**Title of Guideline (must include the word “Guideline” (not protocol, policy, procedure etc)**

| Obstetric Anaesthetic Guidelines |

**Author: Contact Name and Job Title**

| Dr Melanie Davies |
| Anaesthetic Consultant |

**Directorate & Speciality**

| Specialist Support |
| Anaesthesia |

**Date of submission**

| June 2014 |

**Explicit definition of patient group to which it applies (e.g. inclusion and exclusion criteria, diagnosis)**

| Obstetric inpatients at NUH |

**Version**

| 1 |

**If this version supersedes another clinical guideline please be explicit about which guideline it replaces including version number.**

| Yes |

**Statement of the evidence base of the guideline – has the guideline been peer reviewed by colleagues?**

| Yes |

**Evidence base: (1-6)**

| 1 | NICE Guidance, Royal College Guideline, SIGN (please state which source). |
| 2a | meta analysis of randomised controlled trials |
| 2b | at least one randomised controlled trial |
| 3a | at least one well-designed controlled study without randomisation |
| 3b | at least one other type of well-designed quasi-experimental study |
| 4 | well –designed non-experimental descriptive studies (ie comparative / correlation and case studies) |
| 5 | expert committee reports or opinions and / or clinical experiences of respected authorities |
| 6 | recommended best practise based on the clinical experience of the guideline developer |

**Consultation Process**


**Ratified by:**

| Anaesthesia Governance Group |

**Date:**

| February 2014 |

**Target audience**

| Anaesthetists caring for Obstetric patients |

**Review Date: (to be applied by the Integrated Governance Team)**

| February 2019 |

A review date of 5 years will be applied by the Trust. Directorates can choose to apply a shorter review date, however this must be managed through Directorate Governance processes.

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This guideline has been registered with the trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date.
This handbook is the updated version of the previous obstetric anaesthetic guidelines

List of contributors

Amelia Banks
Nav Bhandal
Sam Bharmal
Anup Biswas
David Bogod
James Dawson
Steven Gill
Neil Hawkins
Allan Howatson
Rachel Lawton
David Levy
Elizabeth Maronge
Lesley Woods
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INTRODUCTION

The consultant obstetric anaesthetists and some trainees 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.

Nottingham Consultant Obstetric Anaesthetists

Lead Clinicians in bold type

<table>
<thead>
<tr>
<th>Nottingham City Hospital</th>
<th>Queens Medical Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amelia Banks</td>
<td>Perm Bachra</td>
</tr>
<tr>
<td>Anup Biswas</td>
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<td>Neil Hawkins</td>
<td>David Levy</td>
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<tr>
<td>Rachel Lawton</td>
<td></td>
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<tr>
<td>Anu Philips</td>
<td></td>
</tr>
<tr>
<td>Lesley Woods</td>
<td></td>
</tr>
</tbody>
</table>

THE HOSPITAL SWITCHBOARD HOLDS HOSPITAL BLEEP, HOME PHONE AND MOBILE PHONE NUMBERS. PLEASE SPECIFY WHICH CAMPUS.

If consultant help is needed out of hours:

**NCH**: On call obstetric consultant is available from 19:30-7:30 weekdays and all weekend. Their name is written on the weekly rota. They can be contacted via switchboard or their phone numbers can be found in the anaesthetist office on labour suite. In hours if there is not a consultant assigned to maternity there will be a nominated obstetric trouble-shooter, denoted “OT” on the rota.
**QMC:** Your first port of call should be the 3rd on-call anaesthetist or general on-call consultant, who is welcome to contact one of the Queens consultants for advice.
This situation may change, and it is the responsibility of the trainee to check the current arrangements for consultant cover.

The links to the NUH guidelines only work when connected to the NUH intranet and while these guidelines are current. To access the guidelines outside the hospital follow the link
www.nuh.nhs.uk/healthcare-professionals/clinical-guidelines/
and this will take you to the guidelines homepage.
Any corrections or suggestions for improvement will be welcomed.
Please e-mail Mel.Davies@nuh.nhs.uk
We all hope that you enjoy your time with us.
Orientation to Nottingham University Hospitals

Delivery suites

QMC
The maternity unit is situated on two floors in East Block. The antenatal clinic, delivery suite with midwife-led care unit, maternity theatres and the neonatal unit are on B floor. The obstetric wards are B26 (antenatal/postnatal) and C29 (postnatal). Access through to the labour suite and theatre complex is controlled by swipe card but theatres can be accessed freely from labour suite.
The obstetric consultants’ office and an obstetric trainee office are adjacent to labour suite.
There are two operating theatres; obstetric theatre 1 for caesarean sections and obstetric theatre 2 for all other procedures as well as acting as a second theatre in an emergency when theatre 1 is in use.
There is an anaesthetic preparation area between the two theatres and a one-bedded recovery area.

NCH
The maternity unit is in a purpose-built wing of the hospital some distance from main theatres. The delivery suite, maternity theatres and the neonatal unit are on the ground floor. The wards (mixed antenatal/postnatal) are Lawrence and Bonnington on the first floor. The patient hotel is on the second floor. Access to labour suite and maternity theatres are controlled by swipe card.
There is an obstetric anaesthetists’ office on labour suite.
There are two operating theatres; theatre 17 is used for all cases and theatre 18 is used for emergencies when theatre 17 is already in use.
There is an anaesthetic preparation area between the two theatres and a two-bedded recovery area.

What We Offer

We run three services together as part of the commitment to obstetric anaesthesia.

1. Round-the-clock emergency service.
   • Labour epidurals.
   • Emergency caesarean sections.
• Anaesthetic support for the multidisciplinary care of the sick parturient.

2. Planned caesarean service on weekdays
• Currently integrated with the emergency service on both sites.
• Separate elective caesarean section list on Wednesday mornings at NCH, this may be rolled out on other days.

3. Antenatal assessment and planning service
• Assessment of women referred by midwives or obstetricians during pregnancy.
• Regular clinics at QMC and NCH.

Equipment List
You should ensure you are familiar with the equipment available in theatres, including, anaesthesia machines, syringe drivers, difficult airway trolleys, defibrillator, and emergency drug boxes. The latter include:
• MH
• Lipid rescue for local anaesthetic toxicity
• Cardiac arrest
If there is anything on this list that you do not know how to use, please ask for specific training.

Working in the Labour Ward

Communication
Many of our staff are very experienced, so please listen to and seek their opinion. We treat everyone with respect, and always knock and wait for an answer before entering a delivery room: please do the same.

Alert Page
An updated computerised record system is now in place and the way alerts are communicated may change.
NCH:
- If women have been seen in the obstetric anaesthetic clinic there will be a pink summary sheet in the front of the patient notes.
- High risk patient details are on the board in the anaesthetic office on labour suite.

QMC:
- If women have been seen in the obstetric anaesthetic clinic there will be a green summary sheet in the front of the patient notes.

Daily Duties

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

b) Pagers/Cisco phones - ensure that the bleep and phone are working properly. If you leave the unit it is of paramount importance that you ensure that your bleep/phone is working and that the midwives know how to contact you.

c) Handover/ Communication
- The Trust supports the use of the SBAR (Situation Background Assessment Recommendation) tool for communication between professionals.
- Between outgoing and incoming duty anaesthetists - specifically all clinical activity and all sick parturients.
- With senior midwife on Labour suite - ensure you review the patient board on labour suite in conjunction with the senior midwife regularly. Specifically note high-risk women, women with epidural analgesia or those at high risk of operative delivery. Review as necessary.
- Handover meeting -
  - NCH Morning handover labour suite “board round” with obstetricians, lead midwife and anaesthetists at 8:30am in anaesthetic office on Labour Suite.
  - QMC Morning “board round” at 8.30am on Labour Suite.

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

e) Follow-up
• Try to ensure that all women are followed up, and any significant problem referred to a consultant.

**Excessive workload**

It will inevitably happen that at some times the demands on your time will exceed the capacity of one person to respond, for example for epidural analgesia while you are doing a caesarean section. Unless you are near the end of your other commitment and will be able to respond shortly and in an appropriate time, make sure that the midwives refer such a request to the general on call team – usually the senior resident anaesthetist – or that you call them yourself. It is part of the senior resident anaesthetist’s duties to assist in labour ward at busy times, or to escalate the request to a consultant as appropriate.

**Seeking advice and senior help**

There will be times when you need to ask advice or request help

**Senior Resident Anaesthetist**
*(Consultant on duty for labour suite in working hours)*

Many sections in this handbook refer to the necessity to seek senior advice. Out of hours you should call the senior resident anaesthetist first, particularly if a second pair of hands are required urgently.

**Consultant Anaesthetist**
*Monday to Friday during the day*

There is usually a consultant obstetric anaesthetist assigned to the labour ward for regular sessions. When on leave this may be covered by another consultant obstetric anaesthetist or occasionally a senior trainee.

**Referral to Senior Anaesthetist**

There are certain cases about which you **must** notify a consultant. These include:

• Potential difficult intubation
• Massive obstetric haemorrhage
• Women declining blood transfusion who are to be delivered in theatre or who bleed
• Amniotic fluid embolism/Anaphylactoid syndrome of pregnancy
• Eclampsia
• Unexplained collapse and/or cardiopulmonary arrest
• Cases for which transfer to the critical care unit is considered
• Maternal morbid obesity
• Elective cases out of hours
• Major problems with consent
• Total spinal anaesthesia
• Severe pre-eclampsia
• Any other cases about which you feel unsure after seeking the advice of the senior resident anaesthetist, such as cases of severe co-existing medical disease.

Consent

General considerations
You should adhere to the following recommendations from the OAA/AAGBI. 1, 2

• There is no difference between the principle of obtaining consent for obstetric anaesthesia and any other medical treatment.
• The patient is entitled to receive an explanation of the proposed procedure in appropriate language. Interpreters should be made available to women who do not speak English; if at all possible these should not be family members. The explanation should include the nature and purpose of the proposed procedure, as well as any material risks attached to it. The patient should have the opportunity to ask any questions.
• All explanations should be documented.
• Expectant mothers attending the antenatal clinics are given leaflet information regarding the available anaesthetic/analgesic choices in the labour ward. They are encouraged to form their own choices in advance of labour. Women always retain the right to change their mind, and you should respect this.

Capacity and refusal of treatment
The adult parturient is presumed, like all adults, to have capacity. In law, and a competent pregnant woman can refuse treatment for any reason, even if this puts the unborn child at risk of harm or death. An emergency court order can be requested, but will only be granted if the court concludes that the woman lacks capacity. Such cases should be discussed with a consultant anaesthetist.

Birth plans
A birth plan is a form of advance statement and must be respected and treated as an Advance Decision if a woman obviously loses capacity
during labour. However a presumption of capacity remains in the 
labouring woman and “just as one can give consent, one can also 
change one’s mind when confronted with the pain of labour”\(^3\). Therefore 
competent women who request epidural analgesia in labour despite 
recording a refusal in their birth plan, should have their request 
respected, although they should be asked to countersign any 
documentation concerning consent for the procedure.

**Consent for regional analgesia in labour**
All women should have received information regarding labour analgesia 
and epidurals antenatally. Nevertheless, the woman must still be 
provided with appropriate information at the time of the procedure and 
be offered the opportunity to refuse or to ask questions. This explanation 
should be documented on the epidural form that you must complete for 
each woman.

Although you should use your professional skills in making this 
explanation, we suggest that the following is discussed as a minimum:

- Intravenous access and fluids-to prevent a potential fall in blood 
  pressure.
- Leg weakness may occur
- Imperfect analgesia
  - Common, missed segments, one-sided block, persistent low 
    back pain, rectal pressure
  - Possible need to re-site catheter (about 5% of cases)
- Post-dural puncture headache
  - Risk in your hands if known
  - 1:100 epidurals
- Instrumental Delivery
  - Risk increases by about 5%
  - Caesarean section rate is not affected\(^4\)
- Nerve damage can occur but is rare (see figures below)
- Temperature rise
- Itching
- No increased incidence of long term backache\(^5\)

Further discussion will depend on the individual parturient
Incidences of complications

*Table 1: The OAA epidural information card*\(^6\) *gives the following complication incidences*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Incidence</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant drop in blood pressure</td>
<td>1:50</td>
<td>occasional</td>
</tr>
<tr>
<td>Not working well enough for labour</td>
<td>1:8</td>
<td>common</td>
</tr>
<tr>
<td>Not working well enough for caesarean</td>
<td>1:20</td>
<td>sometimes</td>
</tr>
<tr>
<td>Severe headache (epidural)</td>
<td>1:100</td>
<td>uncommon</td>
</tr>
<tr>
<td>Severe headache (spinal)</td>
<td>1:500</td>
<td>uncommon</td>
</tr>
<tr>
<td>Temporary nerve damage</td>
<td>1:1000</td>
<td>rare</td>
</tr>
<tr>
<td>Nerve damage more than six months</td>
<td>1:13 000</td>
<td>rare</td>
</tr>
<tr>
<td>Epidural abscess</td>
<td>1:50 000</td>
<td>very rare</td>
</tr>
<tr>
<td>Meningitis</td>
<td>1:100 000</td>
<td>very rare</td>
</tr>
<tr>
<td>Epidural haematoma</td>
<td>1:170 000</td>
<td>very rare</td>
</tr>
<tr>
<td>Accidental unconsciousness</td>
<td>1:100 000</td>
<td>very rare</td>
</tr>
<tr>
<td>Severe injury, including paralysis</td>
<td>1:250 000</td>
<td>extremely rare</td>
</tr>
</tbody>
</table>

Providing information in written form
The Obstetric Anaesthetists Association publishes information for mothers in a wide variety of languages. The principal leaflets are those on ‘Pain relief in labour’ and ‘Caesarean section: your choice of anaesthesia.’ There is also an epidural information card. Copies of these leaflets are available on paper alternatively it can be found available on the main OAA web site at: [www.oaa-anaes.ac.uk](http://www.oaa-anaes.ac.uk)
It can be recommended to mothers at: [www.oaaformothers.info/](http://www.oaaformothers.info/)

Non-English speakers
Both hospitals have access to telephone-based interpretation services via “The Big Word”.

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2 Association of Anaesthetists of Great Britain and Ireland and Obstetric Anaesthetists Association. OAA/AAGBI Guidelines for Obstetric Anaesthesia


4 Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK. Lancet, 7 July 2001, (358) 9275:p19-23


6 January 2008 at www.oaafomothers.info
THROMBOPROPHYLAXIS

- Venous Thromboembolism (VTE) is a major cause of maternal mortality in the UK. In the last maternal death enquiry by CMACE (2006-2008) it was the third most common; however before that it was the leading direct cause of maternal death from 1985 until 2005.
- Pregnancy is a risk factor for VTE and is associated with up to 4-6 x increase in risk.
- Whilst most women will not require thromboprophylaxis during or after their pregnancy, risk stratification is necessary to decide which women warrant prophylaxis. The threshold is lower in the postpartum period as the risk/day is higher. The majority of those who require prophylaxis can be identified by a number of well-established risk factors shown in the tables below.
- VTE prophylaxis is the responsibility of the anaesthetist as well as the obstetric team.
- The WHO checklist must be implemented for all women coming to theatre.

<table>
<thead>
<tr>
<th>Table 2: Pre-existing Risk Factors for VTE</th>
</tr>
</thead>
</table>

**Previous Venous Thrombosis**

**Thrombophilia**

*Hereditary*
- Antithrombin deficiency
- Protein S deficiency
- Protein C deficiency
- Factor V Leiden mutation
- Prothrombin gene mutation

*Acquired (Antiphospholipid Syndrome)*
- Persistent antiphospholipid antibodies – Lupus anticoagulant/Anticardiolipin/β2GP1 antibodies

**Other Pre-existing Risk Factors**
- Age over 35
- Obesity BMI>30
- Parity >3
- Gross varicose veins
- Paraplegia
- Sickle cell disease
Inflammatory conditions e.g. inflammatory bowel disease
Nephrotic syndrome
Myeloproliferative disorders - polycythaemia and thrombocythaemia
Other medical conditions e.g. some cardiac conditions, SLE
Malignancy
Family History of VTE
IV drug abuse
Smoking

Table 3: Risk Factors Arising During Pregnancy

Hyperemesis
Ovarian Hyperstimulation Syndrome
Severe infection e.g. pyelonephritis
Surgical procedures in pregnancy or puerperium
Immobility > 4 days
Dehydration
Long distance travel
Pre-eclampsia

Table 4: Risk Factors Arising at Delivery or Post Partum

Excessive blood loss (>1 litre)
Prolonged labour
Difficult or rotational delivery
Caesarean section
Immobility after delivery
Post partum wound infection

Timing
- High-risk women may be prescribed antenatal prophylactic low molecular weight heparin (LMWH) (enoxaparin) or intermediate dose LMWH.
• When a woman thinks she is starting to labour she should be advised not to inject any more LMWH in case of the need for regional analgesia/anaesthesia.
• If LMWH is omitted then full-length anti-embolism stockings, avoidance of dehydration and attempts to keep mobile are essential.
• Epidural should be sited early if required so LMWH can be restarted.
• The prothrombotic changes take several weeks to revert to normal, and this is the peak period for VTE occurrence.
• Women at high risk of VTE should have 6 weeks postnatal thromboprophylaxis.
• Women at intermediate risk should have a minimum of 7 days postnatal prophylaxis.
• Women with no risk factors following vaginal delivery should be encouraged to mobilise early and avoid dehydration.

For full details of the risk assessment see the NUH “Guideline on Management of Thromboprophylaxis in Pregnancy”7 and the “NUH VTE risk assessment tool”8 available on the intranet.

Of note:
• All women with previous VTE should be offered LMWH or warfarin for 6 weeks after delivery, regardless of mode of delivery.
• All women with class 3 obesity (BMI > 40kg/m²) should be considered for prophylactic LMWH for 7 days.
• In those with persisting risk factors, such as infection, prophylaxis should be extended to 6 weeks postpartum.
• All women who have an emergency caesarean section (LSCS) should have LMWH thromboprophylaxis for 7 days.
• Those having an elective LSCS with a VTE score ≥ 2 should have LMWH thromboprophylaxis for 7 days (see and complete the VTE Risk Assessment Tool, appendix 1 which identifies risk factors for VTE).
• Those having an elective LSCS with VTE score <2, should have thromboprophylaxis until discharge.

Low molecular weight heparin (LMWH)

• LMWH is the prophylaxis and treatment of choice. In NUH enoxaparin (Clexane®) is used.
• Unfractionated heparin may be used in women at very high risk of thrombosis around delivery as it has a shorter half-life.
• Other agents are used very occasionally, details of which can be found in the NUH thromboprophylaxis guidelines.
**Dosing regimen according to weight:**

<table>
<thead>
<tr>
<th>Weight Range</th>
<th>Dosing Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 50 kg</td>
<td>20 mg daily</td>
</tr>
<tr>
<td>50-90 kg</td>
<td>40 mg daily</td>
</tr>
<tr>
<td>91-130 kg</td>
<td>60 mg daily</td>
</tr>
<tr>
<td>131-170 kg</td>
<td>80 mg daily</td>
</tr>
<tr>
<td>&gt; 170 kg</td>
<td>0.6 mg/kg/day</td>
</tr>
</tbody>
</table>

High prophylactic (intermediate) dose for weight 50-90 kg is 40 mg bd.

**Timing of LMWH and regional analgesia/anaesthesia**

- Regional anaesthesia should not be performed for 12 hours after prophylactic LMWH
- Regional anaesthesia should not be performed for 24 hours after treatment dose LMWH
- LMWH should not be given until 4 hours following insertion/removal of an epidural catheter
- Epidural catheter should not be removed until 12 hours after last dose of prophylactic LMWH and 24 hours after treatment LMWH
- A risk-benefit analysis should be undertaken if regional anaesthesia is considered outside the above recommendations. This should be discussed with a consultant and the most senior anaesthetist available should perform the procedure
- Spinal is thought to be safer than epidural in terms of risk of Vertebral Canal Haematoma (VCH) in these women
- If in doubt discuss with senior anaesthetist

**Dose timing**

1. First dose 4 hours after end of operation
2. Next dose at suitable drug round (08:00, 12:00, 18:00, 22:00) within 24 hours of previous dose e.g. If had dose at end of op at 10:00, prescribe second dose for next 08:00 drug round
### Table 5: Relative risks related to neuraxial blocks in obstetric patients with abnormalities of coagulation

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Normal risk</th>
<th>Increased risk</th>
<th>High risk</th>
<th>Very high risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMWH-prophylactic dose</td>
<td>&gt;12h</td>
<td>6-12h</td>
<td>&lt;6h</td>
<td>&lt;6h</td>
</tr>
<tr>
<td>LMWH-therapeutic dose</td>
<td>&gt;24h</td>
<td>12-24h</td>
<td>6-12h</td>
<td>APTTR above normal range</td>
</tr>
<tr>
<td>UFH-infusion</td>
<td>Stopped &gt;4h and APTTR≤1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UFH- prophylactic bolus dose</td>
<td>Last given &gt;4h</td>
<td>Last given &lt;4h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSAID + aspirin</td>
<td>Without LMWH</td>
<td>With LMWH dose 12-24h</td>
<td>With LMWH dose&lt;12h</td>
<td></td>
</tr>
<tr>
<td>Warfarin</td>
<td>INR≤1.4</td>
<td>INR 1.4-1.7</td>
<td>INR 1.7-2.0</td>
<td>INR&gt;2.0</td>
</tr>
<tr>
<td>General anaesthesia</td>
<td>Starved, not in labour, antacids given</td>
<td>Full stomach in labour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-eclampsia</td>
<td>Platelets &gt; 100 x 10^9.l^-1 within 6h of block</td>
<td>Platelets 75-100 x 10^9.l^-1 (stable) and normal coagulation tests</td>
<td>Platelets 75-100 x 10^9.l^-1 (decreasing) and normal coagulation tests</td>
<td>Platelet &lt; 75 x 10^9.l^-1 or abnormal coagulation tests with indices ≥ 1.5 or HELLP syndrome</td>
</tr>
<tr>
<td>Idiopathic thrombocytopenia</td>
<td>Platelets &gt; 75 x 10^9.l^-1 within 24h of block</td>
<td>Platelets 50-75 x 10^9.l^-1</td>
<td>Platelets 20-50 x 10^9.l^-1</td>
<td>Platelets &lt; 20 x 10^9.l^-1</td>
</tr>
<tr>
<td>Intra-uterine fetal death</td>
<td>FBC and coagulation tests normal within 6h of block</td>
<td>No clinical problems but no investigation results available</td>
<td>With abruption or overt sepsis</td>
<td></td>
</tr>
<tr>
<td>Cholestasis</td>
<td>INR ≤ 1.4 within 24h</td>
<td>No other clinical problems but no investigation results available</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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9 W. Harrop-Griffiths, T. Cook, H. Gill et all. AAGBI, OAA and RA-UK Guidelines: Regional anaesthesia and patients with abnormalities of coagulation. Anaesthesia 2013.68;966-972
EATING AND DRINKING AND ANTACID PROPHYLAXIS

Labour

Low Risk Labour
- Light Diet: Biscuits, Cereal, Toast, Low-fat yoghurt, Low-fat ice cream
- Non-carbonated, non-particulate Drinks: Water, Clear Squash, Isotonic Sports Drinks (e.g. Powerade, Lucozade Sport, Oasis)

High Risk Labour
- Water/Isotonic Sports Drinks

What can women eat & drink in labour?

What is a high-risk labour?

- Antenatal Risk Factors:
  - Preterm <37/40
  - Intra-uterine growth restriction
  - Multiple gestation
  - Breech
  - Pre-eclampsia
  - Previous postpartum haemorrhage/Retained placenta
  - Previous caesarean section/Uterine scar
  - Medical Condition (Diabetes, Drug Misuse)
  - Booking Body Mass Index > 40
  - Previous Difficult Intubation
• **Intra-Partum Risk Factors:**
  o Non reassuring cardiotocogram
  o Fetal blood sampling
  o Meconium-stained liquor
  o Antepartum haemorrhage/Abruption
  o Oxytocin augmentation
  o Failure to progress
  o Opioids (pethidine/diamorphine)
  o Epidural (discuss with anaesthetist)

• Women can be informed that (non-carbonated) isotonic sports drinks reduce maternal dehydration and ketosis.

• If transfer to theatre (for whatever reason) is impending - sips of water only.

**Antacid prophylaxis**

- All women who either start out in high-risk labour or move from low risk to high risk should be given ranitidine **150 mg** orally, 6-hourly, according to PGD (patient group direction).
- Sodium citrate 0.3M 30 ml should be given immediately prior to general anaesthesia.

These recommendations are in line with NICE (National Institute of Clinical Excellence) Guidelines\(^\text{10}\). For details of the evidence behind them see “The guidelines for Eating and Drinking in Labour”\(^\text{11}\) on the NUH intranet.

**Elective caesarean section**

➢ All women, regardless of planned mode of anaesthesia, may:

- **Eat** until 02:00
- **Drink (non-carbonated, non-particulate)** until 07:00 on the morning of surgery (permissible fluids below)

  Coffee/Tea with semi-skimmed milk  
  Water  
  Fruit squash  
  Isotonic sports drinks (Powerade, Lucozade Sport, Oasis)

- **Have sips of water** (< 50 ml water/hour) until called to theatre.
The senior obstetrician covering labour suite and the senior obstetric anaesthetist will determine the running order of the theatre list, taking into consideration:

- Clinical urgency
- Diabetes mellitus
- Need for pre-op scans: e.g. breech
- Neonatal cot availability

A woman awaiting two or more (elective or emergency) caesarean sections ahead of her on the list can have hot or cold drinks from the list of permissible fluids (see box above).

Please communicate with obstetric theatres to ascertain any changes to the list running order.

All women for elective caesarean section should receive **ranitidine 150 mg** at 22.00 the night before and again at 07.00 on the day of surgery.

---

**Eating and drinking in the early post-partum period**

<table>
<thead>
<tr>
<th>Normal vaginal birth</th>
<th>Uncomplicated assisted vaginal birth or C Section</th>
<th>Complicated vaginal birth or C Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>No restrictions on eating &amp; drinking</td>
<td>On labour suite/in Recovery (post-anaesthetic care unit): No restriction on drinking: Water Fruit squash Isotonic sports drink</td>
<td>Risk of bleeding or return to theatre: e.g. uterine atony/postpartum haemorrhage 3rd degree tear</td>
</tr>
<tr>
<td></td>
<td>On return to the ward: Eat &amp; drink normally.</td>
<td>Sips of water only until medical review</td>
</tr>
</tbody>
</table>
For further details on the evidence for the eating and drinking before caesarean section and in the post-partum period see the full NUH guideline available in the NUH intranet.\textsuperscript{11}

\textsuperscript{10}NICE Guidelines: Intrapartum Care Sept 2007
http://guidance.nice.org.uk/CG55/Guidance/pdf/English

\textsuperscript{11}Levy, D, Banks V. Guidelines for eating and drinking in labour, before elective caesarean section, and in the early postpartum period. April 2011. NUH intranet.
MATERNAL OBESITY

Obesity: \[ \text{BMI} > 30 \text{ kg m}^{-2} \]
Morbid obesity: \[ \text{BMI} > 40 \text{ kg m}^{-2} \]

Pregnant women who are overweight or obese face an increased risk of complications during pregnancy and childbirth. These risks include:

- gestational diabetes
- miscarriage
- pre-eclampsia
- thromboembolism
- instrumental delivery or caesarean section
- maternal/fetal death

The Confidential Enquiry into Maternal Mortality 2011\textsuperscript{12} found that 49% of women who died during pregnancy, childbirth or within 42 days of childbirth were either overweight or obese.

We are required by national recommendations to provide assessment services for obese parturients.\textsuperscript{13}

Points to remember:

**Pre op assessment and planning**

- Women with a BMI > 45 should be referred to the anaesthetic clinic for a discussion with a consultant anaesthetist,\textsuperscript{14} but may present to the on call anaesthetist.
- Women with BMI > 30 should have received the OAA “High BMI” leaflet.
- Measured current weight in kg (important for theatre equipment).
- Thorough airway assessment
- Discussion of issues including preference for regional technique and early epidural in labour. *Explain failure and complication rates may be higher and increased time taken. However epidural analgesia in labour is*
preferred because it can facilitate delivery requiring intervention which is more common in obese women.

- Aim for daytime delivery where possible
- May be given thromboprophylaxis antenatally in presence of other risk factors

**In labour**

- On call anaesthetist should be informed of admission if BMI > 40
- Consider early epidural
  
  *Ultrasound assessment of space may be useful*

  - Consider leaving increased catheter length (~5cm) in space
  - Consider gluing with histoacryl to reduce catheter migration
- Regular ranitidine

*Figure 1: The “Ramped” intubating position.*

The head and neck can be elevated with pillows or towels until the external auditory meatus is in line with the level of the sternal notch, when assessing the patient from the side view. This allows the angle between the oral axis, and laryngeal axis to be reduced, and the larynx and pharynx to be relatively less anterior to the laryngoscope. Intubation and bag/mask ventilation should therefore be easier. Copyright Airway Cam Technologies, Inc.
Caesarean section in morbidly obese

- Senior help
- Appropriately sized equipment and staff available for moving
- Preoperative ranitidine
- Increased risk of bleeding so consider two large-bore cannulae
- Difficult intubation ≥ 10% so avoid if possible
- Consider CSE if no epidural in situ
  - In the morbidly obese consider inserting epidural first and securing and then performing spinal at different interspace (To reduce risk of dislodging epidural during positioning)
- Ramped intubating position may be useful in morbidly obese (see fig. 1)
- Use Oxford HELP pillow which is now available at both sites (see fig. 2)
- Consider uncut size 7 ETT
- Consider arterial line for BP monitoring

Figure 2. The Oxford HELP pillow in the high position

Post partum

- Thromboprophylaxis of adequate dose and duration irrespective of mode of delivery according to thromboprophylaxis guidelines (see page 11)
Summary Care Plan

- For review by the anaesthetist on arrival on labour ward or once established labour has started, for repeat airway assessment and finalisation of plan with woman

- Suggested options:
  - If labour is anything other than straightforward should consider having an epidural earlier rather than later because siting a regional block may take longer than usual.
  - Advise to have an epidural in labour if her airway looks as if it may be difficult.

- Water and non-carbonated sports drinks only - **no food**

- Ranitidine 6-hourly throughout labour

- If venous access difficult site cannula **early**

- Remember LMWH thromboprophylaxis: perform risk assessment

- As assistance may be required with anaesthesia and analgesia, alert senior help early

- If GA required remember Sodium Citrate and ‘ramping’ – chin above chest

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14 Kean, Lucy. Guideline for the Care of Pregnant Women with a Body Mass Index (BMI) of 30 or more. November 2009. NUH intranet.

15 www.airwaycam.com/Ear-Sternal-Notch-Positioning.html
Failed Intubation

Failed or difficult intubation is a leading cause of anaesthesia-related maternal mortality and death is more often a result of hypoxia than inhaled gastric contents. Failed intubation occurs in at least 1:300 obstetric anaesthetics and in as many as 1:150 (compared with 1:2220 in non-pregnant patients).

Preparation

- Appropriate airway assessment and positioning (see GA section page 68)
- Remember to follow a pre-planned drill and not to start experimenting with unfamiliar equipment.
- Call for help before undertaking general anaesthesia in a woman in whom you anticipate a difficult intubation.

Key Points:

- The difficult intubation algorithm for obstetrics shown in figure 3 should be followed.
- In the presence of a poor view of the glottis at laryngoscopy the position of the cricoid pressure should be checked to ensure it is central and correcting for lateral tilt of the woman.
- Do not persist with futile attempts to intubate where oxygenation is endangered. Do not give a second dose of suxamethonium.
- Failed intubation is the inability to intubate after two attempts. Declare ‘FAILED INTUBATION’ to the theatre team and ask a midwife to call for help. The midwife should call the senior resident anaesthetist as an emergency (in normal hours any nearby anaesthetist should be summoned)
- Insert iGel before suxamethonium has worn off or immediately if hypoxia occurs. Remove cricoid pressure and ventilate by hand until hypoxia has resolved. If you have an effective airway do not attempt further intubation.
• If postponement is acceptable (often it is not), then wake the patient. Take into account the risks of repeated anaesthesia to the mother, the original indication for GA, and whether regional anaesthesia is contraindicated (e.g. haemorrhage or patient refusal).
  - Subsequent anaesthesia must be conducted with a consultant present.
  - Use either a regional technique or an awake intubation.

• If surgery is to be continued:
  - Administer atracurium and institute IPPV with the standard volatile anaesthesia mix.
  - Do not try to achieve tracheal intubation
  - Do not drain the oesophageal port of the LMA routinely unless regurgitation is apparent.
  - Observe the drain tube carefully and if necessary pass an orogastric tube down the drain channel. The orogastric tube must be at room temperature and the channel must be well lubricated.
  - A senior obstetrician must perform the surgery.

• If you are unable to oxygenate the patient, declare ‘obstetric emergency’ and have someone put out the emergency calls (including consultants if not already present). You must create a surgical airway – needle cricothyroidotomy (jet ventilation cannula + Manujet or QuickTrach) or surgical cricothyroidotomy. – (See NUH intranet>specialist support>Queens difficult airway trolley for cricothyroidotomy information and videos16)

Follow up
• Complete an incident form.
• Document details in the clinical notes.
• Inform the woman and write a letter for them to take home with a copy to the GP.
Figure 3. Difficult Intubation Algorithm

Unanticipated difficult tracheal intubation - during rapid sequence induction of anaesthesia in an obstetric adult patient

Direct Laryngoscopy → Any problems → Call for help

**Plan A: Initial Tracheal Intubation Plan**

**Pre-oxygenate**
- Cricoid force: 10N awake, 30N anaesthetised
- Direct laryngoscopy - check:
  - Neck flexion and head extension
  - Laryngoscopy technique and vector
  - External laryngeal manipulation - by laryngoscopist (BURP)
  - Vocal cords open and immobile
- If poor view:
  - Reduce cricoid force
  - Introducer (bougie) - seek clicks or hold-up

**Failed Intubation**

**LMATM or iGelTM**
- Reduce cricoid force during insertion
- Oxygenate and ventilate

**Failed ventilation and oxygenation**
- Use face mask, oxygenate ventilate
- 1 or 2 person mask technique
- (with oral ± nasal airway)
- Consider reducing cricoid force if ventilation difficult

**Plan C: Maintenance of oxygenation, ventilation, postponement of surgery and awakening**

**Succeed**

**Plan B not appropriate for this scenario**

**Succeed**

**Postpone surgery and awaken patient if possible or continue with anaesthesia with iGel if condition immediately life threatening**

**Plan D: Rescue techniques for "can't intubate, can't ventilate" situation**
Massive Obstetric Haemorrhage

Massive obstetric haemorrhage can be variably defined as:

- Blood loss >2000ml
- Blood loss with signs of shock
- Blood loss >1500ml and ongoing

Consider activating massive obstetric haemorrhage protocol when blood loss is 1500 ml and ongoing.

- The median blood loss at caesarean section is about 700 ml. Sometimes it can rapidly transform into massive haemorrhage. Regular communication with the obstetricians is essential.
- Tachycardia, hypotension, and vasoconstriction in an obstetric patient represent severe hypovolaemia.
- Coagulopathy may cause haemorrhage. Haemorrhage causes coagulopathy.
- The successful management of haemorrhage includes obstetric management specific to the cause of the haemorrhage – usually delivery for antepartum haemorrhage and uterine contraction or surgical repair for postpartum haemorrhage. Improved survival from massive transfusion over the past ten years is attributed to more effective efficient warming devices, aggressive resuscitation and component therapy and improved blood banking.

Causes

**Antepartum Haemorrhage**

- Ectopic pregnancy
- Placenta praevia
- Placental abruption
- Uterine rupture

**Postpartum Haemorrhage (4 Ts)**

- TONE (including inversion)
- TISSUE
- TRAUMA
- THROMBIN (clotting abnormalities)
Massive Obstetric Haemorrhage Management

1. Call for help
Call for help as soon as massive blood loss is recognised. If blood loss > 1500 ml and ongoing, the attending midwife must request a 2222 ‘obstetric crash call’, which will alert key obstetric, anaesthetic/theatre team and midwifery staff, and activate ‘massive haemorrhage protocol’ (see below) if appropriate:

Staff involved should include:
- Senior anaesthetist
- Obstetric SpR/consultant
- Senior midwives
- Transfusion lab
- On call haematology consultant/SpR
- Porters
- “Runner” should be nominated by lead midwife to take samples to laboratory and collect blood products
- “Scribe” to record events and times

2. Resuscitation
- Airway, breathing and high concentration O₂ to the mother
- Circulation- two large bore cannulae, fluid warmers
- Minimise aortocaval compression if still pregnant

3. Send bloods
- X match, FBC, coagulation and fibrinogen

4. Liaise with blood bank
- Activate massive haemorrhage protocol if appropriate via designated pager (see below and figure 3)
  Information needed:
  o Patient name, DOB, ID number, estimated weight
  o Name of activator
  o Name and contact detail of medical co-ordinator
- Send runner to transfusion lab with to collect blood products

5. Fluids
- Up to 2 L crystalloid/ 1.5 L colloid
- Red cells -X matched if available
  o Type specific/ O RhD negative if more urgent
  o 3 units O negative in fridge in maternity theatres at NCH
  o O negative available from blood bank at QMC
6. Monitoring
- Pulse, blood pressure, pulse oximetry, urine output, respiratory rate and capillary refill (i.e. EWS chart)
- Core temperature- **Active patient warming**
- Initially invasive monitoring is not essential but as part of ongoing resuscitation consider invasive arterial BP and central venous access.

7. Coagulation factor replacement
- FFP - 4 units/ adult bags for every 6U red cells
- Cryoprecipitate
- Recombinant Factor VIII (90 mcg/kg)
  - issued on request after discussion with haematology consultant

8. Consider conversion of regional to general anaesthesia

9. Haemostatic drugs
- Tranexamic acid 1 g iv bolus then 1 g over 8 hr

10. Cell salvage
- Consider if appropriate (see page 74)
- Set up in advance for anticipated haemorrhage
- Can be set up in <5 minutes if needed in emergency setting if staff available
- In ongoing massive haemorrhage do not use reinfusion/leucocyte depletion filter
  - Filter significantly slows reinfusion
  - Balance of risk favours rapid return of salvaged red cells
- **NB. Cell salvage may not always be available in an emergency especially at NCH.**

11. Treatment of cause
- Surgical delivery
- Surgical removal of retained products
- Surgical repair of any genital tract trauma
- **Uterotonic drugs** (see below)
- Bimanual compression of uterus
- Uterine tamponade- Compression balloon (e.g. Bakri, Rusch)
- Uterine haemostatic sutures
- **Selective arterial occlusion or embolisation by interventional radiology** (contact via switchboard)
- Hysterectomy

12. Transfer to area equipped to provide Advanced Obstetric Care
• Usually HDU/ICU

13. Team debriefing
• Led by team leader

<table>
<thead>
<tr>
<th>Uterotonic Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OXYTOCIN</strong></td>
</tr>
<tr>
<td>• 5 U im routinely offered post-delivery for all vaginal deliveries</td>
</tr>
<tr>
<td>• <em>Slow</em> bolus of 5 U iv made up to 5 ml with N/Saline followed by an infusion of <strong>40 U over 4 hours</strong> is given routinely post cord clamping at all Caesarean sections.</td>
</tr>
<tr>
<td>• 2\textsuperscript{nd} dose of 5 U iv may be given</td>
</tr>
<tr>
<td>• May cause tachycardia, hypotension and circulatory collapse especially if given in the presence of hypovolaemia or any form of shock</td>
</tr>
<tr>
<td>• Use with caution in women with pre-existing cardiac disease</td>
</tr>
<tr>
<td>• Short half-life (10 minutes)</td>
</tr>
</tbody>
</table>

| **ERGOMETRINE** |
| • 250-500 mcg iv/im |
| • Generalised vasoconstrictor effects |
| • Causes hypertension, nausea and vomiting. |
| • Use cautiously in pre-eclampsia and heart disease |
| • Slower onset but longer duration of action than oxytocin |

| **Prostaglandins (CARBOPROST/MISOPROSTOL)** |
| • For uterine atony unresponsive to oxytocin/ergometrine |
| • **Carboprost 250 mcg im**- can be repeated every 15 minutes up to 8 doses |
| • **Misoprostol 600 mcg pr** (off licence) |
| • Can cause severe bronchospasm, pulmonary and systemic hypertension, nausea, vomiting and diarrhoea |
| • Use with extreme caution in asthma and pre-eclampsia |
**Massive Haemorrhage Protocol**

See figure 3 and also NUH transfusion policy\(^{17}\) on intranet for more details.

**Important Points**

- All blood products will need collecting from the transfusion laboratory
- Unused products including rVIIa must be returned to the laboratory within 2 hours
- Accurate documentation of blood products and factors is essential, specifically blood transfusion prescription
- If RhD positive platelets are issued to a RhD negative woman, anti D must be issued. *(Not necessary for FFP/cryoprecipitate)*

---

**Aims for obstetric haemorrhage management**

- **Hb 80-100 g/l**
- **PT and APTT < 1.5 x normal**
- **Platelet count > 75 x 10^9/l**
- **Fibrinogen level > 2.0 g/l**

**Normothermia** fluid warmer/ Bair hugger/ warm blankets

**Normocalcaemia**

- regularly check calcium levels
- if low give 5 ml 10% calcium gluconate IV

**Avoid/correct acidaemia**
**Figure 4: NUH Massive haemorrhage protocol (adapted from NUH Transfusion Policy)**

**ACTIVATE**
- **Crash bleep 2222**
  - State “MASSIVE OBSTETRIC HAEMORRHAGE”
  - Give site and patient details
  - Ask for blood and any other components needed (quantity + type)

**Call for Senior Anaesthetic and Obstetric help**
- Send blood samples
  - X match, FBC, Coagulation, Fibrinogen
  - Blood will be issued before these are received
  - O negative/ type specific/ fully cross matched depending on sample already with lab

**COLLECT**
- **blood products**
  - Activator requests runner
    - Runner needs NUH swipe card and any patient identifier
    - No prescription or request form needed

**Activation criteria:**
- Patients with haemorrhagic shock, or impending haemorrhagic shock, due to a major haemorrhage
  - OR
- Systolic BP < 80mmHg on admission, <90mmHg after fluid challenge, with actual or suspected haemorrhagic cause, or when haemorrhage causes a 25% reduction in the systolic blood pressure.
  - OR
- Blood loss ≥ 150 ml/min

**COMMUNICATE**
- **with Haematology**
  - Request further components as required
  - Transfuse as guided by results and Haematology advice

- **Stand down**
  - Call 55660 or bleep 780-7054
  - Return unused products
  - Complete documentation

**Ongoing bleeding?**
**Bleeding controlled**
Figure 5: Flow chart of management of massive PPH (adapted from NUH PPH guidelines)

CALL FOR HELP
- Senior obstetrican/ anaesthetist/midwife
- 2222 “Major Obstetric Haemorrhage will alert above people
- Initiate Massive Haemorrhage Protocol (see figure 4)

RESUSCITATE
- ABC
- Oxygen
- 2 x wide bore cannulae +iv fluids
- Blood + clotting products
- Keep warm

MONITORING + INVESTIGATIONS
- FBC, clotting, fibrinogen, U+E, LFTs
- Xmatch + order appropriate blood products
- Monitoring- NIBP, SpO2, ECG
- Nominate “scribe” to document
- Weigh swabs and estimate loss

MEDICAL TREATMENT
- Rub a contraction
- Empty bladder
- Oxytocin 5 Ux2 iv
- Ergometrine 500 mcg iv (+anti-emetic)
- Oxytocin infusion 40 U 10 U/hr

If bleeding persists:
- Carboprost 250 mcg every 15 mins im up to 8 times
- Misoprostol 600 mcg pr
- Bimanual uterine compression

THEATRE
- Is the uterus contracted?
- Exam under anaesthetic
- Correct clotting abnormalities
- Consider TRANEXAMIC ACID 1 g iv

- Bimanual compression
- Intrauterine balloon tamponade
- Laparotomy bilateral compression
- Haemostatic uterine sutures
- Bilateral internal uterine artery ligation
- Recombinant factor VIIa

Hysterectomy (Gynae consultant)
Uterine Artery Embolisation

Consider Critical Care
Women who refuse blood transfusion

See obstetric guideline for greater detail. The principles of treating Jehovah’s Witnesses and other women 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. Ensure there is no coercion by family or others by discussing with the patient alone.

• Patient Competency – women should be considered competent unless it is clear that they cannot fulfil all of the following:
  ▪ Understand – the information that you give them.
  ▪ Retain - the Information that you give them.
  ▪ Weigh Up the Choices – that are available to them.

• Under 16 Years - in England, a patient under the age of 16 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.
  • Between 16 and 18 years there is considerable confusion about whether they can refuse treatment so consultants should be involved.

b) Refusal of Treatment – ascertain which products the woman 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.

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

Will accept:

- Crystalloids
- Artificial colloids

c) Antenatally
- regular Hb
- Fe, folic acid and B12
- Consultant Obstetric Anaesthetist and Consultant Obstetrician to see
- If the woman’s Hb is below 10g/dl, IV iron +/- erythropoietin may be indicated
- Liaise with Haematologists
- Women must be informed that 24 hour cell salvage is not available at NCH- if they want this guarantee they must book at QMC.

d) Documentation –
- A ‘Record of Refusal of Specific Treatment- Transfusion of Blood and Blood Components’ proforma (found in Transfusion Policy”) documenting exactly what treatment they will and won’t accept should be completed and signed with the patient and filed in the front of the patient’s notes. Ideally this should be done antenatally.
- Should also be documented on Medway

e) Communication
- On admission or transfer to theatre, inform a senior obstetrician and a senior obstetric anaesthetist. A consultant haematologist should be involved if complications are anticipated in labour.
- Reconfirm consent details
- Theatre staff should be informed early in order to set up cell salvage

f) Labour – in discussion with midwife / obstetrician
- Intravenous cannula and Hb on admission
- Active management of 3rd stage, i.e. oxytocin 5 U
- Prompt post-delivery suturing
- Consider post-delivery infusion of oxytocin (10 U/hr) for 4 hours.

g) Caesarean section
- Most senior available obstetrician and anaesthetist
- Cell salvage

h) Obstetric haemorrhage
• Early use of haemostatic drugs
• Early surgical intervention
  o B-Lynch suture/ arterial ligation/ vessel embolisation (radiology) can be employed to stop blood loss.
  o Consideration should be given to the pre-LSCS placement of intra-iliac balloon catheters (radiology) if high risk
• Early hysterectomy

**i) Severe anaemia postnatally**
• May need to be treated by ventilation with 100% oxygen in critical care unit.
• Intravenous iron and erythropoietin therapy (haematology).

### Management of Severe Local Anaesthetic Toxicity

**Immediately**

<table>
<thead>
<tr>
<th>Give an initial intravenous bolus injection of 20% lipid emulsion at 1.5 ml.kg(^{-1}) over 1 min</th>
<th>and</th>
<th>Start an intravenous infusion of 20% lipid emulsion at 15 ml.kg(^{-1}).h(^{-1})</th>
</tr>
</thead>
</table>

**After 5 min**

| Give a maximum of two repeat boluses (same dose) if: | and | Continue infusion at same rate, but:
  • cardiovascular stability has not been restored or
  • an adequate circulation deteriorates |
| Leave 5 min between boluses |
| A maximum of three boluses can be given (including the initial bolus) |

Continue infusion until stable and adequate circulation restored or maximum dose of lipid emulsion given

**Do not exceed a maximum cumulative dose of 12 ml.kg\(^{-1}\)**
1. Recognition

Signs of severe toxicity:

• Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions
• Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur
• Local anaesthetic (LA) toxicity may occur some time after an initial injection

1. Immediate Management

• Stop injecting the LA
• Call for help
• Maintain the airway and, if necessary, secure it with a tracheal tube
• Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)
• Confirm or establish intravenous access
• Control seizures: give a benzodiazepine, thiopental or propofol in small incremental doses
• Assess cardiovascular status throughout
• Consider drawing blood for analysis, but do not delay definitive treatment to do this

2. Treatment

In circulatory arrest

• Start cardiopulmonary resuscitation (CPR) using standard protocols
• Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment
• Consider the use of cardiopulmonary bypass if available
• GIVE INTRAVENOUS LIPID EMULSION
• Continue CPR throughout treatment with lipid emulsion
• Recovery from LA-induced cardiac arrest may take >1 h

Without circulatory arrest

• Use conventional therapies to treat:
  o hypotension,
  o bradycardia,
o tachyarrhythmia

- **CONSIDER INTRAVENOUS LIPID EMULSION**

**Of note:**
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy
- Lipid emulsion is in yellow box on the defibrillator trolley in obstetric theatre recovery and in labour suite emergency equipment room (CHN), and the anaesthetic room (QMC)

**4. Follow-up**

- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved
- Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days
- Report cases to the National Patient Safety Agency (via www.npsa.nhs.uk)
- If Lipid has been given, please also report its use to the international registry at www.lipidregistry.org. Details may also be posted at www.lipidrescue.org

**Total Spinal**

- This is the rapid onset of hypotension and analgesia with widespread paralysis and apnoea due to cervical spread of intrathecal local anaesthetic.
- It may occur following epidural insertion with an unrecognised dural tap, or following catheter migration several hours after insertion. It can also occur during normal spinal anaesthesia.

**Management**

- Call for senior help, an ODP and the resuscitation trolley
- **Airway and Breathing**
  - **Oxygen**
  - Intubate if necessary
    - Routine RSI in theatre is safest if time permits
    - Immediate intubation and ventilation may be required
• Ventilate until the block has worn off, usually about 2 hours
  ▪ Sedation using propofol

• Circulation
  o Minimise aortocaval compression
  o Intravenous fluids and vasopressor agents as required
  o Anticholinergic agents to treat bradycardia

• Obstetric management
  o Caesarean section may be required if there is fetal compromise
    or if maternal circulation remains compromised
  o Decision should involve senior obstetric and anaesthetic staff

• Critical care
  o Further management of ventilation and cardiovascular support
    may be required in the Critical Care Unit until the block has
    worn off.

• Do not forget to give appropriate sedation until the block has
  worn off

**Other emergencies**

**Uterine inversion**

• Consider if there is severe abdominal pain after delivery, if there is
  shock out of proportion to the apparent blood loss or unexplained
  bradycardia
• Blood loss is often underestimated.
• Give oxygen and establish venous access.
• Diagnose and treat shock with prompt resuscitation for the
  haemorrhage.
• Give atropine as necessary for the vagal bradycardia.
• Prepare for a general anaesthetic in the event of rapid replacement
  not being possible with tocolytic therapy. Volatile general anaesthesia
  relaxes the uterus for replacement.
• You may need to use tocolytic drugs e.g. terbutaline
• After replacement of the uterus, give Syntocinon as an intravenous
  bolus followed by an infusion
• Treat post partum haemorrhage as above
• Neurogenic shock is rare but may occur and should not be treated
  with large volumes of intravenous fluids.
**Umbilical cord prolapse**

**Treatment:**
- Elevation of presenting part of fetus away from cord by obstetrician/midwife
- Consider urinary catheter and bladder filling
- Rapid delivery usually requiring emergency caesarean section

Prepare for immediate induction of anaesthesia for caesarean section. A general anaesthetic will usually be required because of the mother’s distress and her position. Regional anaesthesia may be appropriate if fetal well-being can be ascertained (working epidural *in situ* or rapid single-shot spinal in lateral position). Delivery should be as rapid as possible while maintaining patient safety.

**Uterine rupture**

- Consider if there is sudden cessation of uterine activity or *abdominal pain between contractions*, sometimes despite the epidural.
- Fetal compromise, vaginal blood loss and shock may all be present.
- Give oxygen, establish venous access and send serum for issue of four units of type-specific blood.
- Send for senior help.
- Diagnose and treat shock. The mother’s welfare is paramount and shock should be treated so as to render induction of anaesthesia safe. However, in extremely rare circumstances, operative resuscitation may be required.
- Prepare for immediate induction of general anaesthesia, for caesarean section and repair.
- Expect massive obstetric haemorrhage and manage accordingly.

**Amniotic fluid embolism (anaphylactoid syndrome of pregnancy)**

- This is rare and thought to be an anaphylactoid reaction triggered by maternal exposure to fetal antigens.
- It is classically characterised by a triad of
  - Cardiovascular collapse
  - Severe hypoxaemia
  - Disseminated intravascular coagulation
• Significant premonitory signs and symptoms, i.e. respiratory distress, cyanosis, restlessness and altered behaviour, may give the first clue to diagnosis before collapse and haemorrhage occur.
• Other clinical features include acute dyspnoea, seizures and pulmonary oedema.

**Treatment**
- BLS/ALS aimed at restoration of cardiac output
- Correction of coagulopathy
- Critical Care
- Consider peri-mortem caesarean section
- TOE may have a role

**Eclampsia**

See page 84.

**Unexplained collapse and cardiopulmonary arrest**

- Place patient in the left lateral position (except when external cardiac compression is required when wedge should be inserted or table tilted)
- 100% O2 and iv access
- Commence basic and advanced life support as appropriate.
- Exclude hypoglycaemia
- Determine the cause. It may fall into **one or more** of three groups.
  - Pre-existing maternal conditions e.g. epilepsy.
  - Pathological syndromes of pregnancy e.g. eclampsia, embolus.
  - Iatrogenic causes e.g. total spinal anaesthetic

**Cardiopulmonary resuscitation**
- Manual left lateral displacement of the uterus or an obstetric wedge
- Cardiac Arrest team (2222)
- Senior Obstetric and Anaesthetic Staff
- Emergency caesarean section within 5 minutes of the diagnosis of arrest to aid resuscitation
  - This should be performed immediately and should not be delayed by transfer to theatre
- Document all events as soon as possible and as accurately as
possible.

16 Queens Difficult airway trolley NUH intranet
http://nuhnet/specialist_support/qdat/Pages/default.aspx

17 NUH Transfusion Policy, August 2013. NUH intranet

18 El Senoun, G. NUH Guideline for The Management of Postpartum Haemorrhage, November 2010. NUH intranet


20 AAGBI Safety Guideline: Management of Severe Local Anaesthetic Toxicity. 2010
http://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf
LABOUR ANALGESIA

Regional Analgesia for Labour

Labour Epidurals

We offer women in labour a 24-hour, on-request epidural service.

We aim to attend the mother within 30 minutes of being informed. If you have a request for urgent epidural analgesia when you are busy in theatre, approach another suitably experienced member of the anaesthetic on-call team for assistance.

Contraindications:

- Patient refusal
- Anticoagulation/coagulopathy (If platelet count <80, discuss with senior colleague).
- Sepsis (isolated pyrexia without systemic signs, especially when treated with iv antibiotics, is not an absolute contraindication)
- Uncorrected hypovolaemia
- Lack of trained midwives
- Imminent birth

In certain rare instances it may be of benefit to patients to have an epidural sited in labour despite contraindications. These patients must be discussed with a consultant anaesthetist and epidurals must be sited by the most experienced anaesthetist available.

Epidural technique

Pre-insertion checks

- Verbal consent- accurately documented (checklist in peripartum booklet) (see page 7)
- No contraindications
- Blood tests
  - FBC if evidence of:
    - Pre-eclampsia
    - HELLP
    - Fatty liver of pregnancy
- Antepartum bleeding
- Thrombocytopenia suspected (platelet count should be ≥80 prior to epidural insertion)
  - Coagulation studies are not normally required but should be considered if:
    - Pre-eclampsia and platelet count below 100
    - Uterine death >2 weeks previously or uncertain date

**IV Access**
- 14 or 16 gauge cannula in situ and working prior to insertion

**Crystalloid Infusion**
- It is not necessary to give a fluid pre-load or co-load prior to inserting an epidural provided the suggested loading doses of local anaesthetic/opioid mixture are used (see below)

**Patient positioning**
- Lateral or sitting
- Examine insertion site before scrubbing up

**Aseptic technique**
- Scrub, sterile gown and gloves, hat, surgical mask and drape(s)
- Eye protection if woman is high risk for blood borne viruses

**Skin preparation**
- Prior to opening of epidural insertion equipment – great care must be taken to avoid contaminating epidural equipment with skin prep solutions
- Keep skin prep solution away from prep tray
- 0.5% pink chlorhexidine in alcohol (from multiuse bottle) – and ensure completely dry before proceeding
- If woman has a sensitivity to chlorhexidine use povidone iodine (Betadine)

**Insertion technique**
- Lumbar spine
- Midline approach
- Adequate skin infiltration with 1% lidocaine
- Loss of resistance to N/Saline
- Leave 3-4 cm catheter in epidural space (more if woman is obese)
- A bacterial filter must be fitted to catheter at all times
- After insertion all epidural injections must be via bacterial filter
Dressings
- Use a sterile, transparent dressing to allow observation of insertion site and length of catheter at the skin
- Tape around transparent dressing
- Narrow tape to hold catheter to back and over shoulder
- Second sterile, transparent dressing around catheter/filter interface
- Consider using skin glue in high BMI and other selected patients

Disconnection
- See under complications

Safe disposal of sharps
- Sharps container should be available at point of use and should not be overfilled; do not disassemble needle and syringe; do not pass sharps from hand to hand

Initial dose
- “Every dose is a test dose”
- Maternal and fetal monitoring during initial dose
- 10-12.5 mg of levobupivacaine constitutes a test for intrathecal placement (e.g. 10 ml 0.125% levobupivacaine or 4 ml 0.25%)
- 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
- The next contraction should feel the same as the last

Intravenous catheter
- You must be familiar with signs and symptoms of LA toxicity and know where the equipment for dealing with LA toxicity is kept
- If the test dose is intravenous the woman may become light headed with circumoral tingling
- Keep talking to the woman
- Enquire about symptoms of LA toxicity
- Get senior help and the yellow intralipid (LA toxicity) box from theatres/labour suite
- See emergencies section (page 37)

Subsequent dose
Options:
• Further 10 ml 0.125% levobupivacaine (to give a total of 20 ml including initial “test dose”) + fentanyl 50 mcg
• Further 6 ml 0.25% levobupivacaine (to give a total 10 ml including initial test dose) + fentanyl 50 mcg

Maintenance
• Infusion
  o Premixed bag (containing 250 ml 0.1% levobupivacaine +2 mcg/ml fentanyl) at 10 ml/hr (range 0-15 ml/hr) via dedicated yellow epidural line only
• PCEA
  o Premixed bag
  o For infusion protocol see latest guideline as this is about to change

Documentation
• Complete epidural section of intrapartum record
  o Document that epidural and intravenous lines have been checked with midwife and ask him/her to countersign

Drug Card Prescription
• Epidural infusion – within infusion section of drug card
  o Pre-filled bag, bupivacaine 0.1% + fentanyl 2 mcg/ml, run as per protocol
• Top-up doses – within ‘as required’ section of drug card
  o 5 ml 0.25% levobupivacaine every 30 minutes
  o 10 ml of pre-mixed bag solution may be given
• Instrumental/suturing dose – within once only section of drug card
  o 5 ml (+ 5 ml if required) 0.5% levobupivacaine
• Intravenous fluid if necessary
• PCEA documentation – use yellow sticker
  Please see latest guidelines for details of PCEA protocol and prescription as this about to change

Combined Spinal-Epidural for labour
• In selected cases CSE may be indicated
• If performing a needle through needle technique the level should be L3/4 or below as for a spinal
• Intrathecal dose
  o 1 ml 0.25% levobupivacaine + 15-25 mcg fentanyl or
  o 2 ml 0.125% levobupivacaine + 15-25 mcg fentanyl
• Epidural first dose must be given by the anaesthetist as for epidural analgesia (above), when spinal analgesia starting to wear off
• Epidural infusion can be commenced after loading dose if no adverse effect

Mobility in Labour

Guidelines for mobility in labour are currently in progress.

Troubleshooting Labour Epidural Analgesia

Ideal block
• T10-S5 to cold with minimal motor block
• Maternal satisfaction

Block above T6
• Stop infusion
• Restart as soon as block height has regressed to T10

Inadequate analgesia
• Check insertion site and assess block
• Low block
  o Inadequate volume in epidural space
  o Epidural top up
    ▪ 10 ml from premixed infusion or
    ▪ 5 ml 0.25% levobupivacaine
• Missed segment/ unilateral block
  o May be due transforaminal escape (too much epidural catheter in space) or presence of midline barrier within epidural space
  o Ensure only 3-4 cm catheter within space if not withdraw to 3-3.5 cm
  o Top up with
    ▪ 10 ml from premixed infusion with woman lying on painful side or
    ▪ bolus with higher concentration levobupivacaine (5-10 ml 0.25%) and/or
    ▪ bolus opioid (fentanyl 50 mcg)
• No block
  o Bolus of up to 30 ml total of infusion mixture (0.1% levopbupivacaine + fentanyl 2 mcg/ml) (including top up and initial loading dose) or
Bolus of higher concentration (up to 10 ml 0.5% levobupivacaine incrementally)

- **Offer epidural re-site early.** If analgesia is still inadequate one hour after first dose offer to re-site the epidural.

## Complications of Epidural Analgesia/Anaesthesia

### Bloody tap
- If blood from Tuohy needle after removal of stylet reinsert in different interspace
- If blood through catheter
  - withdraw and then flush with N/Saline until no further blood appears on aspiration
  - if sufficient catheter remains in space proceed cautiously with test dose
  - failing this, re-site epidural at a different interspace
- **LMWH should not be given for 12 hours following a bloody tap through needle**

### Catheter disconnection (between the patient and the filter)
- Epidural catheter should be re-sited due to infection risk
- Transparent dressing around catheter/filter connection may prevent this

### Hypotension
- Hypotension is defined as a decrease in systolic blood pressure by 20% from the initial reading and is often accompanied by symptoms of dizziness and nausea. It is accentuated by aortocaval compression and/or hypovolaemia.
- Administer supplemental oxygen.
- Place the mother in the left lateral position.
- Run in fluids appropriate to the pulse rate and blood pressure.
- If she is still hypotensive, administer vasopressor boluses intravenously.
- Check the block level (motor and sensory) and seek other causes of hypotension.

**Total spinal/ high block** (see emergencies)

### Subdural block
- The subdural space is between the dura and the arachnoid mater
- A subdural block is characterised by:
o High block - block spreading unexpectedly high over 20-30 mins, sometimes to cervical dermatomes
o Patchy sensory block with sacral sparing
o Minimal motor block
o Nasal stuffiness and Horner’s syndrome
o Relative maintenance of blood pressure

• Bolus dose may rupture arachnoid mater converting subdural block to subarachnoid block
• Management is resiting of epidural catheter

Accidental Dural Puncture (ADP)

• Incidence ~1%
• May be with Tuohy needle or epidural catheter

If recognised at time, two management options

• Intrathecal catheter
• Resite epidural at different level

1. Intrathecal Catheters
Do not leave obstetric department if an intrathecal catheter technique is in progress

Dural Tap (needle)

• Advance catheter into subarachnoid space by 2-3 cm
• 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 woman and document this in the notes, including a management plan (see below)
• Also inform senior anaesthetist on site
• Ensure handover to the on-coming anaesthetist
• Do not perform a prophylactic blood patch

Dural tap (catheter)

• Leave the catheter in the CSF and treat as above

Top-ups – Intrathecal Catheter

• Anaesthetist only
• Do not use an infusion
• Remain with the woman for at least 10 minutes following the top-up to ensure any hypotension is treated promptly

**Labour Analgesia**
- Levobupivacaine (2.5 mg/ml) 0.25% 1-2 ml flushed slowly through with 2 ml N/Saline
- 15-25 mcg fentanyl
- Expect to repeat the intrathecal local anaesthetic dose 1-2 hourly
- Further fentanyl can be given cautiously, if required, after 6 hours

**Caesarean Section**
- Titrate 0.5 ml increments of (5mg/ml) 0.5 % levobupivacaine
- Also inject diamorphine 250-500 mcg

**2. Resite the epidural**
- If not happy to manage an intrathecal catheter or difficulty/paraesthesia attempting to insert intrathecal catheter, re-site it at another inter-scape
- If this proves to be technically difficult, or if at all unsure, request more experienced help
- **NB: in the presence of a meningeal tear the amount of local anaesthetic required for the resited epidural may be significantly less than for analgesia with intact meninges** (caution required especially if large volume top-up for caesarean section)
- Therefore initial top-ups must be given by the anaesthetist
- If a further tap occurs consultant input must be sought

**Resited Epidural Infusion**
- An infusion regimen can be considered after a catheter has been resited at another inter-space, only if bolus top-ups have not exhibited excessively fast onset or unusually extensive block
- Discuss this with a senior registrar or consultant obstetric anaesthetist first

**Elective Instrumental Delivery**
- Advisable only if headache arises during labour
- Straining may increase CSF leak and worsen headache

**Catheter Removal**
• There are no differences in how epidural and intrathecal catheters should be removed

Recumbency
• There is no evidence that enforced recumbency is of any use in the prevention of post-dural puncture headache
• However, it is likely to relieve symptoms

IV and Oral Fluids
• Encourage oral fluid intake
• Continuous intravenous fluids for 24 hours
• Aim for total daily fluid input of 3 litres

Review Daily
• Ensure that the woman is reviewed on a daily basis
• 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 women, but an epidural blood patch may be required.
• Give woman OAA leaflet on “Headache after Epidural or Spinal”
• See below for management of Post Dural Puncture Headache.

Follow-Up
• All women who have had an accidental dural puncture should be referred to the Obstetric Anaesthetic Clinic 6-8 weeks postpartum
• The ward midwives will arrange this on request
• If the woman develops a severe/worsening headache before the appointment they should phone Labour Suite to arrange an anaesthetic review (rather than attend A&E or GP)

Remember subdural haematoma is a rare but recognised complication of ADP

Incident Forms
• Please complete an online incident form if a dural tap occurs

Post-Dural Puncture Headache (PDPH)
• Headache is a common symptom in the postpartum period and there are many causes.
• 30% of dural punctures are not recognised at the time of insertion and first present in the postpartum period
• Up to 70% of women will report symptoms of PDPH after dural puncture with a 16G Tuohy needle

Classical Features
• Typically postural- relieved by lying flat
• Exacerbated by standing, sitting, straining
• Often accompanied by:
  o Neck stiffness
  o Tinnitus, photophobia, dizziness, diplopia
• Atypical presentations are well described.

Note:
• Not all headaches after epidurals and spinals are PDPHs and careful history and examination is required to avoid missing other potentially serious causes of headache such as subarachnoid haemorrhage, pre-eclampsia, cortical vein thrombosis, meningitis.
• Intracranial hypotension can lead to subdural haemorrhage through tearing of bridging dural veins, and a delay in diagnosis and treatment can be dangerous
• If in doubt seek a second senior opinion

Treatment
• Symptomatic
  o Simple analgesia- paracetamol, ibuprofen
  o Rehydration
  o Opioids and antiemetics
• Caffeine
  o Can offer symptomatic relief
  o Suggest caffeine-containing drinks
• Consider acupuncture
• Epidural Blood Patch (EBP) – definitive treatment

Epidural Blood Patch

Indications
• A blood patch should be considered for any woman with symptoms of a PDPH persisting for at least 24 hours and causing disability or delayed discharge
Timing of blood patch
- Normally 24 hours after ADP
- Success rate within the first 24 hours is lower

Preparation
- **Senior Supervision**
  - Blood patch must be performed under direct supervision of a consultant or senior registrar, in the theatre suite, with an ODP to assist
- **Informed Consent**
  - Woman should sign written consent form
  - Full explanation of the cause of the headache and the reasons for performing a blood patch (OAA patient information leaflet21)
  - Brief description of procedure
  - Successful on the first occasion in 70-80% of cases, however a subsequent procedure may be necessary
  - Complications as for any epidural should be explained and documented (see pages 7 and 43)
  - Some pain or pressure symptoms may be referred to the back, hip or leg during or immediately after the procedure
  - Backache may develop and persist for up to two weeks
- **No infection**
  - Woman must be apyrexial
  - There must be no infection of the skin at the proposed vertebral level
  - There is no need to do blood cultures when performing a blood patch
- Ensure no thromboprophylaxis has been given for 12 hours before the procedure

Technique
- **In theatre/theatre recovery**
- **Two anaesthetists**
  - Aseptic technique
  - Both scrubbed, wearing sterile gown, gloves, hat and mask
- **IV access**
- **Vertebral level**
  - Clot spread is principally cephalad
  - Insert Tuohy needle at the same epidural space or below the original puncture site
- **Take 20 ml blood aseptically**
• Injection
  o Inject slowly
  o If back or leg pain or pressure occurs, stop injecting and wait a few seconds
  o If the pain or pressure symptoms persist then abandon the procedure
• Recumbency
  o For 1-2 hours and then mobilise cautiously
• Review
  o If the symptoms have not completely resolved, refer to a consultant - a repeat blood patch may be required
  o All women who have a PDPH with or without a blood patch should be referred to the Obstetric Anaesthetic Clinic 6 weeks postpartum (ward midwives will arrange this on request). They should be advised that they can be seen earlier if required.
• Documentation
  o Record the procedure in the notes and on ORMIS (NUH operation record system)

Non-regional Labour Analgesia

IM or IV Opioids

Diamorphine, morphine or pethidine can be given by a midwife.

Patient Controlled Analgesia (PCA)

PCA is not as useful in labour as post-operatively due to the peaks of pain caused by the contractions. In NUH it is reserved for women who have a contraindication to epidural.
It has been agreed by the obstetric anaesthetic consultants that we will no longer offer remifentanil PCAs due to the risk of patient apnoea. If an epidural is contraindicated and subcutaneous diamorphine is inadequate a fentanyl PCA should be used using the standard NUH prescription chart.

21 OAA 2011. Headache after an epidural or spinal injection: What you need to know. www.oaafomothers.info
pathogenesis, prevention and treatment. *British Journal of Anaesthesia* 91:718-29

ANAESTHESIA FOR CAESAREAN SECTION

Elective Caesarean Section

Preoperative Assessment
- Standard anaesthetic history and examination
- Special care on airway assessment
- Fasting (see fasting guidelines and page 16)
  - Not to be nil by mouth from midnight
  - 6 hours for food
  - 2 hours for clear fluids
  - Sips of water to time of surgery
- Indication for caesarean
- Premedication
  - Ranitidine 150 mg, two oral doses pre-op
  - Consider 30 ml Sodium Citrate 0.3M immediately prior to surgery if two doses of ranitidine have not been given
- Investigations
  - FBC
    - Expect anaemia of pregnancy
    - Hb > 9.0 g/dl does not require correction preoperatively
  - Blood Group and Antibody Screen
    - Confirm on NOTIS or phone blood bank
    - Electronic cross matching is available for rhesus positive women who have no antibodies and who have had no history of antibodies detected or transfusion reactions. A valid sample (which must be within 72 hours) along with a historical sample (from any date) is required. Blood can be provided within 5-10 minutes of request via this method.
    - Confirm there are no atypical antibodies that would affect cross matching. If there are atypical antibodies, discuss with senior obstetrician and haematologist.
    - (NB. Blood then usually needs transporting from Sheffield which can take several hours)
    - An elective procedure should be delayed until compatible blood is in the hospital
    - Consider cell salvage
  - Placental site
    - Check U/S scans to ascertain placental position
Other investigations are not usually indicated without further reason, for example pre-eclampsia.

**Anaesthetic Technique**
The majority of women do have and should be encouraged to undergo regional anaesthesia.

**Spinal Anaesthesia Explanation** *(see also earlier section on consent (pages 7 and 43))*

**Discuss**
- Nausea and vomiting secondary to hypotension
- Feeling touch/pull/pressure/tugging through procedure
- Intraoperative pain and possible conversion to GA
- Pruritus from spinal opioids
- Nerve damage

**Consider discussion of**
- Shaking/shivering
- PDPH
- Spinal canal abscess/haematoma, extremely rare in NAP3

Incidences as per the OAA for mothers are listed on page 7. Some of these are on the anaesthetic chart as an aide memoire.

**In Theatre Sequence**
- WHO checklist
- Prepare phenylephrine infusion
- Have ephedrine and atropine to hand if needed
- Establish free running iv access, minimum 16G
- Attach monitoring: ECG *(sitting stickers posteriorly aids access for skin to skin contact post delivery)*, BP, SpO2
- Perform spinal injection
- Position woman supine with 15° left lateral tilt or wedge to avoid **aortocaval compression**
- Start phenylephrine infusion
- Test the block prior to allowing surgery to commence
- 1 dose of iv antibiotics (prior to skin incision when possible)
- Give 5 units of oxytocin iv slowly at cord clamping *(beware twins, give after 2nd twin delivered)*
Please note, oxytocin and antibiotics should not be drawn up before they are required, or should be kept in a separate area until required.

**PHENYLEPHRINE Infusion**

**NCH**
- 1 mg in 20ml N/Saline (50 mcg/ml)
- 25-50 ml/hr (via a syringe driver)

**QMC**
- 5 mg in 500 ml N/Saline (10 mcg/ml)
- 125-250 ml/hr (via a Graseby giving set and pump)

Rate should then be adjusted according to BP/HR

- Change to oxytocin infusion post delivery

**Spinal Anaesthesia**

- Full sterile precautions with gown/gloves/mask/hat
- Pink 0.5% chlorhexidine in alcohol skin preparation solution.
- Allow to dry fully before performing the injection.
- **Ensure no contamination of spinal needle or injectate with skin prep.**
  The easiest way to achieve this is to place receptacle for skin prep away from sterile field (i.e. on bed next to woman) then prepare the skin and discard the solution prior to drawing up any other drugs
- Drugs to be injected into the CSF need to be drawn up with a filter needle
- **Vertebral level L3/4 or below**
  - Identify body of L4 in midline on intercristal line and choose L4/L5 or L3/L4.
  - L2/3 only after assessing risks/benefits
  - DO NOT insert above L2/L3 as risk of damage to conus medullaris
- Needle size- smallest available pencil point (25G-27G)
• A non luer lock spinal must be used
  o SURETY needle

• Intrathecal Drug Doses
  o Heavy 0.5% Bupivacaine
    ▪ 2.5 ml is appropriate for most women
    ▪ Pre-term women may need more
    ▪ Obese women and twin pregnancy may need less
  o Opioids provide excellent perioperative analgesia
    • Diamorphine 250-400 mcg
      Opioid of choice for caesarean section
      Dissolve 5 mg powder into 5 ml N/saline
    • Morphine 100 mcg
      Must be PRESERVATIVE FREE
      Available as epimorph 2 mg in 10 ml
    • Fentanyl 15-20 mcg
      Preservative free and lasts about 6 hours
      Diamorphine is the preferred choice but morphine may be
      used and does not need diluting in an emergency
  • Intravenous co-load 1000 ml Hartmann’s solution
  • Once injection is complete, lay the woman down supine and
    apply a left lateral tilt on the table.
  • Arm board on the left to allow the women to maintain their
    balance and also to allow easy access for venous/arterial lines
    if required in an emergency
  • Patient Restraining Device (PRD) should be inserted next to
    patient when tilting to reduce risk of falls
  • Start the phenylephrine infusion immediately and titrate to
    optimise cardiovascular status.
  • The Bezold-Jarisch reflex is a paradoxical bradycardia in
    response to decreased atrial filling and should be promptly
    treated with fluids, anticholinergics (atropine) and left lateral tilt.

Testing the block

Pain during LSCS is the commonest reason for complaint in
obstetric anaesthesia.
It is essential to check and document the block to cold as well as
documenting the motor block

Sensory Block
• To Cold
Using ethyl chloride, check no perception of cold bilaterally to T4.

- **To Touch**
  - Use ethyl chloride or cotton wool/gauze
  - The cephalad extent should be to T5 bilaterally

**Motor Block**
Inability to lift knees or heels off the table is adequate.

**Inadequate block**
- Attempt change of position, knee and hip flexion or cautious use of the Trendelenberg position
- If still inadequate consider a CSE with not more than 1.5 ml 0.5% bupivacaine intrathecally
- **Senior advice should be sought**
- If fetal compromise, a general anaesthetic may be required

**Antibiotics (see NUH guidelines\textsuperscript{24})**

Give before skin incision
- **1.2 g iv Co-amoxiclav**
- **Cefuroxime 1.5 g and metronidazole 500 mg** if mild penicillin allergy
- **Clindamycin 900 mg** by slow iv for women with a penicillin allergy
  \(\text{dilute in at least 50 ml and give over at least 30 mins}\)

**Intraoperative management**

Maintain verbal contact with the woman as this often gives the earliest clue of hypotension.

**Fluids**
- The first 1000 ml Hartmann’s is usually given quickly, started before spinal injection
- Subsequent fluid replacement is guided by the estimated blood loss

After the cord is clamped (the last fetus if multiple pregnancy)
- Level the table
- Administer 5 units of oxytocin diluted up to 5 ml N/Saline by slow iv injection
This may cause tachycardia and hypotension which can be minimised by a pre-emptive bolus of phenylephrine

- Stop the phenylephrine infusion
- Commence the oxytocin infusion

- **QMC** 40 units oxytocin in 500 ml N/Saline to run at 125 ml/hr
- **NCH** 40 units in 40 ml N/Saline to run at 10 ml/hr
- Additional uterotonics may be required to help restore uterine tone (See page 30).

**Intraoperative Breakthrough Pain**

If a woman complains of discomfort during LSCS,
- Liaise with surgeon and stop surgery if possible
- Analgesia must be offered for persistent unrelieved pain
- Options include:
  - **Entonox** 50/50 oxygen/nitrous oxide
  - **Alfentanil** 250 mcg increments iv
  - Ketamine 10-30 mg increments iv

**A general anaesthetic must be offered for unrelieved pain**

It is essential that the options offered and the timing points are documented on the intraoperative record.

**Postoperative care**

**Regular prescriptions**
- **Paracetamol** 1 g 6 hourly.
- **Diclofenac** (unless contraindications) 50 mg 8 hourly. 100 mg PR should be given at end of surgery and next regular dose crossed off
- Enoxaparin 40 mg (or appropriate dose if >90 kg) sc daily (see page 11).

Record relevant drugs given in theatre on the front of the drug chart.

**PRN Prescriptions**
- Antiemetics
- Oramorph (or equivalent) 20-30 mg 2 hourly
- Crystalloid infusion over 8 hours
- Oxytocin infusion over 4 hours (10 U/hour)
  (There is a sticker for this at NCH)
Alternative Anaesthetic Techniques for Elective LSCS

1. Epidural anaesthesia

- May be indicated in high-risk women with significant comorbidities. This would be with a consultant anaesthetist.
- Can use 20 ml of “Rapid top-up mix” (see page 66) or up to 0.5% levobupivacaine and opioids to establish the block (occasionally larger doses may be required but remember maximum recommended doses)
- See emergency LSCS section page 67 for further details.

2. Combined spinal epidural

- Useful if surgery may be prolonged e.g. in women with previous abdominal operations likely to have caused adhesions
- Sometimes used to minimise the initial spinal dose of local anaesthetic to reduce risk of high block
  - e.g. in obese women
  - in the case of failed epidural top up/ inadequate spinal block
- May be useful if spinal anaesthesia technically difficult
- Can use a needle through needle technique or site epidural at one interspace and secure before performing spinal at a different interspace.

3. General Anaesthesia

- If despite all usual explanations the woman declines a regional technique, a GA is indicated.
- If other contraindications to regional technique are present e.g. infection at site of needle insertion, coagulopathy and severe thrombocytopenia, fixed cardiac output status
- See emergency LSCS techniques for further details.
Emergency Caesarean Section

Anaesthetic technique for emergency caesarean section is determined by the urgency of the procedure and the balance of risk to the mother and foetus.

- The OAA and RCOG classification is based on urgency rather than decision to delivery times.

*Figure 6. A classification relating the degree of urgency to the presence or absence of maternal or fetal compromise* 

<table>
<thead>
<tr>
<th>Urgency</th>
<th>Definition</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal or fetal compromise</td>
<td>Immediate threat to life of woman or fetus</td>
<td>1</td>
</tr>
<tr>
<td>No maternal or fetal compromise</td>
<td>No immediate threat to life of woman or fetus</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Requires early delivery</td>
<td>3</td>
</tr>
<tr>
<td>At a time to suit the woman and maternity services</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

- In order to anticipate emergency caesarean sections, communicate regularly with obstetric team and labour suite co-ordinator.

- Identify women in labour at higher risk of an operative delivery or difficulties with anaesthesia e.g.
  - Obesity, especially BMI > 40
  - Prolonged labour
  - Suspicious CTG
  - Previous LSCS
  - Pre-eclampsia

- Ensure these women have established iv access and relevant investigations e.g. G+S or cross-matched blood available. Perform a detailed airway examination and possibly a back examination.
Many women are seen in the obstetric anaesthesia clinic and have an anaesthetic plan for labour. Check the notes/Medway for the anaesthetic plan and site an early epidural if advised provided the woman consents to this.

Prescribe regular ranitidine orally through labour for high risk women (see Eating and Drinking in Labour guidelines11 and page 16)

Pre-op assessment for emergency caesarean section

- Documentation (for all emergency surgery)
  - Time anaesthetist notified
  - Indication
  - Declared urgency

- Normal anaesthetic history and examination just as for elective LSCS, particularly airway assessment

- Ensure a valid G+S sample and if needed and time available, blood is cross-matched and in theatre prior to induction. Otherwise, gain intravenous access and send an urgent sample.

- Explain the chosen anaesthetic technique to the woman. If a category 1 section with limited time, explain pre-oxygenation and cricoid pressure

- Give sodium citrate on labour suite or in theatre for GA (Consider omitting sodium citrate if fasted and two or more doses of ranitidine have been given)

Intra-uterine fetal resuscitation (SPOILT)

This may be appropriate:
  - If the indication for the emergency LSCS is fetal distress or bradycardia along with pre-op assessment
  - Implement alongside theatre preparation
  - This can sometimes downgrade a category 1 to “urgent category 2” and buy time for a spinal rather than GA
  - Do not use tocolytics in placental abruption or antepartum haemorrhage or without liaising with obstetric team
SPOILT

Syntocinon off
Position full left lateral
Oxygen
Iv infusion of 1 L crystalloid
Low blood pressure, correct with vasopressor
Tocolysis to stop contractions (see below)

Tocolytic drugs

Terbutaline
250 mcg sc (or slow iv)

GTN
2 x 400 mcg puffs sublingual
Can be repeated x 3 at one-minute intervals until contractions stop

Anaesthetic technique for emergency caesarean section

The Category 1 emergency caesarean section:
- Principle duty of care is to the mother.
- Category 1 means immediate threat to life of mother and/or fetus.
- It is not a contraindication to topping up a working epidural.
- De novo regional anaesthesia is not generally advised but consider if obvious difficult airway.

Indications for technique

General Anaesthesia
- Immediate threat to maternal life e.g.
  - Placental abruption
  - Uterine scar rupture
  - Recurrent eclamptic seizure
  - Severe cardiovascular collapse of any cause

- Immediate threat to fetus e.g.
Sustained fetal bradycardia

**Epidural Top-up**
- Fetal distress
- Cord prolapse provided the cord is decompressed manually

If an epidural is not in situ, these are usually also indications for a general anaesthetic but will depend on brief discussion with obstetric team.

**Spinal Anaesthesia**
- Suitable for most category 2 and 3 emergency caesarean sections.
- Uncorrected hypovolaemia is an absolute contraindication.
- The spinal technique is the same as an elective procedure (see earlier page 58).

**Epidural top-up for emergency caesarean section**

**Preparation**
- Check if epidural has been effective
- Check the extent of the block
- Explain the top-up procedure

**Epidural top up regime**
- Can achieve surgical anaesthesia in 7-11 minutes

NCH

“Rapid top up” mix:
- 10 ml 0.5% bupivacaine with 1:200 000 adrenaline
- 10 ml 2% lignocaine
- 2 ml 8.4% sodium bicarbonate (add last or the mixture will precipitate)

Inject 15-22 ml over 5 minutes

Top-up drug boxes are kept in the same room as the epidural trolley on labour suite and in theatre.

QMC

20 ml 0.5% levobupivacaine
+- 50-100 mcg fentanyl

Inject 15-20 ml over 5 minutes.
NB. Trainees will not be criticised for using either regimen.

**Epidural opioids**
- Improve the quality of block during surgery
- Use not precluded by epidural fentanyl in labour
- 50 mcg fentanyl at top-up
- **2.5 mg diamorphine after delivery** for postoperative analgesia

**Where to top-up**
If a top-up is given in the delivery room, the anaesthetist MUST stay with the woman from the time the top-up is given

**Block testing**
- The criteria for an adequate block are the same as for elective spinal anaesthesia
- Sacral sparing leading to pain during visceral traction and pressure on vagina is a phenomenon of epidural rather than intrathecal anaesthesia; therefore check and document perineal sensation

**Intraoperative management**

**Fluids/Vasopressors**
- Phenylephrine infusion is not usually required, although occasional boluses of 50-100 mcg may be needed, e.g. on administration of oxytocin
- Fluid requirements are guided by the haemodynamic status.
- If large blood loss, replace with warmed blood products.
- In the pre-eclamptic woman, judicious fluid management is advised.

**Breakthrough pain intra-operatively**
- Stop surgery and give further epidural top-up if maximum dose not exceeded
- As for elective caesarean section *(see page 61)*

**Postoperative management**
- Remove the epidural catheter, ensuring the blue tip is out
- Enoxaparin 4 hours post removal of epidural catheter
General anaesthesia for emergency caesarean section

The vast majority of LSCS are performed under a regional technique. However general anaesthesia may be required. It is important all anaesthetic machines are checked at the start of the shift.

Pre-operative

- A focussed anaesthetic history and airway assessment should be carried out for all women. There is ALWAYS time for this
  - The incidence of failed intubation much higher (1/300) in obstetrics compared with general population (1/2200)
  - If difficulty is anticipated, call for help prior to starting
  - An awake fiberoptic intubation should be considered for difficult airways, and sedation should not be withheld on the grounds of fear of fetal depression
- Explain RSI and TAP blocks (see page 72) if you are competent at this technique.
- Check relevant investigations
  - Delegate to a NAMED person, “runner” (midwife/obstetric SHO/Anaesthetic colleague), for the transfer of blood products to theatre if needed
- Administer sodium citrate 30 ml 0.3M
- Transfer the woman to theatre in the left lateral position, with:
  - On-going intrauterine fetal resuscitation
  - On-going maternal resuscitation with oxygen and iv fluids

In Theatre

Preparation

- Perform WHO checklist sign in and time out
- Transfer the woman onto the table and apply 15° left lateral tilt
- Prepare for intubation (see below)
- Prepare induction drugs (see below) and pre-oxygenate whilst the woman is catheterised and the ODP attaches the monitoring
- Surgical team should then be scrubbed with the woman “prepped and draped” prior to induction. This can occur simultaneously with pre-oxygenation
Intubation

- Ensure the head and neck position is optimal for intubation (“sniffing the morning air” neck flexion with head extension) Consider the RAMP position in obese women (Oxford HELP if available) *(see pages 21 and 22)*
- Laryngoscope insertion into the patient’s mouth can be difficult in rapid sequence induction in pregnancy (cricoid + large breasts), choose a suitable laryngoscope — consider short handled or polio blade.
- Be familiar with the difficult intubation equipment on the ‘airway trolley’ including introducers, smaller tubes and polio blade, McCoy blade (levering) and short-handled laryngoscopes.
- Consider using a video laryngoscope if you anticipate challenging intubation **and** you are skilled in its use.
- The most important factor is to follow a pre-planned drill and not to start experimenting with unfamiliar equipment.
- Confirm the position of the tracheal tube post intubation.
- Call for help before undertaking general anaesthesia in a woman in whom you anticipate a difficult intubation.

**The difficult intubation algorithm for obstetrics shown in figure 3 (page 26)**

**Induction**

- Have suction turned on and under the pillow and table control handy if needed
- Pre-oxygenate with 100% oxygen via a tight fitting face mask. Ensure there is a CO2 trace and aim for \( \text{EtO}_2 >90\% \) prior to induction
- Cricoid pressure
  - Check cricoid pressure direction is correct to allow for the tilt on the table

**Drugs**

- **Thiopentone 5-7 mg/kg is the induction agent of choice**
  Pre-mixed syringes are kept in the fridge of the anaesthetic room.
  Please fill out the patient details on the thiopentone forms as these are supplied on a named patient basis by pharmacy
- **Ketamine 1-2 mg/kg** is an alternative in the shocked woman who does not have hypertensive disorder of pregnancy
- **Suxamethonium 1.5 mg/kg**
Opioids SHOULD be given at induction if there is maternal CNS (pre-eclampsia) or CVS risk from a pressor response to laryngoscopy e.g. 1-2 mg alfentanil Ensure the neonatal team are aware of this

Intubation
- Intubate the trachea, and inflate the cuff.
- Attach breathing circuit and manually ventilate to ensure
  - Bilateral air entry
  - Regular CO₂ trace
  - No audible leak around the cuff
- At this point cricoid pressure can be released and surgery can commence

Maintenance
- Isoflurane or sevoflurane with up to 67% N₂O and 33% O₂ with an initial period of overpressure for rapid achievement of desired MAC
- Ensure a MAC (end-tidal) of at least 1.3 before administration of iv opioids after which a MAC of 1.0 is sufficient.
- In severe haemorrhage, consideration may be given to discontinuation of volatile and administration of 1 mg/kg of ketamine to improve uterine tone. In this situation conversion to TIVA with TCI propofol could be considered.
- Aim for ETCO₂ of around 4.0 kPa
- iv fluids/blood resuscitation as needed, through a fluid warmer
- Non-depolarising muscle relaxant doses should be guided by response to peripheral nerve stimulation.
  - Pregnant women have a reduced cholinesterase levels and therefore a prolonged action of suxamethonium
  - Magnesium potentiates the action of non-depolarising neuromuscular blocking drugs so smaller doses are required
- Oxytocin 5 units at cord clamping and infusion as in elective caesarean section

Analgesia
- If there is an epidural in situ give 2.5 mg diamorphine, or
- 10-15 mg iv morphine in theatre after cord clamping followed by a morphine PCA for post-operative analgesia. The PCA needs to be set up by the anaesthetist
• iv paracetamol and PR diclofenac
• **Bilateral transversus abdominis plane blocks** (see below) can be sited prior to extubation or infiltration of the rectus sheath by the surgeons under direct vision
• Administer anti-emetics as risk of PONV is high

**Extubation**

- Ensure patient is warm, not acidaemic, haemodynamically stable and has no coagulopathy from major blood loss
- Ensure adequate reversal neuromuscular blockade with nerve stimulator
- Consider a large bore orogastric tube to suction out stomach contents and then remove the orogastric tube
- Extubate the patient once airway reflexes are restored, in the head down, left lateral position or sitting up
- Monitor in recovery and give oxygen until \( \text{SpO}_2 > 95\% \) on air
- The anaesthetist must be immediately available whilst the patient is in the recovery area

**Postoperative care**

- All women who have undergone a caesarean section MUST remain fully monitored and supervised in the recovery area for a minimum of 30 minutes. A longer time is required in some women to meet the discharge criteria.
- The anaesthetist should be immediately available during this period and should not leave the unit.
- Before discharge, ensure
  - Vital signs are stable. If BP low, check that spinal block has not ascended
  - Pain free
  - Drug and anaesthetic chart completed
  - Handover to midwife

All attempts should be made to follow up all women undergoing a surgical procedure in obstetric theatres. The following problems should be reported to a consultant anaesthetist:

- Pain during regional anaesthesia
- Neurological deficit
- Significant headache that keeps woman in bed, worsening or associated with neurological deficit, fever or vomiting
• Awareness under GA
• Any complaint concerning anaesthetic care

**Caesarean section observation protocol**

ALL OBSERVATIONS LISTED ARE MANDATORY AND SHOULD BE RECORDED ON:

1. Obstetric early warning score chart
2. Fluid balance chart

Both charts should be kept by the woman’s bedside at all times. A functioning iv cannula must remain in-situ for 24 hours post surgery.

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25 Royal College of Obstetricians and Gynaecologists and The Royal College of Anaesthetists. Good Practice No. 11: Classification of urgency of caesarean section- A continuum of risk April 2010


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**TAP blocks**

Transversus abdominis plane (TAP) blocks can be employed after caesarean section or laparotomy. They have been proven to be effective (as part of a multimodal analgesic regimen) in reducing requirements for opiates for up to 48 hours, but evidence regarding any benefit after the use of long-acting neuraxial opioids is lacking. The anterior divisions of spinal segmental nerves that supply the anterior abdominal wall pass through the transversus abdominis plane.
**Indication**
- Caesarean section or other abdominal surgery in maternity theatres; particularly after general anaesthesia.

**Contraindications**
- Patient refusal
- Sensitivity to local anaesthesia.
- Local infection.
- Large doses of local anaesthesia in the last four hours e.g. small women, epidural dosing. You should calculate the dose received by each patient and determine whether TAP blocks are feasible.

**Method**
- Obtain verbal patient consent or check that it is recorded. For general anaesthesia obtain explicit consent prior to anaesthesia if time permits, otherwise consider if it is in the patient’s best interests.
- Aseptic technique is required: clean hands, sterile gloves.
- The usual dose is levobupivacaine 50 mg in 20 ml (0.25%) each side.
- An ultrasound guided technique should be used the detail of which is beyond the scope of these guidelines.

**Aftercare**
The purpose of this block is to reduce ‘as needed’ opiate usage on the postnatal ward. All elements of multimodal analgesia should be employed (except for local anaesthesia infiltration of the wound). No other specific measures are needed.


Intraoperative cell salvage in obstetrics\textsuperscript{17} 

This guideline should be followed in conjunction with 'Trent intra-operative cell salvage standard operating procedures'.\textsuperscript{17} 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 contraindications, particularly in situations of life-threatening haemorrhage.

Indications in Obstetrics

- **Actual/ anticipated major haemorrhage** - during caesarean section.
  e.g. placenta praevia - (see page 89).
- Caesarean section in the woman with objections to donor blood transfusion.
- Difficulty in the provision of cross-matched blood e.g. rare blood type.
- NB. NUH is currently participating in the “SALVO” trial looking cell salvage in caesarean sections

Contra-indications

- **Infection** - in the operative field.
- **Malignant tumours** - in the operative field
- **Sickle cell disease**.

Cautions

- **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

- **Consent** - whenever possible the use of cell salvage should be discussed with the woman in advance and this discussion should be documented.
- **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 be competent to use cell salvage in obstetrics.
- **Amniotic Fluid/ Fetal Squames**
Risks uncertain
Depends on clinician but many now advocating use of cell salvage from the beginning of surgery
Re-infused blood can be passed through a leucocyte depletion filter to minimise the risk of infusing fetal cell debris although this should not be used if blood is to be given rapidly.

- **Re-infusion** - salvaged blood for re-infusion must be clearly labelled with the following:-
  - **patient’s name**
  - **hospital number**
  - **date of birth**

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.

- **Jehovah’s 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 and patient *(see page 35)*.
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

- Reflux
  - Regard every woman from 18 weeks of pregnancy, until 2 days postpartum, or any woman with symptoms of gastro-oesophageal reflux as being at risk from reflux.
  - Give H₂ antagonists (if time permits) and consider sodium citrate
  - RSI if GA

- Anaesthesia
  - Most women can routinely be offered spinal anaesthesia.
  - 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.²⁹
  - Remember hypotension in the course of regional anaesthesia for retained placenta can be related to the extent of maternal blood loss rather than block height.
• **Laparotomy**
  o Pregnant women not uncommonly present with abdominal pain and require procedures such as appendicectomy or ovarian cystectomy.
  o These are best performed under general anaesthesia. The risk of precipitating abortion/ premature labour is attributable to surgical activities rather than anaesthesia.

• **NSAIDs**
  o Avoid if the fetus remains in utero as they cause premature closure of the ductus arteriosus.
  o 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 women have labour induced and augmented and therefore may 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 women, and this position must be respected and therefore the following guideline applies:

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

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

**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 multidisciplinary communication is essential. The obstetric *Guideline for the management of severe pre-eclampsia and eclampsia* is available on the NUH Intranet.

<table>
<thead>
<tr>
<th>The following are important warning features of imminent maternal or fetal deterioration:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Recently developed hypertension in excess of 150 mmHg systolic, 110 mmHg diastolic or 125 mmHg mean</td>
</tr>
<tr>
<td>• Proteinuria &gt; 1 g/24 hrs or ≥ 3+ on dipstick testing</td>
</tr>
<tr>
<td>• Epigastric pain and/or vomiting</td>
</tr>
<tr>
<td>• Hyperreflexia and clonus (≥ 3 beats)</td>
</tr>
<tr>
<td>• Severe frontal headache/photophobia/visual disturbance</td>
</tr>
<tr>
<td>• Fetal heart rate abnormalities</td>
</tr>
</tbody>
</table>

**Management on delivery suite**

- The anaesthetist might be involved with analgesia, blood pressure control, fluid therapy and monitoring.
- All women with severe pre-eclampsia should have regular anaesthetic review and be started on an Obstetric HDU Observation Chart, with hourly observations being made, including respiratory rate and hourly urine output.
Treatment

General
- The only definitive treatment is delivery of the feto-placental unit. Regular ranitidine should be given as for high-risk women (see page 16)
- Ensure bloods up to date including G+S

Seizure prophylaxis
- The most effective agent for prevention of eclampsia is MAGNESIUM SULPHATE (Grade A recommendation)\textsuperscript{31,32}. (See page 85 for regimen)
- Start magnesium if there are symptoms of imminent eclampsia (headache, photophobia, flashing lights, epigastric pain) or severe pre-eclampsia.
- See NUH Guidelines of the Management of Severe Pre-Eclampsia and Eclampsia\textsuperscript{30} for criteria.

Hypertension
- Severe pre-eclampsia is life threatening.
- The commonest cause of death being intra-cerebral haemorrhage, severe hypertension should be treated as a matter of urgency.
- 150 mmHg (systolic) has been accepted as a threshold for treatment. The drugs listed below can be used\textsuperscript{30}.
Antihypertensive drugs in Pre-eclampsia

HYDRAZINE

- 2.5 mg IV (slowly) (peak action 20 mins)
- Give further bolus every 15 minutes up to a maximum of 10mg. Repeat after 30 minutes if the BP is not controlled.
- Lasts several hours, so use repeated boluses rather than infusion. Hydralazine acts as a vasodilator so may require concurrent volume replacement e.g. 250 ml colloid.

LABETOLOL

- 25-50 mg IV boluses (slowly)
- Repeat dose can be given after 15 mins to a maximum of 200mg.
- Once BP is controlled commence infusion at 20 mg/hr (4 ml/hr of 5 mg/ml solution).
- Increase rate half hourly according to response to a maximum of 160 mg/hr (32 ml/hr of 5 mg/ml solution).

NIFEDIPINE

- 10-20 mg po
- slow release preparations
- NB nifedipine has tocolytic effects.

- Other drugs
  - There is experience of ketanserin on City Campus.
  - It is a selective 5-HT_2 antagonist with a lower incidence of headache, visual complaints, and nausea/vomiting than hydralazine.
  - It appears to work at the level of the disturbed platelet–endothelial cell interaction, rather than acting merely as a vasodilator.
  - Ketanserin is currently unlicensed in the UK, and is for consultant use only.
  - Nimodipine has been in extreme cases, again for consultant use only.
OBSTETRIC ANAESTHETIC HANDBOOK

• **NB.** Hydralazine, labetalol and nifedipine can cause hypotension and fetal compromise. Magnesium can exaggerate the hypotensive effect of these drugs. Sublingual nifedipine is not recommended, as the blood pressure can drop precipitously.

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

**Fluid management**

- **Maintenance fluids**
  - N/Saline or Hartmann’s.
  - **Total** iv input of 80 ml/hr or 1 ml/kg/hour with free oral fluids.
  - Administer oxytocin in small diluent volumes by syringe pump.
  - If a significant volume of blood has been lost this should be replaced with clear fluid or blood as necessary to avoid renal failure.

- **CVP**
  - Senior decision.
  - A peripherally inserted central line may be safer than other approaches if available.
  - Measurement of the CVP can reveal hypovolaemia and help its correction, particularly useful in the pre-eclamptic woman who has suffered major haemorrhage and is at particular risk of renal failure. 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.

- **Coagulopathy**
  - In severe pre-eclampsia, HELLP syndrome or Fatty Liver of Pregnancy, need FBC no more than 2 hours before a regional block is undertaken.
o 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.
o If there are any petechiae, or the platelet count is <80 x 10^9/L (and coagulation screen normal), a platelet transfusion is indicated immediately prior to performing a regional block.
o This should first be discussed with the anaesthetic consultant.
o See Table 5 (page 15) for OAA/AAGBI guidelines.

Anaesthesia for caesarean section – pre-eclampsia

Control of hypertension - it is essential, except in the most urgent of situations, that the BP is controlled before induction of anaesthesia. Aim for a BP of around 140/90. Women with severe pre-eclampsia can have hypertension that is resistant to the normal anti-hypertensive drugs.

Regional anaesthesia for caesarean section

Hypotension
• Excessive hypotension is not usually associated with spinal anaesthesia in pre-eclampsia, because the hypertension of pre-eclampsia is not mediated by the sympathetic nervous system\(^{34}\).
• Phenylephrine or ephedrine should be given cautiously as small bolus doses in response to hypotension, or at lower than normal infusion rates.

Epidural or CSE
• May be considered to facilitate post-operative analgesia by infusion of (levo) bupivacaine/fentanyl in a high dependency area.
• In the presence of borderline platelet count or clotting function where regional is preferred on balance of risks, a single-shot spinal is preferable.

General Anaesthesia

• Indications
  o as for GA in healthy women
  o also when there is a coagulopathy
  o or symptoms (especially piercing headache) or signs of impending eclampsia.
• **Invasive monitoring**  
  o Have a low threshold for invasive arterial pressure (IABP) monitoring.  
  o If there is IABP monitoring, life-threatening increases in BP following intubation (covered with alfentanil or remifentanil) can be controlled with small doses of GTN to protect the cerebral circulation.

• **Specific problems**  
  o laryngeal oedema (be prepared for difficult intubation)  
  o severe pressor response  
  o potentiation of non-depolarising neuromuscular block by therapeutic serum concentrations of magnesium.

• **Induction sequence**  
  o Must attenuate the pressor response to intubation to protect the mother’s cerebral circulation.  
  o **Alfentanil 20 mcg.kg\(^{-1}\) or remifentanil 2 mcg.kg\(^{-1}\)** as part of RSI.  
  o Inform the paediatrician that the mother will receive an opioid.  
  o Labetalol could also be used in conjunction with opioids.

• **Maintenance**  
  o No place for maintenance with excessively light inhalational anaesthesia.  
  o Aim for an end-tidal MAC of at least 1.5 prior to incision.  
  o After delivery, administer iv morphine 10-15 mg and reduce the MAC to normal levels. (see GA caesarean section page 68)

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

**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.30

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.
  - Recent evidence suggests eclamptic deaths arise often from intra-fit hypoxia in a similar fashion to normal epilepsy deaths, therefore aim to terminate the seizure so oxygen can be given quickly.
  - 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.  
    (See page 80)

**Anticonvulsants**

**MAGNESIUM SULPHATE (MgSO₄)**
This reduces the systemic and cerebral vasospasm, probably by the antagonism of calcium and it reduces the incidence of further fits in eclamptic women.³¹,³²

**MAGNESIUM regime**

**Loading dose**
4 g MgSO₄ over 20 minutes
- via an infusion pump
- Add 8 ml of a 50% MgSO₄ solution to 100 ml N/Saline.
- Or give 8 ml of a 50% MgSO₄ solution as a slow IV 'push' over 20 minutes ³⁰.

**Maintenance**
2 g/hr
- 20 ml of 50% MgSO₄ in 250 ml N/Saline at 50 ml/hr for 24 hours.
- Very obese- a higher rate of 3 g/hr may prove necessary.

**Convulsions during MgSO₄ therapy**
- Further bolus of 2 g of MgSO₄ should be given over 2 to 3 minutes unless a recent serum level was high.

**Monitoring –**

**Clinical monitoring:** Continue MgSO₄ unless BP decreases to < 110/70 mmHg, respiratory rate decreases below 16/min, urine output < 30 ml/hr or tendon jerks are not elicited (see MgSO₄ overdosage section below).
In this case, stop the infusion and check magnesium levels urgently.

**Therapeutic range** - 2 to 3 mmol.l⁻¹.
Hourly observations – reflexes, BP, respiratory rate, urine output and mental state (AVPU, or GCS)

MAGNESIUM toxicity

Clinical features:
- 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 MgSO₄ infusion
- Oxygen
- Give ventilatory and circulatory support as required.
- 10 ml of 10% calcium gluconate over 3 minutes.

THIOPENTONE

- 25-50 mg increments
- Equipment to support the airway must be immediately to hand.

Anaesthesia after eclampsia

Regional block

May be appropriate after a single seizure provided: ³⁵

- Woman has GCS 14 or 15;
- Coagulation screen normal
- Platelet count > 80 000 mm⁻³

General anaesthesia

- General principles – as for pre-eclampsia (see page 82)
• **Non-depolarising neuromuscular blocking drug doses** -
  - Must be reduced in the presence of therapeutic serum concentrations of magnesium.
  - *(Dose of succinylcholine need not be altered.)*

• **Peripheral nerve stimulator** - is mandatory

• **Post-operative sedation and 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 intracerebral haemorrhage.

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

• **ITU Care** - nurse with head-up tilt, monitor SpO2 ECG, BP, CVP, urine output, and manage pain, hypertension, convulsions, coagulopathy, renal/cardiac failure as appropriate. Exclude laryngeal oedema prior to extubation.

---


33 Engelhardt T, MacLennan FM. Fluid management in pre-eclampsia. *Int J Obstet Anesth* 1999; 8: 253-9 (level IV)


DIABETES MELLITUS

Specialist Midwife in Diabetes:
City Ex 57562 QMC Ex 64114
Mobile: 07812268062

Pre-existing Diabetes
Pregnant women with pre-existing diabetes (Type I & Type II) are usually seen in the Joint Diabetic/Obstetric clinic held on Tuesday mornings at the City Campus and Wednesday mornings at QMC. An individualised care plan for every woman should be documented in the Part I records and hospital records that covers the pregnancy and 6 weeks post delivery.

Gestational Diabetes (GDM)
2-5% of all pregnancies are complicated by gestational diabetes (GDM). Women with risks for gestational diabetes should be screened at 24-28 weeks with an oral glucose tolerance test (OGTT). Those with previous GDM and BMI>45 will be screened at 16-18 weeks and again at 28 weeks if the first GTT is normal.

Delivery Plan
Refer to ‘Pregnancy Insulin Prescription Chart’ for women with diabetes.
Each woman will have a cross-town labour plan/diabetes prescription chart given to them from 36 weeks, having had a discussion about their labour management.

Postnatal Management of Diabetes
Refer to ‘Pregnancy Insulin Prescription Chart’ for immediate post delivery care.
Discontinue hypoglycaemic therapy immediately after the birth in women who were diagnosed with gestational diabetes. Test their blood glucose to exclude persisting hyperglycaemia.

For further details see the full obstetric guideline available on the hospital intranet.36

PLACENTA PRAEVIA

- Placenta praevia exists when the placenta is inserted wholly or in part into the lower segment of the uterus.
- It is classified by ultrasound imaging according to what is relevant clinically:
  - **MAJOR**: if the placenta lies over the internal cervical os
  - **MINOR/PARTIAL**: if the leading edge of the placenta is in the lower uterine segment but not covering the cervical os.
- The incidence of placenta praevia is 0.5% at term.
- Risk factors include increasing maternal age, parity, multiple gestation and the number of previous caesarean sections.
- When an anteriorly located placenta praevia presents in a mother who has a uterine scar the possibility of **placenta accreta** should be considered.
- A morbidly adherent placenta includes **placenta accreta**, **increta** and **percreta** as it penetrates through the decidua basalis into and then through the myometrium. (Accreta is often used as a general term for all these conditions.)
- Imaging techniques are not reliable in diagnosing or excluding morbid placental adherence however MRI may be useful.

*Table 6: A table to show the incidence of placenta accreta depending on number of previous caesarean sections*

<table>
<thead>
<tr>
<th>No. of previous Caesarean section(s)</th>
<th>Incidence of placenta accreta (%)</th>
<th>Chance of placenta accreta if placenta praevia (%)</th>
<th>Incidence of hysterectomy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.24</td>
<td>3</td>
<td>0.65</td>
</tr>
<tr>
<td>1</td>
<td>0.31</td>
<td>11</td>
<td>0.42</td>
</tr>
<tr>
<td>2</td>
<td>0.57</td>
<td>40</td>
<td>0.9</td>
</tr>
<tr>
<td>3</td>
<td>2.13</td>
<td>61</td>
<td>2.4</td>
</tr>
<tr>
<td>4</td>
<td>2.33</td>
<td>67</td>
<td>3.49</td>
</tr>
<tr>
<td>5</td>
<td>6.74</td>
<td>67</td>
<td>8.99</td>
</tr>
</tbody>
</table>
Management principles

- A woman with a placental edge less than 2 cm from the internal os in the third trimester is likely to need delivery by caesarean section.
- Blood should be readily available for the peripartum period.
- Interventional radiology can be life-saving for the treatment of massive postpartum haemorrhage.
- The place of prophylactic catheter placement for balloon occlusion or in readiness for embolisation if bleeding ensues requires further evaluation but is being used in selected elective cases.
- The choice of anaesthetic technique for caesarean sections for placenta praevia and suspected placenta accreta must be made by the anaesthetist conducting the procedure. There is insufficient evidence to support one technique over another.
- Consultant Anaesthetist responsible for labour suite and Consultant Obstetrician should be involved in planning and delivery.

Anaesthetic management

- Senior obstetrician and anaesthetist present in theatre
- In the presence of bleeding assess the haemodynamic status of the woman and resuscitate appropriately. (See massive haemorrhage guidelines page 27)
- Insert two large bore cannulae with warmed fluids run through prior to caesarean section
- Ensure 4 units blood cross-matched and available in theatre if time
- Cell salvage should be used
- Regional anaesthesia may be appropriate in the haemodynamically stable patient
  - Woman should be informed of risk of conversion to GA
  - Epidural should be inserted prior to intra-iliac balloon catheter insertion then topped up on return to theatre

---

CARE OF THE CRITICALLY ILL OBSTETRIC PATIENT

Key points

- Critical illness in pregnancy is rare but potentially catastrophic.

- The labour suite anaesthetist has a key role in the management of all critically ill obstetric patients.
  
  You should familiarise yourself with any woman at risk of critically illness and review the regularly.

- The Obstetric Consultant and the Obstetric Anaesthetic Consultant (or Consultant Anaesthetist on call) are responsible for critically ill obstetric patients and should be involved in all aspects of their care.

- Early involvement of the outreach and critical care teams are essential.

- Good communication with the obstetricians, midwives and critical care team is paramount to a good outcome, especially at handover.

- Any review of a patient must be clearly documented in the notes and should include a plan of management and further review.

- Levels of Care – The ICS define levels of care according to the number of organs systems requiring support and the nature of that support. The table below demonstrates this with regard to obstetric illness.

- Advanced Obstetric Care (Labour Suite High Dependency Unit) – Advanced Obstetric Care (AOC) refers to the provision of care for pregnant women or those in the postnatal period requiring a higher level of care than that readily available on the ward (see AOC Guideline on NUH intranet\textsuperscript{39}). It is important to note that the AOC guideline defines levels of midwifery supervision women require within AOC from level 1 (constant attention) to level 3 (transitional back to ward care), and this should not be confused with the definitions in table 7.
**Table 7: Examples of Maternity Care Required at ICS Levels of Support for Critical Care**

<table>
<thead>
<tr>
<th>Level of Care</th>
<th>Maternity Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0: normal ward care</td>
<td>Care of low risk mother</td>
</tr>
</tbody>
</table>
| **Level 1: Additional monitoring or intervention, or step down from higher level of care** | Risk of haemorrhage  
Oxytocin infusion  
Mild pre-eclampsia on oral anti-hypertensives/fluid restriction etc  
Woman with medical condition such as congenital heart disease, diabetic on insulin infusion |
| **Level 2: single organ support** | **Basic Respiratory Support (BRS)**  
50% or more oxygen via face-mask to maintain oxygen saturation  
Continuous Positive Airway Pressure (CPAP), Bi-Level Positive Airway Pressure (BiPAP)  
**Basic Cardiovascular Support (BCVS)**  
Intravenous anti-hypertensives, to control blood pressure in pre-eclampsia  
Arterial line used for pressure monitoring or sampling  
CVP line used for fluid management and CVP monitoring to guide therapy  
**Advanced Cardiovascular Support (ACVS)**  
Simultaneous use of at least two intravenous, anti-arrhythmic/anti-hypertensive/vasoactive drugs, one of which must be a vasoactive drug  
Need to measure and treat cardiac output  
**Neurological Support**  
Magnesium infusion to control seizures (not prophylaxis)  
Intracranial pressure monitoring  
Hepatic support  
Management of acute fulminant hepatic failure, e.g. from HELLP syndrome or acute fatty liver, such that transplantation is being considered |
| **Level 3: advanced respiratory support alone, or support of two or more organ systems above** | **Advanced Respiratory Support**  
Invasive mechanical ventilation  
Support of two or more organ systems  
Renal support and BRS  
BRS/BCVS and an additional organ supported* |

*a BRS and BCVS occurring simultaneously during the episode count as a single organ support*
Table 8: Locations of AOC and Critical Care on each Campus

<table>
<thead>
<tr>
<th></th>
<th>QMC Campus</th>
<th>CHN Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Obstetric Care</strong></td>
<td>Two designated rooms on labour suite</td>
<td>Can be provided in any room on labour suite</td>
</tr>
<tr>
<td><strong>Critical Care</strong></td>
<td>Level 2 care on Surgical HDU, Level 2 &amp; 3 care on Adult ICU</td>
<td>Level 2 &amp; 3 Care on Combined Critical Care Unit</td>
</tr>
</tbody>
</table>

**Obstetric Critical Illness**

The following is an illustrative list of conditions which typically require Advanced Obstetric Care and may need escalating to the main critical care unit, it is not exhaustive.

- Major obstetric haemorrhage
- Severe pre-eclampsia, eclampsia or HELLP syndrome
- Coagulopathy
- Severe sepsis
- Multiorgan dysfunction
- Pulmonary embolism
- Pulmonary oedema
- Poorly controlled asthma
- Unstable diabetes
- Sickle crisis
- Any medical condition requiring invasive monitoring
- Postoperative care
  - Post General Anaesthetic
  - Anaesthetic or medical concerns requiring admission for monitoring
- Intensive monitoring- step down care from critical care units
- Unexplained elevation of the early warning score (EWS)

It is important to consider the physiological changes of pregnancy and how they may mask or exaggerate the effects of any critically ill obstetric patient the following table illustrates some of the changes commonly seen.
Table 9: Physiological and physical changes in pregnancy

<table>
<thead>
<tr>
<th>Changes in pregnancy</th>
<th>Impact on resuscitation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular system</strong></td>
<td></td>
</tr>
<tr>
<td>Plasma volume</td>
<td>Increased by up to 50%</td>
</tr>
<tr>
<td>Heart rate</td>
<td>Increased by 15–20 bpm</td>
</tr>
<tr>
<td>Cardiac output</td>
<td>Increased by 40%</td>
</tr>
<tr>
<td>Uterine blood flow</td>
<td>Significantly reduced by pressure of gravid uterus on IVC</td>
</tr>
<tr>
<td>Systemic vascular resistance</td>
<td>Decreased</td>
</tr>
<tr>
<td>Arterial blood pressure</td>
<td>Decreased by 10–15 mmHg</td>
</tr>
<tr>
<td>Venous return</td>
<td>Decreased by pressure of gravid uterus on IVC</td>
</tr>
<tr>
<td><strong>Respiratory system</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>Increased</td>
</tr>
<tr>
<td>Oxygen consumption</td>
<td>Increased by 20%</td>
</tr>
<tr>
<td>Residual capacity</td>
<td>Decreased by 25%</td>
</tr>
<tr>
<td>Arterial PCO₂</td>
<td>Decreased</td>
</tr>
<tr>
<td>Laryngeal oedema</td>
<td>Increased</td>
</tr>
<tr>
<td><strong>Other changes</strong></td>
<td></td>
</tr>
<tr>
<td>Gastric motility</td>
<td>Decreased</td>
</tr>
<tr>
<td>Lower oesophageal sphincter</td>
<td>Relaxed</td>
</tr>
<tr>
<td>Uterus</td>
<td>Enlarged</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Increases</td>
</tr>
</tbody>
</table>

CPR = cardiopulmonary resuscitation; IVC = inferior vena cava; PCO₂ = partial pressure of carbon dioxide
1. Identifying Women Developing Critical Illness

Successive CMACE reports have demonstrated that identifying women developing a critical illness is difficult and delayed recognition and management leads to poorer outcomes. Both obstetric units use Modified Obstetric Early Warning Scores (MEOWS) which colour code deranged observations. The following explains the responses expected;

- As observation deviate from the expected normal values they are colour coded yellow and then red.
- The scoring of two yellow or one red observation should generate immediate referral to the on call obstetric team.
- 1\textsuperscript{st} and 2\textsuperscript{nd} Responders - these are members of staff who are designated to monitor the patient and to respond to trigger levels in the OEWS.
  - 1\textsuperscript{st} Responder- midwife designated as caring for the patient
  - 2\textsuperscript{nd} Responder- the first available labour suite Obstetrician or Anaesthetist
- The on call Consultant Obstetrician should be informed of all sick pregnant woman in the hospital.
- Do not ignore abnormal physiology. If a cause cannot be identified then discuss the case with senior obstetric and anaesthetic staff.

The MEOWS should however not be relied on as the sole detector of critical illness. “Eye-ball”ing a patient regularly can be an invaluable tool, similarly regular examination and appropriate investigations including arterial blood gases may aid detection of evolving critical illness.

2. Caring for Women Developing Critical Illness

Immediate Management
Follow the ABCDE principle. Guidance on the management of specific obstetric conditions is covered elsewhere in this handbook

Location of Care
Decision based on how best to balance obstetric and critical care needs.
• **Remain on ward/labour suite**  
  o With regular observations & review

• **Transfer from ward to labour suite**

• **Immediate transfer to theatre**  
  o For delivery and/or management of haemorrhage.

• **Advanced obstetric care on labour suite**  
  o Regular review the patient.  
    *(See NUH Advanced Obstetric Care guideline)*

• **Transfer to main critical care unit** *(see page 97)*

**Senior Involvement**  
Discussion with senior anaesthetist should be considered in certain cases such as eclampsia, maternal collapse, caesarean section for major placenta praevia, major post partum haemorrhage of more than 1500 ml with continued haemorrhage.

**Invasive Monitoring**  
• Can be undertaken as part of AOC.

• **Central venous access**  
  o can be achieved via a peripheral long line if available  
  o Alternatively via the internal jugular vein, preferably ultrasound guided.  
  o Indications include  
    ▪ lack of other IV access  
    ▪ to guide fluid management (e.g. major haemorrhage, severe pre-eclampsia)  
    ▪ to administer vasoactive drugs prior to transfer to critical care unit.

• **Arterial lines**  
  o If regular arterial blood gas testing is required  
  o If there is difficulty monitoring NIBP such as obesity.  
  o Haemodynamic instability requiring arterial pressure monitoring is probably an indication for referral to critical care.
3. Referral and Transfer to the Critical Care Unit

The decision to transfer a woman to the critical care unit is a difficult balance between obstetric care best delivered on labour suite and critical care best delivered on the critical care unit. This is a decision which must be judged on an individual patient basis and where there is uncertainty consultants of all relevant specialties must be involved.

Personnel & Communication –
- Ensure Consultant Obstetrician, Anaesthetist and Intensivist are all aware
- Establish ongoing management plan.

Who to refer (The following is a guide only):

- **Airway protection**
  - Any woman with a GCS < 8 or prolonged seizures will need tracheal intubation.
  - This will more than likely need to be done prior to transfer to the critical care unit.

- **Ventilatory support**
  - Any woman needing
    - FiO₂ > 40%,
    - non-invasive ventilation (NIV)
    - intermittent positive pressure ventilation (IPPV) to achieve SpO₂ >95% needs referral.

- **Circulatory support**
  - BP not responding or transiently responding to fluid therapy may need invasive monitoring and possibly inotropic/vasopressor therapy
  - Ensure surgical haemostasis has been achieved before transfer.

- **Acid-Based derangement**
  - pH<7.2 or lactate > 3 should be discussed with the on call critical care consultant (prior to attempting extubation if the patient is intubated in theatre).
• **Renal replacement therapy**  
  o Standard indications apply though may be instituted early if co-existing pre-eclampsia.

• **Multi Organ Dysfunction**  
  o This should be discussed with the on call Critical Care Consultant.
  
• **Others:** Any patient with deteriorating observations or MEOWS should be considered for referral even if the diagnosis is unclear.

**Who to refer to**

• Ideally consultant to consultant referral or to  
  • Critical Care Outreach Team (CCOT)  
  • Critical care trainee holding the referral bleep

**Preparing for transfer** –

• Get senior support  
• Ensure patient is stable – may mean intubating or starting new treatments  
• Get equipment transferred and check it. Below is a check list which may help preparation for transfer

**Transfer & Handover** –

• Supervised by sufficiently experienced anaesthetist  
• Responsible midwife should also attend  
• Handover should include anaesthetic, obstetric and midwifery aspects of care  
• Care is then shared between the critical care and obstetric teams  
• Ultimate responsibility lies with the critical care team  
• The obstetric team should review the patient at least daily and discuss ongoing care

**Problems and critical incidents**  
The care of critically ill obstetric patients involves a difficult balance between two specialities. If you encounter any problems or incidents please ensure they are brought to the attention of senior members of
obstetric and anaesthetic teams. If necessary complete an incident form.

Transfer Checklist:

- **Patient**
  - Airway safe and secured
  - Ventilation adequate or supported using c-circuit/ambubag or portable ventilator
  - Haemodynamically stable with sufficient IV access, including central if indicated
  - Monitored, including arterial BP monitoring if recent haemodynamic instability

- **Communication**
  - Consultant obstetrician, anaesthetist and intensivist should all be aware and involved
  - Labour Suite coordinator also aware
  - Nurse in charge of the Critical Care Unit should be aware and consulted before transfer commences
  - Patient’s next of kin should be aware and escorted to critical care unit separately

- **Equipment (available from obstetric theatre or critical care unit)**
  - Airway equipment to (re)intubate
  - Self inflating bag and mask (essential if oxygen fails)
  - Sufficient oxygen (with Schraeder valve connection if using ventilator)
  - IV cannulation kit, fluids and giving set
  - Monitoring, sufficiently charged – Minimum of SpO2, ECG, NIBP, ETCO2 (mandatory if ventilated) +/- Arterial BP
  - Defibrillator if already needed or potential for arrhythmia
  - Infusion pumps with sufficient charge, including epidural or PCA where in use

- **Drugs**
  - First line emergency drug box (contains standard ALS drugs)
  - Emergency intubation drugs
  - Sedation and muscle relaxation
  - Anticonvulsants if indicated
  - Check ongoing infusions are not about to run out
  - IV fluids and blood if indicated
  - Uterotonic drugs if pre-delivery or post delivery uterine hypotonicity
• **Fetal care (where indicated)**
  o Fetal monitoring as required/practicable. This will be guided by the obstetricians
  o Delivery equipment (even if IUFD has occurred)

• **Personnel**
  o Sufficiently experienced anaesthetist
  o ODP
  o Outreach nurse if involved
  o Midwife responsible for patient
  o Obstetrician (may handover by phone if appropriate)

• **Documentation**
  o Patient Notes including obstetric notes and drug card
  o Operation and anaesthetic documentation
PERINATAL SEPSIS

- The incidence of perinatal sepsis is increasing; the genital tract is commonly the focus.
- It is the leading direct cause of death in CEMACE 2006-2008
- Half of all deaths were associated with **Group A Beta-Haemolytic Streptococcal infection** (Streptococcus Pyogenes)
- Death can occur rapidly within 12 hours of onset of clinical features
- Recognition is hampered by young healthy hosts who compensate well, atypical presentations and lack of awareness or failure to consider the diagnosis.
- As labour suite anaesthetist you should be actively involved in the management of patients on labour suite who may have sepsis.
- May occur at any time in pregnancy or puerperium
- The combination of fetal loss, abdominal pain and diarrhoea is highly suggestive of genital tract sepsis and should be investigated thoroughly.
- Vaginal delivery and absence of prolonged rupture of membranes do not exclude the possibility of genital tract sepsis.

**Recognition of sepsis**

Sepsis is defined as the presence of at least three of the systemic inflammatory response syndrome (SIRS) criteria in the context of proven or suspected infection.

- **Temperature** <36° or >38° Celsius
- **HR** > 90 bpm
- **RR** > 20 breaths per minute (the alternative definition of PaCO2<4.3 kPa cannot be applied in pregnancy)
- **WBC** < 4x10⁹ or > 12x10⁹ cells/l *(NB. WBC often raised peripartum)*

Sepsis in pregnancy is often insidious in onset but can progress quickly. Early recognition and treatment can save lives.
Initial management of sepsis

The management of suspected sepsis should follow the guidance of the Surviving Sepsis Campaign\textsuperscript{44}, which in summary consists of the following;

<table>
<thead>
<tr>
<th>SURVIVING SEPSIS CAMPAIGN BUNDLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO BE COMPLETED WITHIN 3 HOURS:</td>
</tr>
<tr>
<td>1) Measure lactate level</td>
</tr>
<tr>
<td>2) Obtain blood cultures prior to administration of antibiotics</td>
</tr>
<tr>
<td>3) Administer broad spectrum antibiotics (WITHIN 1\textsuperscript{st} HOUR)</td>
</tr>
<tr>
<td>4) Administer 30 ml/kg crystalloid for hypotension or lactate $\geq$4mmol/L</td>
</tr>
<tr>
<td>TO BE COMPLETED WITHIN 6 HOURS:</td>
</tr>
<tr>
<td>5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) $\geq$65 mm Hg</td>
</tr>
<tr>
<td>6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate $\geq$4 mmol/L (36 mg/dL):</td>
</tr>
<tr>
<td>--Measure central venous pressure (CVP)*</td>
</tr>
<tr>
<td>--Measure central venous oxygen saturation (ScvO\textsubscript{2})*</td>
</tr>
<tr>
<td>7) Remeasure lactate if initial lactate was elevated*</td>
</tr>
</tbody>
</table>

*Targets for quantitative resuscitation included in the guidelines are CVP of $\geq$8 mm Hg; ScvO\textsubscript{2} of $\geq$70%, and normalization of lactate.

The latter parts of this management will require involvement of the critical care team and their involvement should be requested early.
Perinatal Sepsis

Group A Streptococcus (GAS)

- GAS accounts for most of the rise in perinatal sepsis deaths
- Almost all women who died from GAS sepsis had recent contact with children (common carriers) or adults with upper respiratory tract symptoms
- The incidence of perinatal GAS sepsis-related death is seasonal (all occurring between December to April)
- **Treatment**
  - IV ANTIBIOTICS (consult NUH Antibiotic Policy 24)
  - +/- INTRAVENOUS IMMUNOGLOBULIN (discuss with microbiology)

---


40 Providing equity of critical and maternity care for the critically ill pregnant or recently pregnant woman – Royal College of Anaesthetists, 2011


43 Mid Trent Critical Care Network Admission & Operational Policy

44 Dellinger RP, Levy MM, Rhodes A, et al: Surviving Sepsis Campaign:

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 or 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.

General Principles for emergency caesarean section

Figure 3. A classification relating the degree of urgency to the presence or absence of maternal or fetal compromise

<table>
<thead>
<tr>
<th>Urgency</th>
<th>Definition</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal or fetal compromise</td>
<td>Immediate threat to life of woman or fetus</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No immediate threat to life of woman or fetus</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Requires early delivery</td>
<td>3</td>
</tr>
<tr>
<td>No maternal or fetal compromise</td>
<td>At a time to suit the woman and maternity services</td>
<td>4</td>
</tr>
</tbody>
</table>

- Ranitidine & Sodium Citrate (30 ml 0.3 molar)

- Co-amoxiclav 1.2 g
  - before incision if time
  - If contraindicated give cefuroxime/metronidazole or clindamycin.

- Control perioperative hypotension (regional)

- Phenylephrine infusion (see page 58)
  - NCH 1 mg in 20 ml N/Saline (50 mcg/ml) at 25-50 ml/hr
  - QMC 5 mg in 500 ml N/Saline (10 mcg/ml) at 125-250 ml/hr
  - Rate should then be adjusted according to BP

- Phenylephrine boluses: 50-100 mcg or ephedrine

- Pre-loading 500 ml 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
  - 5 U after cord cut (check for twins!)
  - 40 to 40 ml with N/Saline over 4 hours (NCH)
  - 40 U in 500 ml with N/Saline over 4 hours (QMC)
  - Caution with oxytocin if significant uncorrected hypovolaemia/ cardiac disease.

• **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.

**Spinal for caesarean section**

• **Heavy bupivacaine 0.5% 2.5 ml + 250-400 mcg diamorphine**
  - L3/4 space or lower
  - Block to cold to T4, to sensation (altered touch) to T5-6.
  - Ensure loss of leg motor function.

**Rapid top up epidural for caesarean section**

• **Local anaesthetic mix**
  Mix all three below in a 20ml syringe
  - 10ml 0.5% bupivacaine + 1:200,000 adrenaline
  - 10ml 2% lignocaine
  - 2ml 8.4% Sodium Bicarbonate (add last)
  **OR**
  - 20ml 0.5% levobupivacaine

• **Drug location**
  NCH
  - Anaesthetic room in theatre
  - Epidural trolley room
QMC
- Anaesthetic room in theatre

- **Location**
  - If top up administered on labour suite, must stay with the woman at all times

- **Topping-up**
  - 5-ml aliquots every 3 minutes.
  - 15-20 ml is usually needed.
  - 10-15 ml bolus for category 1 LSCS.

**GA for LSCS**

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

- **Call for Paediatrician**

- **Rapid Sequence Induction**

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

- **Maintenance**
  - End tidal MAC 1.5 (Sevo/Iso + N₂O) until cord clamped, then opiates and reduce MAC to 1.
  - Non depolarising muscle relaxants are no problem