patients with a possible placenta accreta. If the MRI is suspicious it is then worth discussing whether intra-ileac balloon catheters could be placed pre-operatively. Note, after balloon catheters are placed the women will not be able to bend her legs, so a pre-balloon catheter epidural should be considered for top-up when back in theatre.

PRE-ECLAMPSIA

Pre-eclampsia is a syndrome of multisystem endothelial dysfunction. Organ systems are affected to a variable extent. Oedema is a non-specific sign and not diagnostic (affects 80% of normotensive pregnant women).
Pregnancy-induced hypertension (PIH) implies absence of systemic disease, and has less prognostic significance for maternal and fetal outcome.

Good management of the severe pre-eclamptic will be maximised by good multidisciplinary working, which means communicate your thoughts & deeds with your consultant and with the obstetricians and midwives. There is an obstetric guideline available on Labour Suite and on the Intranet.

a) **Diagnosis** - the following are conventional diagnostic criteria, although the disease is sometimes suspected when blood pressure and proteinuria are not at diagnostic levels

- ⊙ **Arterial pressure -** diastolic >110 mmHg on any one occasion, or >90 mmHg on 2 or more occasions at least 4 hours apart.
- ⊙ **Proteinuria -** >300 mg/24 hrs

- ⊙ **Severe Disease** - any one of the following elevates the diagnosis to 'severe'.

  - **Systolic ≥160 -** on 2 occasions, 6 hrs apart.
  - **Diastolic ≥110 mmHg** – on 2 occasions, 6 hrs apart.
  - **Proteinuria ≥ 5 g/24 hrs –** or 1g/L or 3+'s on dipstick
  - **Oliguria ≤ 400 ml/24 hrs**
  - **Raised Creatinine** – in pregnancy this is > 80
  - **Pulmonary oedema**
  - **Cerebral or visual disturbances –** headache, hyperreflexia
  - **Epigastric pain –** hepatic tenderness
  - **Coagulopathy/ thrombocytopenia**
  - **'HELLP' -** haemolysis, elevated liver enzymes, low platelets
  - **Hepatic rupture**

b) Management on delivery suite - the anaesthetist may be involved with analgesia, blood pressure control, fluid therapy and monitoring. All severe pre-eclamptics should have regular anaesthetic review and should be started on an Obstetric HDU Observation Chart, with hourly observations being made, including urine output via a catheter and respiratory rate.

c) Treatment

⊙ **General -** the only definitive treatment is delivery of the feto-placental unit. In view of the increased risk of operative delivery, ranitidine 50 mg i.v. or 150 mg orally 6-hourly should be commenced, and blood grouped & saved.

⊙ **Seizure Prophylaxis** – magnesium sulphate helps prevent seizures in severe pre-eclampsia and should be commenced according to the Labour Suite protocol - **(see page 63-64)**.[ref 24,25]

⊙ **Hypertension** – severe pre-eclampsia is life threatening with the commonest cause of death being intra-cerebral haemorrhage. Severe hypertension should be treated as a matter of urgency and a treatment level of 160mmHg systolic has been suggested by the latest CEMACH report [ref 26, 26a]. The following drugs can be used [ref 27]:

- **Hydralazine 2.5-5 mg IV** (peak action 20 mins) – to a maximum of 10mg. Repeat after 20-30 minutes if the BP is not controlled. Lasts several hours, so use repeated boluses rather than infusion.
- **Labetalol 10-20 mg boluses –** to a maximum of 100mg. Use repeated boluses.
- **Ketanserin 2.5-10mg boluses** – followed by infusion (2-20mg/hr). If you wish, or need to use this drug perform a 12 lead ECG to exclude Q-T prolongation as ketanserin will lengthen the Q-T interval itself & should be avoided in those with an already prolonged Q-T interval. You should also discuss its use with a consultant. Not available at QMC.
- **Nifedipine 10-20 mg** - of the slow release preparations. Also, remember that Nifedipine has tocolytic effects.

- **NB**. Hydralazine, labetalol and nifedipine can cause hypotension and fetal distress. Magnesium will exaggerate the hypotensive effect of these drugs. Sublingual nifedipine should not be used as the blood pressure may drop precipitously.

⊙ **Epidural analgesia** - is strongly indicated to provide optimal analgesia and thus prevent further rises in BP secondary to pain, but should not be regarded as a first-line treatment for hypertension. Platelets and coagulation should have been checked within the previous 2 hours in patients with severe pre-eclampsia, HELLP syndrome or Fatty Liver of Pregnancy.

⊙ **Fluid management** [ref 28]

- **Maintenance fluids -** N Saline or Hartmann's. Total IV input of 80-100 ml/hr with free oral fluids. Administer Syntocinon® in small diluent volumes by syringe pump. However, if a significant volume of blood has been lost this should be replaced with colloid or blood as necessary to avoid renal failure.

- **CVP** – the decision to site a CVP line should be made at a senior level. A brachial 'long' line is safer than other approaches. Measurement of the CVP will reveal hypovolaemia and help its correction, particularly useful in the pre-eclamptic who has bled and is at risk of renal failure. Oliguria is common in pre-eclamptic patients, however, persistent (> 4hrs) or severe oliguria (<15mls/hr) is an indication for insertion of a CVP line. There is disparity between CVP and PAWP at CVP measurements of >5 mm Hg, when the PAWP may be considerably higher. Cautious volume expansion can be undertaken if the CVP is <5 mmHg, but the circulating volume should be considered full if CVP is ≥5 mmHg. Beware of the rising CVP post-partum when the extra-vascular fluid shifts back to the vascular space. If the CVP upward trend (accurate reading) reaches 10mmHg in a patient with severe disease and very low albumin (e.g. 15), this must be discussed this with a senior anaesthetist. Remember that the patients with a very low oncotic pressure are at greater risk of pulmonary oedema.

⊙ **Coagulopathy** – in severe pre-eclampsia, HELLP syndrome or Fatty Liver of Pregnancy, a full blood count should have been processed no more than 2 hours before a regional block is undertaken. If the platelet count is <100, or if the trend is steadily downwards, proceed to a coagulation screen (INR/APTT/TCT), which must be within normal limits for spinal/epidural block to be performed. If there are any petechiae, or the platelet count is <80 000 mm^{-3} (and coagulation screen normal), a platelet transfusion is indicated immediately prior to performing a regional block.

Anaesthesia for Caesarean Section – pre-eclampsia

a) **Control of hypertension** - it is essential, except in the most urgent of situations, that the BP is controlled prior to induction of anaesthesia. Aim for a BP of around 140/90. Extremely severe pre-eclamptic patients can have hypertension that is very resistant to the normal anti-hypertensive drugs. If the doses of hydralazine, labetalol and ketanserin (NCH with consultant input) have been maximised and the BP remains excessively high, consider the following:

- ⊙ **Phentolamine IV –** 2-5 mg. Long acting alpha blocker.
- ⊙ **GTN IV** - with invasive arterial monitoring. Start with 10mcg boluses and titrate upwards.
- ⊙ **Nimodipine IV** – discuss doses with pharmacy or Critical Care (it is used at QMC AICU for neuro patients).

These drugs are rarely used for this indication and patients with this disease severity and the potential use of phentolamine, GTN or nimodipine should be discussed with a consultant anaesthetist. Inform the paediatrician that these drugs have been utilised.

b) **Regional Anaesthesia for Caesarean Section**

- ⊙ **Hypotension** - excessive hypotension is not associated with spinal anaesthesia in pre-eclampsia, because the hypertension of pre-eclampsia is not mediated by the sympathetic nervous system [ref 29]. It can be inferred that the pre-eclampsia is more severe the less the hypotensive response to the spinal, because the humoral component of BP maintenance is the greater. Phenylephrine or ephedrine, given in standard i.v. doses, does not cause an exaggerated hypertensive response. However, it is best to avoid prophylactic dosing and observe to see if there is any significant BP drop following regional anaesthesia.

- ⊙ **Epidural or CSE** – this type of anaesthesia has the advantage of facilitating post-operative analgesia by infusion of (levo)bupivacaine/fentanyl in a high dependency area.

c) General Anaesthesia

- ⊙ **Indications** – as for GA in non-pre-eclamptics, but also when there is a coagulopathy or symptoms (especially piercing headache) or signs of impending eclampsia.
- ⊙ **Invasive monitoring** - have a low threshold for direct arterial pressure monitoring. If there is invasive arterial monitoring, serious rises in BP following intubation (covered with alfentanil or remifentanil) can be controlled with small doses of GTN to protect the cerebral circulation **(see above)**
- ⊙ **Specific problems** - include laryngeal oedema (be prepared for difficult intubation) severe pressor response and potentiation of non-depolarising neuromuscular block by therapeutic serum concentrations of magnesium.

- ⊙ **Induction sequence** – this must attenuate the pressor response to intubation to protect the mother's cerebral circulation. Alfentanil 10-20 mcg kg^{-1} or remifentanil 2 mcg kg^{-1} should be given prior to rapid sequence induction. Inform the paediatrician that the mother will receive an opioid.

- ⊙ **Maintenance** -there is no place for maintenance with excessively light inhalational anaesthesia. Aim for an end-tidal MAC of at least 1.5 prior to incision. After delivery, administer i.v. morphine 10-15 mg and reduce the MAC to normal levels.

- ⊙ **Extubation** – prior to extubation, consider specific therapy (e.g. labetalol in 5-20 mg increments) to avert a dangerous pressor response. If a swollen larynx was evident at laryngoscopy, or if the intubation was traumatic, be extremely wary of post-extubation stridor. Consider a period of elective ventilation.

d) Post-partum - the woman is still at risk of eclampsia and will require continued antihypertensive and anticonvulsant therapy, with careful fluid management and close monitoring of urine output in an HDU environment.

ECLAMPSIA

Eclampsia complicates about 1:2000 deliveries in Europe and developed countries. Almost half the cases occur post-partum and around 40% before a diagnosis of pre-eclampsia has been made. Hypertension may not have developed at this stage. Seizures occurring in late pregnancy and labour should be regarded as eclamptic unless proven otherwise. Alternative diagnoses include epilepsy, embolism (clot, amniotic fluid, air), intra-cerebral pathology (tumours,

vascular malformations, haemorrhage), water intoxication, and local anaesthetic toxicity.

There is an obstetric guideline available on Labour Suite and on the Intranet.

a) General treatment

- ⊙ **Summon skilled anaesthetic assistance**
- ⊙ **Call for senior anaesthetic help**
- ⊙ **Maintain airway patency and give 100% oxygen** - if this is not possible using simple manoeuvres then intubate the trachea, preferably using thiopental or propofol and succinylcholine.
- ⊙ **Avoid aorto-caval compression**
- ⊙ **Prevent trauma** - to the mother and fetus.
- ⊙ **Post-seizure** - most initial seizures will be self-limiting. After the convulsion has terminated, examine the woman's respiratory system for signs of aspiration. The fetus may show signs of compromise secondary to maternal hypoxaemia or placental abruption.
- ⊙ **Antihypertensives** -may still be required to control hypertension.

b) Anticonvulsants

- ⊙ **Magnesium sulphate ($MgSO_4$)** – this reduces the systemic and cerebral vasospasm, probably by the antagonism of calcium and it reduces the incidence of further fits in eclamptic women.[ref 24,25]
  - **Loading dose** – 5 g $MgSO_4$ over 20 minutes via an infusion pump by adding 10 mls of a 50% $MgSO_4$ solution to 100 mls Normal Saline. Alternatively, give 10 mls of a 50% $MgSO_4$ solution as a slow IV 'push' over 20 minutes [ref 27].
  - **Infusion** –
    - **2 g/hr** - 20 mls of 50% $MgSO_4$ in 250 mls Normal Saline at 50 ml/hr for 24 hours.
    - **< 50 kg** - use 1g/hr.
    - **Very obese -** a higher rate of 3g/hr may prove necessary.
    - **Convulsions during $MgSO_4$ therapy** - further bolus of 2g of $MgSO_4$ should be given over 2 to 3 minutes unless a recent serum level was high.

- **Monitoring –**
  - **Mg levels -** after 60 min, then every 6 hours.
  - **Therapeutic range** - 2 to 3 mmol l^{-1}.
  - **Hourly observations** – reflexes, BP, respiratory rate, urine output and mental state (AVPU - **[page 66]**, or GCS)

- **Magnesium toxicity**
  - **Nausea** - vomiting and flushing are early signs.
  - **Loss of deep tendon reflexes** - occurs at 3.5 - 5 mmol l^{-1}.
  - **Respiratory depression** - occurs at >5 mmol l^{-1}.
  - **Cardiac arrest** - occurs at around 12.5 mmol l^{-1}.
  - **ECG changes** - widened QRS may occur in therapeutic range.
  - **Renal impairment** - reduces Mg clearance & Mg levels will rise.
  - **treatment -** stop $MgSO_4$ infusion. Give oxygen. Give ventilatory and circulatory support as required. Administer 10ml of 10% calcium gluconate over 3 minutes.

⊙ **Diazepam** - 5 mg i.v. increments

⊙ **Thiopentone** – 25-50mg increments. Equipment to support the airway must be immediately to hand.

c) Anaesthesia after eclampsia

⊙ **Regional block** - may be appropriate after a single seizure provided: **ref 30**

- **Fully conscious**
- **Coagulation screen normal**
- **Platelet count > 100 000 mm^{-3}** – or can be made so by a platelet transfusion
- **Serum magnesium concentration** - is in therapeutic range

⊙ **General anaesthesia**

- **General principles** – as for pre-eclampsia **(see page 61-62)**.

- **Non-depolarising blocker doses** - must be reduced (but not succinylcholine) in the presence of therapeutic serum concentrations of magnesium.

- **Peripheral nerve stimulator** - is mandatory

- **Post-op ventilation** - consideration should be given to sedation and ventilation for any eclamptic woman who has had a Category 1 GA

section. Ideally, brain CT should be performed en route to ITU to exclude intra-cerebral haemorrhage.

- **Exclude laryngeal oedema** - prior to extubation.

- **ITU Care -** nurse with head-up tilt, monitor SpO_2 ECG, BP, CVP, urine output, EEG (CFAM), and manage pain, hypertension, convulsions, coagulopathy, renal/cardiac failure as appropriate. Exclude laryngeal oedema prior to extubation.

OBSTETRIC HIGH DEPENDENCY CARE

CHN obstetric unit has an HDU Service, whereby the patient's room becomes an HDU area when required. QMC has dedicated HDU beds, so the patient has to be transferred to them. Both units have their own specific "High Dependency Care" guidelines at present. The guideline, below, is one of general principles that can be applied in both units. If possible, please refer to the stand-alone "High Dependency Care guideline" at each hospital for detail of unit specific issues.

a) **Management Plans –** the obstetric and midwifery teams should individually tailor obstetric management plans and care pathways. These should be recorded at least daily in the notes. Advice should be sought from other specialties, such as cardiology, renal, haematology, as appropriate.

b) **Patient Management Responsibility** - assistance for HDU type care on Labour Ward is now available 24 hours a day and the duty anaesthetist should be intimately involved with the care of any HDU patient. The responsible anaesthetist and obstetrician will monitor and correct abnormalities relating to the cardio-respiratory, renal, hepatic, haematological and CNS systems.

Persons Responsible
a) **Obstetric Anaesthetic Consultant, or Consultant Anaesthetist "on-call or acting as the "Troubleshooter" (labour suite trainee anaesthetist to alert consultant)**

b) Consultant Obstetrician or Consultant Obstetrician "on-call (labour suite trainee to alert consultant)

c) Midwife Coordinator on Labour Suite

c) Communication - between the above two doctor groups and with the midwifery staff is essential for the correct management of HDU type patients. Unilateral changes in patient management are discouraged. Changes in management should be discussed with the responsible anaesthetist. When the course for best management is unclear, the patient should be discussed with the on-call Consultants.

d) Patient Review - depends upon the severity and stage of the patient's illness, but should be a minimum of twice a shift. Other patients may require more intensive input. These reviews and management plans should be documented in the notes by both anaesthetic and obstetric staff. All staff should write sequentially in the same record.

e) Documentation – the following is required:

- ⊙ **Admission Note** – describing the reason for HDU care, the initial findings on admission, management plan and time of future review. These notes are to be either in the standard notes, or in a specific "HDU" folder.
- ⊙ **Serial Blood Results** – are to be recorded on a flow sheet to allow the identification of trends.
- ⊙ **HDU Observation Chart** – is to be started and the parameters, below, recorded at least hourly in the acute phase of the illness:

  - **Blood pressure**
  - **Heart rate**
  - **Respiratory rate**
  - **Haemaglobin oxygen saturation**
  - **Urine output**
  - **Accurate fluid balance**
  - **AVPU score**

    - **AVPU score –** this is an easy bedside assessment of conscious level. P and U indicate an obtunded conscious level that requires the patient to have their trachea intubated. This protects the upper airway from obstruction and the lower airway from soiling. This level of diminished consciousness is a medical emergency.

      A Alert

V Responds to voice

P Responds to pain only

U No response to stimuli

f) Patient Referral for HDU Care

⊙ **1st & 2nd Responders –** these are the members of staff who are designated to monitor the patient and to respond to trigger levels in the Early Warning Score. They are defined as follows:

- **1st Responder –** midwife designated as caring for the patient.
- **2nd Responder –** the first available labour suite obstetrician and/or anaesthetist

⊙ **Early Warning Score** (EWS)

- **EWS ≥ 5 (or 2 yellow parameters)** - any patient with this scoring should be referred to an obstetrician and anaesthetist immediately. Obstetric HDU care, or transfer to the Critical Care Unit must be considered.
- **EWS 3 (or one red) in any single parameter** - should be referred to an obstetrician or anaesthetist immediately. Obstetric HDU care, or transfer to the Critical Care Unit must be considered.

⊙ **Anaesthetic Referral** - obstetric or midwifery staff may refer to the anaesthetist any patient they are concerned about.

- **Anaesthetic assessment** - the patient should be assessed by the anaesthetist at the first possible opportunity.

g) High Dependency Admission - examples

⊙ **Major haemorrhage -** and/or the potential for continuing blood loss

⊙ **Severe pre-eclampsia, eclampsia, HELLP syndrome**

⊙ **Coagulopathy**

⊙ **Severe Sepsis**

⊙ **Multi-organ Dysfunction**

- ⊙ **Invasive Monitoring**
- ⊙ **Postoperative care** – team decision by anaesthetist, obstetrician and midwife.
- ⊙ **Pulmonary embolism.**
- ⊙ **Pulmonary oedema**.
- ⊙ **Medical conditions** – e.g. unstable diabetes mellitus, asthma.
- ⊙ **Intensive Monitoring Required –** step down/ post-Critical Care.

l) Levels of Obstetric HDU Care (within the Level 1 HDU designation)

- ⊙ **Level 1 –** constant attention required.
- ⊙ **Level 2 –** the patient can be left for short periods (e.g. 15 mins)
- ⊙ **Level 3 –** transitional between HDU and ward care.

h) Outreach team – referral for support should be instituted early in patients not responding to therapy or deteriorating, or if there are problems with invasive monitoring.

i) Physiotherapy - referral to maintain lung function should be instituted early. Incentive spirometers are very useful in maintaining lung function between physiotherapist visits and their utilisation is encouraged.

j) Central Venous Catheters & Central Venous Pressure Monitoring

- ⊙ **Use** - if a patient would benefit from CVP monitoring/ access, then a discussion concerning this requirement should occur between the responsible anaesthetic and obstetric staff and central venous access instituted if required.
- ⊙ **CVC Lines** - an ante-cubital fossa “long line” is the safest option, however, should this fail or be deemed inappropriate an internal jugular line should be inserted, preferably utilizing ultrasound guidance.
- ⊙ **Pre-eclampsia** - it is essential that in the case of severe pre-eclampsia a fluid balance plan should be discussed with the Consultant Obstetrician and Consultant Anaesthetist and this should be recorded in the notes. The guidelines on fluid balance are located in the guideline “Management of severe hypertension” in the file on labour suite and on the intranet.

k) Arterial lines - should only be used if the patient requires regular blood gases, or is already in-situ on return from theatre. If the blood pressure is unstable and not responding to fluid replacement, the patient will require transfer to the

main hospital HDU or Critical Care Unit. Inotropic support may be instituted for stabilisation prior to and for transfer.

l) **Critical Care/ Intensive Care** – (see Obstetric HDU Critical Care Transfer Guideline, below) if the patient becomes so compromised that they need more than 40% oxygen, continuous positive airway pressure, ventilatory assistance, inotropes or renal replacement therapy, then they should be transferred to the main hospital HDU or Critical Care Unit, after discussion with the Critical Care, the Anaesthetic and the Obstetric consultants. It is essential that full communication between anaesthetic, obstetric and midwifery staff about this process occurs prior to the ITU referral.

m) **Hand-over** - a comprehensive hand-over between anaesthetists, obstetricians and midwives should occur at each shift change until the patient no longer requires HDU support.

n) **Discharge From HDU Care –** this must be a multidisciplinary decision and should involve the following:

Responsible Obstetrician
Responsible Anaesthetist
Midwife
Labour Ward Coordinator

- **Criteria For Discharge** – to be considered:
  - **Invasive lines removed**
  - **Haemorrhage/ Coagulopathy resolved**
  - **No CNS depression/ irritation**
  - **Not requiring:**
    - oxygen
    - hourly observations
    - ECG monitoring
    - intravenous antihypertensives

Discharge Documentation – should include information concerning the patients condition and vital signs, the reason for discharge, the plan for further care and where the patient was discharged to. The name of the doctor authorising the discharge should be recorded.

CRITICAL CARE REFERRAL & TRANSFER

This guideline describes the general principles of transferring the critically ill obstetric patient to the Critical Care Unit. And they be applied on both campuses. If possible, please refer to the " Critical Care referral & Transdfer" guideline when at the City Campus and to the "Critical Care referral & transfer" section of the "High Dependency Care" guideline when at the QMC campus.

a) **Reason for Guideline -** in keeping with other large obstetric units and with the recommendations of the CEMDs/ CEMACH, we have set up an HDU service/ unit at both the City & QMC Hospitals for our compromised mothers on the Maternity Units. The severity of illness that these patients develop will sometimes exceed the level of care that can be competently delivered by our High Dependency Service/ Unit (HDU) on Labour Suite. Mothers may also become seriously unwell on the wards. This guideline is to help identify which patients require transfer to the main hospital Critical Care Unit, from either the Labour Suite or the Maternity Wards. The second aim is to direct effective communications between the professional groups involved so as to minimise delay and error during the transfer procedure.

b) **Responsibility for Transfer Arrangements –** these are as follows: -

Persons Responsible
⊙ **Obstetric Anaesthetic Consultant, or Consultant Anaesthetist "on-call or acting as the "Troubleshooter" (labour suite trainee anaesthetist to alert consultant)**
⊙ **Consultant Obstetrician or Consultant Obstetrician "on-call (labour suite trainee to alert consultant)**
⊙ **Midwife Coordinator on Labour Suite**

c) **Communication**

⊙ **Groups to Communicate -** it is essential that the responsible members **(see b above)** of the following groups communicate well concerning the need for, and the details of any transfer**:-**

▪ **Anaesthetist**
▪ **Obstetrician**
▪ **Critical Care Doctor**
▪ **Midwife**
▪ **Critical Care Nurses**
▪ **Outreach Nurse**

⊙ **Consultant Obstetrician & Consultant Anaesthetist -** must be informed of any woman where transfer is being considered.

⊙ **Consultant Intensivist** - must be made aware of any referral, preferably by the responsible Consultant Anaesthetist or Consultant Obstetrician, or both.

⊙ **Critical Care Unit** - Immediately prior to transfer it is essential to phone the Critical Care Unit to ensure that they are ready to receive the patient.

d) Decision to Transfer

⊙ **Initial Trigger -** if any member of the following groups feel that the patient requires greater support than can be given by the Labour Suite HDU Service, then transfer to the Critical Care Unit must be considered.

▪ **Anaesthetist**
▪ **Obstetrician**
▪ **Midwife**
▪ **Outreach Nurse**

⊙ **Medical Review -** any member of staff who is concerned that a patient may require transfer should alert the responsible member (see 2 above) of their professional group. The responsible anaesthetist, obstetrician and midwife must review the patient as soon as possible.

- ⊙ **Early Warning Score Trigger & 1st & 2nd Responders –** these are the members of staff who are designated to monitor the patient and to respond to trigger levels in the Early Warning Score. They are defined as follows:

  - **1st Responder –** midwife designated as caring for the patient.
  - **2nd Responder –** the first available labour suite obstetrician and/or anaesthetist
  - **EWS ≥ 5 (or 2 yellow parameters)** - any patient with this score should be referred to an obstetrician and anaesthetist immediately. Obstetric HDU care, or transfer to the Critical Care Unit must be considered.
  - **EWS 3 (or one red) in any single parameter** - should be referred to an obstetrician and anaesthetist immediately. Obstetric HDU care, or transfer to the Critical Care Unit must be considered.

- ⊙ **Critical Care Referral -** if it is felt that transfer is indicated, the patient must be referred to the Critical Care Consultant (Intensivist). The Consultant Obstetrician, Consultant Anaesthetist, or both, should ideally be the members of staff who refer the patient to the Critical Care Consultant. A decision to transfer, or not, should then be made.

- ⊙ **Disagreement -** in cases where there is disagreement about the need to transfer, it is often very useful to ask for the opinion of the Critical Care Consultant or the Outreach nurse.

- ⊙ **Note-keeping -** the decision to transfer, the reason and by whom, should be recorded the notes, dated and timed.

e) Indications for Transfer – the following list is not exhaustive and clinical assessment is the final arbiter. The obstetric anaesthetist is trained in critical care and should discuss the case with the Critical Care Consultant, firstly to warn them that there is a critically ill patient on the Maternity Unit that may require transfer at some stage, and secondly, to obtain their advice, because critically ill patients frequently do not fit rigid guidelines. The reason to transfer, or not, must be recorded in the notes.
(see below).

Reasons For Transfer To Critical Care - Examples

	Requirement	Example
1	**Ventilatory Assistance**	a. Inspired oxygen > 40% to maintain haemoglobin oxygen saturation ≥ 95% or arterial oxygen tension ≥ 8 kPa b. Continuous positive airway pressure required c. Intermittent positive pressure ventilation required
2	**Inotropic/ Vasopressor Support**	Blood pressure not responding to fluids (crystalloids, colloids, blood), provided haemostasis has been secured.

3	**Airway Protection**	Glasgow Coma Scale of ≤ 8, or a score of P or U on the AVPU scale (see 8, below)
4	**Acid-Base Derangement**	pH ≤ 7.2 or a lactate ≥ 3 needs to be discussed with the Critical Care Consultant.
5	**Renal Replacement Therapy**	Rising creatinine (≥300), particularly when hyperkalaemia or acidosis develops. Discuss with Critical Care Consultant.
6	**Coagulopathy**	When not responding to coagulation factor and/ or platelet replacement. Surgical haemostasis must be secured before transfer.
7	**Multi Organ Dysfunction**	Discuss with the Critical Care Consultant
8	**HDU Competent Staff**	Occasionally Labour Suite is so busy that there is inadequate staff to safely care for HDU type patients. This is an indication to consider transfer or to request extra LW staff.

f) Transfer

- **Patient Monitoring -** appropriate to the severity of the maternal illness must be utilised during the transfer to the Critical Care Unit. The responsible anaesthetist (see above) and/ or the Critical Care doctor should determine the level of monitoring .
- **Fetal Monitoring -** If the baby is still in-utero, appropriate monitoring of the fetus, as determined by the responsible obstetrician, must be used if practicable. If the baby is in-utero, a midwife needs to accompany the patient to Critical Care. They must ensure that they have with them all of the equipment and drugs necessary to perform a vaginal delivery and these should be left with the patient on the Critical Care Unit.
- **Transfer Personnel -** most patients will require the presence of an anaesthetist and an Outreach practitioner during the transfer.
- **Notes -** the patient notes and investigation results must accompany the patient.
- **Ventilated Patients -** should be transferred utilizing the equipment listed below.

1	**Transfer Trolley**	Usually from Critical Care, with 2 full oxygen cylinders
2	**Critical Care Transfer Ventilator**	+ self-inflating bag back-up
3	**End Tidal Carbon Dioxide Monitor**	Usually from Critical Care or Theatres
4	**Critical Care Transfer Monitor**	NIBP (+/- arterial) ECG, Haemoglobin oxygen saturation,
5	**Intubation Equipment**	Critical Care Transfer bag
6	**Resuscitation Drugs**	as a minimum a 1st line resuscitation box, preferably also 2nd line drug box.
7	**Infusion Controllers**	if required

- ⊙ **Contact Numbers -** for midwifery and obstetric advice should be given to the receiving Critical Care team.
- ⊙ **Obstetric/Midwifery Review -** a plan should be formulated for regular midwifery and obstetric monitoring and review. This plan should be recorded in the notes.

g) Arterial lines/ Inotropes & Vasopressors - if the blood pressure is unstable and not responding to fluid replacement, the patient will require inotropic/ vasopressor support. This must be initiated and monitored by the anaesthetist prior to transfer to the Critical Care Unit and the blood pressure stabilised prior to transfer. Inotropic/ vasopressor support mandates the use of intra-arterial monitoring and central venous access for administration.

h) Magnesium Sulphate – any woman who requires magnesium to prevent eclampsia should have had the loading dose prior to transfer.

i) Intubation on the Maternity Unit – this should be a rare event, but is indicated for :-

- ⊙ **Airway protection** - (see 5 and 8 above).
- ⊙ **To maintain the arterial oxygen tension -** ≥ 8 kPa when 100% oxygen from a trauma mask is not successful.
- ⊙ **Acutely rising arterial carbon dioxide tension -** (acute type II respiratory failure e.g. exhausted asthmatic patient).
- ⊙ **Respiratory arrest -** has occurred or is imminent.

j) AVPU Score – this is an easy bedside assessment of conscious level.
P and U indicate an obtunded conscious level that requires the patient to have their trachea intubated. This protects the upper airway from obstruction and the lower airway from soiling. This level of diminished consciousness is a medical emergency.

A	Alert
V	Responds to voice
P	Responds to pain only
U	No response to stimuli

k) Epidural Analgesia - when a patient with epidural analgesia is transferred to the Critical Care Unit: -

- ⊙ **Syringe Pump Change –** must occur when on the Critical Care Unit to the pump type used by that Critical Care Unit, if it differs from the maternity pump. This should be completed as soon as practicable after transfer, by either the labour suite anaesthetist or Critical Care Unit doctor.
- ⊙ **The Acute Pain Team** - must be informed when a patient has an epidural on the Critical Care Unit, for monitoring purposes. Routine epidural management is carried out by the Critical Care Unit team in conjunction with the obstetric anaesthetists and obstetricians.

l) PCA Pump Change – must occur when on the Critical Care Unit if the PCA machines used routinely on the Critical Care Unit differ from the Maternity Unit PCA machine.

m) Shared Care

- ⊙ **Medical responsibility** – there is shared care between the Critical Care team and the obstetric team responsible for the patient. However, ultimate responsibility for critical care matters lies with the Critical Care team headed by the Critical Care Consultant on-call, as indicated by the "Mid Trent Critical Care Network Admission & Operational Policy", 2005.

- ⊙ **Review** - the referring obstetric team should review at the patient least daily.

- ⊙ **Contact numbers** - for midwifery & obstetric advice should be made available to the Critical Care team and a midwife should always be available to attend the women on the Critical Care Unit, if requested.

n) **Critical Incidents** – any delay in admission to a Critical Care Unit should trigger the completion of a "Critical Incident" form.

AUDIT

The Royal College of Anaesthetists has published "**Raising the Standard: A compendium of audit recipes (Second Edition 2006)"** Those pertaining to obstetric services can be found at **www.rcoa.ac.uk/index.asp?PageID=125**

TRAINING

Documents relating to training and assessment in obstetric anaesthesia can be found at **www.rcoa.ac.uk** and **www.oaa-anaes.ac.uk**

QUICK GUIDELINE FOR NON-OBSTETRIC ANAESTHETISTS

Please note that these instructions are to be recognised as a quick guide only. They are not a policy, nor a prescription, the final decision rests with the responsible anaesthetist. More detailed descriptions of the management of obstetric patients can be found in this booklet.

a) General Principles

Category/ Grade	Definition (at time of decision to operate)
Cat 1/ Emergency Decision-Delivery	**Immediate threat to life of woman or fetus** Confirm urgency with medical staff. GA or rapid epidural top-

< 30 minutes	up (works in ~7 mins) and ensure paediatrician is called. GA quickest.
Cat2/ Urgent	**Maternal or fetal compromise, not immediately life-threatening** Confirm urgency with medical staff, spinal/ rapid epidural top-up and ensure paediatrician is called if necessary.
Cat3/ Scheduled	**Needing early delivery but no maternal or fetal compromise**
Cat4/ Elective	**At a time to suit the woman and maternity team**

- ⊙ **Ranitidine & Sodium Citrate (30ml 0.3 molar)** - all

- ⊙ **Control per-op hypotension (regional) -** is by phenylephrine (preferably) 50-100 mcg boluses or ephedrine or. Pre-loading 500ml crystalloid helps with epidurals, much less so with spinals.

- ⊙ **Monitor fetus** - during anaesthesia, prior to surgery.

- ⊙ **15 degrees left lateral tilt.**

- ⊙ **Oxytocin** - after delivery of all fetuses

- 5iu after cord cut (check for twins!) - split into two 2.5IU boluses
- 40 iu to 40 ml with N.Saline over 4 hours (NCH)
- 40 iu in 500ml with N.Saline over 4 hours (QMC)
- Avoid oxytocin if significant uncorrected hypovolaemia/ cardiac cripple.

- ⊙ **Augmentin 1.2g -** for all. If contra-indicated give clindamycin 600mg in IVI.

- ⊙ **Pre-eclamptics/ single fit conscious eclamptics** - may have a spinal provided the coagulation is normal and platelets > 80 from a specimen within last 2 hours.

b) Spinal for LSCS

- ⊙ **Heavy bupivicaine 0.5% 2.5ml -** plus 3-500 micrograms diamorphine - L2-3 space or lower, sitting if possible. Block to cold to T4, to sensation (altered touch) to T5-6. Ensure loss of leg motor function.

c) Rapid top up epidural for LSCS

- ⊙ **Local anaesthetic mix** - Mix all 3 below in a 20ml syringe

- 10ml 0.5% bupivicaine + 1:200,000 adrenaline
- 10ml 2% lignocaine
- 2ml 8.4% Sodium Bicarbonate (add last)

OR

- 0.5% levobupivacaine

⊙ **Drug location** - are boxed together on the anaesthetic machine

⊙ **Location** - not advised to top-up in labour suite. If you do, stay with the patient

⊙ **Topping-up** - 5ml aliquots every 3 minutes. 15-20mls is usually needed. 15ml bolus for category 1 LSCS.

d) GA for LSCS

⊙ **Indications -** Category 1 CS, failed regional techniques, coagulopathy, uncontrollable intra-operative pain/ discomfort (pre-eclampsia per-se is not an indication)

⊙ **Call for Paediatrician**

⊙ **Rapid Sequence Induction** – thiopentone, (etomidate) – avoid propofol.

⊙ **Opiates at induction** - alfentanil if pre-eclamptic, to control BP.

⊙ **Maintenance** - End tidal MAC 1.5 (Sevo/ Iso + N_2O) until cord clamped, then opiates and reduce MAC to 1. Non depolarising muscle relaxants are no problem

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Classification of evidence levels:
Ia meta-analysis of randomised controlled trials
Ib at least one randomised controlled trial
II at least one controlled study without randomisation
III non-experimental descriptive studies (comparative studies, correlation studies, case studies)
IV expert committee reports/clinical experience of respected authorities

Note: reference to the obstetric, haematology & diabetic guidelines for the NUH Trust 2007, have been made, as appropriate, while compiling this guideline.