# Obstetric Anaesthesia Guidelines

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## Disclaimer

These guidelines are not standards of medical care. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in the light of the clinical data presented and the diagnostic and treatment options available.

# Introduction

These guidelines are intended to give guidance to anaesthetic trainees. They provide essential information and should be read before starting an attachment in obstetrics. They are also useful for later reference. As with any guidelines, professional freedom is maintained but any departure should be justified and discussion with senior colleagues is advised.

The basic role of the obstetric anaesthetist is to provide:

1. Safe and effective anaesthesia for obstetric operative procedures.
2. Safe and effective epidural analgesia for the first and second stages of labour.
3. Help and advice for mothers, midwives and medical staff with particular regard to obstetric analgesia.

# Lines of Communication

Senior help and advice are always available:

There will be at least one Consultant Obstetric Anaesthetist on duty for delivery suite every day (8am-5pm) and a dedicated Consultant obstetric anaesthetist at night (5pm-8am Monday-Friday and for 48 hours at weekends). The 'out of hours' obstetric anaesthetic consultant rota is displayed on delivery suite, with preferred telephone numbers, and is also available on CLW rota with mobile numbers.

During the daytime, there is often a StR Year 6-7 on their advanced training module to also assist.

In an emergency, help may also be obtained from the UHW anaesthetic department on ext. 43107/43106 OR out of hours, the co-ordinating resident senior trainee (bleep 6000) may also be called for assistance.

## Consultants:

1. Dr Mark Stacey
2. Dr Rachel Collis
3. Dr Sarah Harries
4. Dr Korede Adekanye
5. Dr Rafal Baraz
6. Dr Lucy DeLloyd
7. Dr Abrie Theron
8. Dr Sarah Bell
9. Dr David Leslie
10. Dr Mike Adamson
11. Dr Yavor Metodiev
12. Dr Charlotte Oliver




**Communication of potential or actual problems to the Senior StR and/or Consultant is expected.**

## Daily Responsibilities:

At the start of every duty period the anaesthetic trainees must:

- Conduct handover of all patients on delivery suite with the anaesthetists from the previous shift. On weekday mornings, there is a debrief of the night-shift work at 8am, followed by review of all post-natal patients who have received regional anaesthesia/HDU patients. This is followed by formal multi-disciplinary handover of 'the board' with the midwife in charge and the obstetric team.
- Check all anaesthetic equipment including the anaesthetic machines and intubation equipment. There may not be time to do so later if an emergency anaesthetic is suddenly required (e.g., for cord prolapse).
- Ensure that a tray of routine general anaesthetic drugs is prepared and kept in each theatre fridge. This should be checked, dated, signed and every 24 hours.

  Tray Contents:
  - Propofol 1% - 20 ml ampoule x2.
  - Rocuronium – 50 mg vial x2.
  - Two 20 ml syringe labelled propofol.
  - 10 ml syringe labelled rocuronium.
  - 2 ml syringe labelled fentanyl.
  - 30 ml Sodium Citrate 0.3M Oral Solution.

- There should be access to the following as per the agreed SOP (See Appendix 5 for details):
  - IV access tray
  - Atropine – 0.6 mg with syringe but not drawn up.
  - Glycopyrronium - 600mcg with syringe but not drawn up.
  - Ephedrine – 3 mg/ml drawn up.
  - Phenylephrine 500 mcg in 10 mls – prefilled syringe.
  - Syntocinon – 5 IU diluted in 5ml syringe (in the fridge).

- If Syntocinon infusion is required in theatre (Syntocinon 40 Units in 500ml Hartmann's Solution) this should be made up the prep room. Adding 30 units to an existing infusion is strongly discouraged.
- Ensure that the board is kept up to date with the names and contact numbers of the Consultant, Obs1 and Obs2 anaesthetists.
- In addition to labouring mothers, obstetric patients are kept on delivery suite if they require high dependency care; anaesthetic involvement in such patients is usually desirable.
- An anaesthetic workbook (green book) is kept at the main desk or handover room, which contains the details of all patients, who receive an anaesthetic intervention and whether they have been reviewed. A note of any problems should also be made. This should be kept up to date as it is an important means of communication and audit. Please do not remove this book from delivery suite for personal audit.
- All patients who receive anaesthetic care must be entered onto the obstetric anaesthetic electronic database.
- Ensure that the anaesthetic procedure / epidural record forms are completed including any current audit forms (e.g., Dural tap/PDPH)

- Visit patients on the postnatal ward who have had anaesthetic interventions and enquire about morbidity and satisfaction, and record information appropriately in the workbook and the database.
- There is a responsibility to teach midwives/students about obstetric anaesthesia and maternal/neonatal resuscitation.
- The anaesthetic trainees also provide medical support to the acute pain service. Either the acute pain or ward nurses will notify the anaesthetist of particular problems. Any pain problems should be referred in a similar way to obstetric anaesthetic ones.
- The anaesthetic trainees also provide medical support to the acute pain service. Either the acute pain or ward nurses will notify the anaesthetist of particular problems. Any pain problems should be referred in a similar way to obstetric anaesthetic ones.

## Roles & Responsibilities of Consultants

The Consultant Obstetric Anaesthetists have differing roles and responsibilities as set out in the attached table. As well as completion of your IAOAC or Obstetric CUT form, you will be encouraged to take up teaching, QI, research projects or any other interests to help build your training portfolio during your placement in Cardiff. Please approach any of the Consultants to discuss the possibilities.

| **S Harries** | **L de Lloyd** | **S Bell** | **R Collis** | **R Baraz** |
|---|---|---|---|---|
| Consultants Lead | Research | QI/audit lead | Research | Trainees' induction |
| Attendance at Lead meetings, negotiating sessional cover, new Consultant appointments | Organise research meetings/ club outside specific projects | Quality and Safety lead (risk register) Liaise with HOM | Clinical governance lead | E-Datix response for Obs Anaes reports, Neuraxial change-over, Epidural pumps |
| Advanced training Lead – interviews, appraisal and sign - off | PROMPT Consultant coordinator | Maternity network lead | Midwifery epidural teaching | Maintaining anaesthetic charts, Maintaining green books |
| Maternity Prof Forum | OAA surveys Lead responder | T2 Lead | Maternity Prof Forum | Electronic database, Guidelines update |
| **M Stacey** | **O Adekanye** | **A Theron** | **D Leslie** | **M Adamson** |
| Trainee wellbeing lead | Intermediate and Higher training | | Core training lead – IAOC sign off | UKOSS Anaesthetic Lead |
| DS Multi-professional team & resilience training | Lead for CUT form sign off | | PROMPT trainee coordinator (inform JG) | PROMPT CIPPS Lead |
| **Y Metodiev** | **C Oliver** | | Consultants rota | |
| Trainees' rota | Acute pain lead | | | |
| Advanced training (2010 curriculum) Stage 2 & 3 training (2021 curriculum) | Sustainability | | | |
| Meeting minutes | Midwifery epidural teaching | | | |
| | | | | |

# Documentation:

All anaesthetic procedures and obstetric interventions must be documented in the:

- Anaesthetic chart
- Green book
- Electronic database

## *Anaesthetic chart*

- All anaesthetic procedures and obstetric interventions should be documented in the anaesthetic chart.
- Document date and time and your name clearly.
- Regional anaesthesia section can accommodate up to three procedures/interventions.
- There is dedicated space for general anaesthesia.
- Complete the timeline especially when patient is ready for surgery.
- Document the block details, ice and touch level and motor block.
- Complete drug chart including antibiotics, analgesia and IV fluids

## *Green book*

- All intervention including PCA for labour, must be entered in the green book as well as the electronic database.
- You must document the **date** and **time**, your **name**, the **anaesthetic procedure** and the **obstetric intervention**.
- Make sure you document the anaesthetic procedure and the obstetric intervention (e.g. labour epidural, spinal for CS, or epidural top up for trial of instrumental delivery). Entry of the anaesthetic procedure without the obstetric intervention is not acceptable.
- Clearly document the category of the CS.
- Fill in the complications section, examples: high BMI, PPH, fetal distress, admission to neonatal unit, dural puncture, pain during surgery etc.
- If you do more than one procedure in same patient, add as a second and/or third procedure in the same original entry.
- We only need a second addressograph if the procedure is not related to the delivery (e.g. epidural blood patch, Laparotomy, return to theatre beyond 48hours).

## *Electronic database*

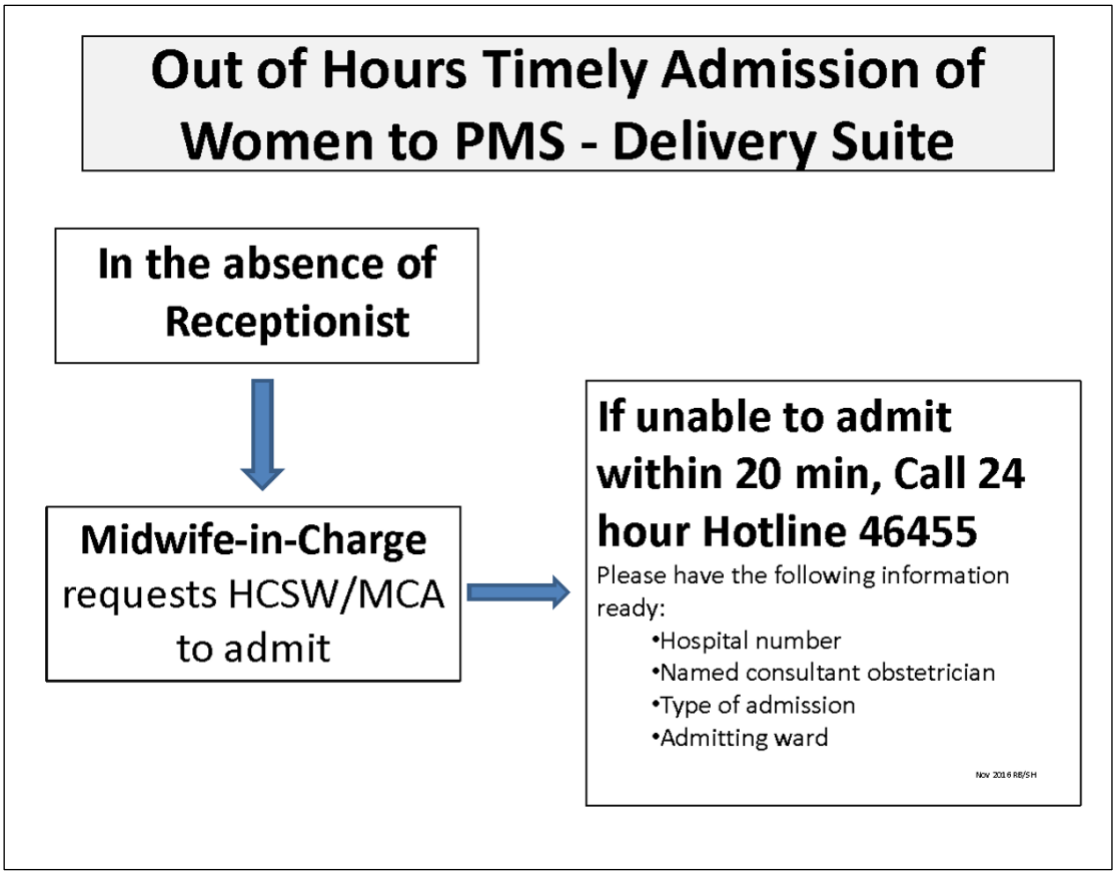
User instructions are as follows:

Open Clinical Workstation: Username: oateam Password: oateam

1. Find patient on DSW ward map.
2. Highlight patient yellow
3. Right click, drop menu to “Clinical” >>>>>> Obstetric Anaesthesia >>>>>Anaesthetic assessment.
4. Create assessment then save.
5. Click on “Clinical” tab on top.
6. Find patient then highlight yellow.
7. Right click: “Add intervention”.
8. “Add Procedure(s).
9. Save procedure.
10. Save intervention.

**11.** You are done.

- Yellow fields are drop menus, double click then select from the drop menu.
- If you can't find patient on DSW ward, it is worth checking the 1st Floor map.
- If you can't find patient on either ward, then most likely the woman is not admitted to the PMS. Please ask receptionist and/or Midwife in charge to assist in admission to the PMS.
- Below is troubleshooting guide:




## Patients with medical problems likely to affect anaesthetic/analgesic management

The obstetricians are encouraged to warn us of any antenatal patients who have medical problems that may affect their anaesthetic or analgesic management. This allows us time to assess, formulate and document an appropriate plan for the patient's management during labour.

High risk anaesthetic antenatal clinics run on Tuesday afternoons and Wednesday mornings each week for such patients, plus an alternative week clinic for high-risk cardiac patients. These are held in the antenatal clinic at UHW. Trainees are encouraged to attend. Check whether there are any patients attending the clinic and at what time it starts, usually 13:30.

All patients who attend the clinic will have a written management plan on a grey Obstetric Anaesthesia sheet in their hand-held maternity notes. More complex patients will have a typed plan on the Welsh clinical portal +/- a typed plan in separate loose-leaf folder at the main delivery suite desk. Inside the folder are forms which should detail the management plan of any obstetric patient due for delivery and who has been identified antenatally as having potential significant anaesthetic problems.

Be proactive and assess any high-risk patients who attend delivery suite with potential for significant anaesthetic or obstetric concern.

## Fluid administration guideline for women in labour (CLU)

This guideline is a starting point for fluid administration on the consultant led unit (CLU), UHW. It is recognised that this will need to be adapted in special circumstances e.g., cardiac patients and for those conditions already with guidelines on fluid administration e.g., PET, diabetes. **If in doubt discuss with senior obstetrician/anaesthetist.**

It is important to think about why a patient needs fluids. Excessive fluid administration can cause harm. When considering a person's fluid requirement, it is important to consider the following 3 categories and treat each separately:

- Maintenance fluids
- Fluid deficit
- Resuscitation fluids

***Maintenance fluids***

Everyone requires a minimum amount of fluid each day to replace ongoing natural losses. This is termed **maintenance** fluid and equates to 35 mL/kg/day (2000-3000 mL/day). Where possible, fluid replacement should be achieved orally, this allows the body to optimise its own fluid intake. Where this is not possible, we need to judge fluid requirements and aim to replace them intravenously.

***Fluid deficit***

Fluid deficits fall into 2 categories:

- Reduced intake (prolonged starvation, nausea and vomiting)
- Increased losses (sweating, hyperventilation, pyrexia, diarrhoea, vomiting, bleeding, etc.)

An assessment of fluid deficit should be made on all women on admission to hospital and is calculated following a detailed history and examination. Examination should look for signs of hypovolaemia and compromised maternal circulation, these include thirst, dry mucous membranes, cool peripheries, hypotension, tachycardia, low urine output, tachypnoea, maternal acidosis and fetal compromise

***Resuscitation fluids***

Patients with a compromised circulation may require additional **resuscitation** fluid that is given in the form of a stat **bolus**. This is termed a fluid challenge, and after administration it is necessary to assess the **response of the patient**. If there is an improvement in patient parameters fluid replacement is probably the correct treatment, and this may be repeated as necessary. However, if there is no response to several boluses, then another cause and treatment option should be sought.

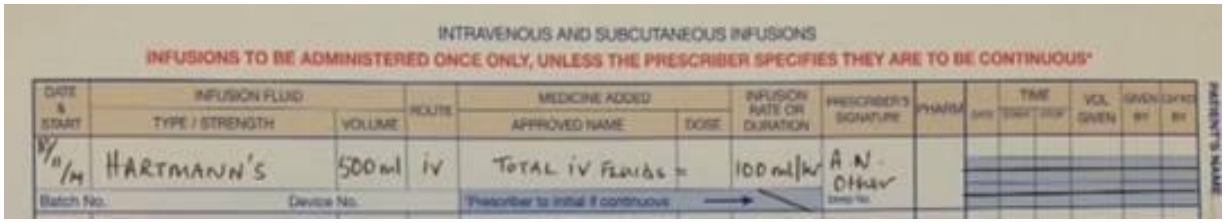
## Maintenance Fluids

*For patients tolerating oral fluids:*

- Encourage patient to drink clear fluids.
- Intravenous maintenance fluids are not routinely required.
- If an epidural is sited, **IV access must be secured and cannula flushed**, but fluids only administered as required (maintenance IV fluids if not tolerating oral fluids, or as a bolus if there are signs of a compromised circulation).

*For patients not tolerating oral fluids:*

- Initially, IV crystalloid (usually Hartmann's) infusion to make a **total** IV fluid administration of 100 mL/hr (i.e., 500 mL over 5 hours). This fluid should be prescribed as follows:


INTRAVENOUS AND SUBCUTANEOUS INFUSIONS

INFUSIONS TO BE ADMINISTERED ONCE ONLY, UNLESS THE PRESCRIBER SPECIFIES THEY ARE TO BE CONTINUOUS*

| DATE & START | INFUSION FLUID TYPE / STRENGTH | VOLUME | ROUTE | MEDICINE ADDED APPROVED NAME | DOSE | INFUSION RATE OR DURATION | PRESCRIBER'S SIGNATURE | PHARM | TIME | VOL GIVEN | GIVEN BY | CHKD BY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D/M | HARTMANN'S | 500ml | IV | TOTAL IV FLUIDS + | | 100 ml/hr | A N Other | | | | | |

Batch No. Device No. Prescriber to initial if continuous

- **Total** is the sum of:
    - Syntocinon infusion
    - Intravenous maintenance fluids
    - Any other IV infusion

**Note**: Only one bag of fluid is to be given for every row of fluids prescribed, i.e., both the "prescriber to initial if continuous" and the additional 2 lines on the right (see above) should be crossed out for **all** maintenance fluid prescribed on the consultant led unit. To avoid the risk of inadvertent fluid overload fluids should usually be administered from a **500ml** bag.

- To determine the required drip rate to achieve the desired mL/hr rate (N.B. 1 drip = 0.04 mL):

| **Desired rate** | **Drip rate** | |
|---|---|---|
| 40 mL/hr | 17 drops/min | 1 drop every 4 seconds |
| 60 mL/hr | 25 drops/min | 1 drop every 3 seconds |
| 80 mL/hr | 33 drops/min | 1 drop every 2 seconds |
| 100 mL/hr | 42 drops/min | 2 drops every 3 seconds |

**Please note:**

**All patients requiring IV fluids require a fluid balance chart** to accurately monitor fluid input and output.

## Fluid Challenge / Bolus (for resuscitation and to replace deficits)

Signs of hypovolaemia and compromised maternal circulation include thirst, dry mucous membranes, cool peripheries, hypotension, tachycardia, low urine output, tachypnoea and maternal acidosis*. A fluid challenge may also be given for fetal compromise, and the following principles apply equally:

- A single fluid bolus should be given over **10-15 minutes** and should not exceed 500mL of Hartmann's solution. The response to the fluid challenge (see * above) should then be considered.

- If indicated the fluid bolus can be repeated after 1 hour.

- After 2 consecutive boluses have been given a senior obstetrician or anaesthetist must review the patient response to the fluid challenge and document in the notes whether further fluid boluses or maintenance fluids are indicated.

- The patient may require an increased level of monitoring, including hourly urine output, regular U&Es and venous lactate. Senior review is required if there is no improvement in patient parameters after the administration of two consecutive fluid boluses.

For **all** patients requiring IV fluids, a fluid balance chart should be commenced to monitor input and output

# Epidural for labour

## General information and planning

Plan to attend mother for an epidural within 30 minutes of request. If both trainees are busy out of hours, ask CEPOD 3 trainee or the on-call consultant to attend. Placement of an epidural catheter should be completed within approximately 20 minutes from starting, or after 3 attempts. If a trainee is having difficulty and taking longer than this, they should stop and seek senior assistance. Consider a low-dose spinal whilst help is on the way.

Anaesthetists performing the epidural should be confident about their technique and certified as competent by the Royal College of Anaesthetists requirements.

- Before establishing epidural analgesia, the anaesthetist should explain the procedure and explain common complications (see anaesthetic chart): The length and depth of the explanation should be patient specific depending on the clinical situation and the amount of information the mother wants. It should briefly cover all the areas indicated on the anaesthetic chart and check boxes ticked:
  - Accidental dural puncture & risk of severe headache
  - Association with instrumental delivery
  - Incomplete analgesia, including need for re-siting
  - Nerve damage and infection should be mentioned as rare complications.

- Backache is common after childbirth and is multifactorial in aetiology. Contemporary prospective controlled studies have shown that the incidence of long-term backache is no more frequent in women who have received an epidural or spinal than those who have not. Naturally there is an increased incidence of localised tenderness at the site of the epidural that lasts about 48 hours and is related to localised bruising. If the mother enquires about backache, then she should be reassured.

- The NICE intrapartum care document, regarding the impact of epidural opiates on breast feeding (below) for women who ask this question. (December 2014)

> *Evidence statement*
>
> There is a moderate level of evidence on the use of fentanyl to reduce the total dose of bupivacaine, which results in less motor block, a longer duration of analgesia but also increases the incidence of pruritus.
>
> Evidence from small studies, of variable quality, suggests a weak association between the dose of fentanyl and the duration and success of breastfeeding.

- Epidural Information Card, C Section information sheet and Headache after Epidural/Spinal leaflets in English and other languages are available on the OAA/Labour pains website. These can be printed or viewed on a mobile device. https://www.oaa-anaes.ac.uk/home or https://www.labourpains.com/home

- Language line or preferably language line via the" i-pad" should be used for mothers who speaks limited or no English. Translation via a partner or relative should not be relied on but may be used in an emergency or if there is no alternative.

- Women should have an obstetric review and plan written in the notes before an epidural is sited. This includes women from the MLU who are transferred to the CLU for an epidural.

- Continuous CTG monitoring for a minimum of 15 min is required before the epidural is placed.

- IV access (preferably 16G) should be sited and flushed before epidural insertion.

- Baseline maternal heart rate and BP must be recorded.

- All mothers having epidural analgesia for labour should be prescribed omeprazole 20 mg BD orally for the remainder of their labour.

- Epidurals should be performed under strict aseptic conditions with operator wearing a surgical gown, hat, sterile gloves and mask. The Acute Pain Service guidelines for skin preparation prior to epidural insertion (see below).

- Women should not be denied an epidural for labour unless there is an absolute contraindication (see below). If a woman requests the epidural before commencing syntocinon, then should be placed and block established as usual.

## Indications

1. Provision of pain relief for women in established labour (maternal request).
2. Induction of labour/ assisting uterine contractions (often before commencing syntocinon infusion).
3. Pregnancy-induced hypertension/ PET.
4. Twin pregnancy.

## Contraindications

1. Maternal refusal.
2. Previous lumbar back surgery (posterior approach).
3. Severe inherited bleeding tendency.
4. Coagulopathy
5. Anticoagulation.
6. Within 24h of therapeutic LMWH.
7. Within 12h of prophylactic LMWH.
8. Double antiplatelet therapy.
9. Platelet count <90.
10. Severe sepsis.

## Patient's positioning

- Poor patient positioning is responsible for many failures to site epidurals/spinals.
- If using the sitting position:
  - Place the woman's feet flat on a stool, try to prevent the knees falling laterally.
  - Ensure the knees are higher than the hips (to reduce the lumbar lordosis)
  - If sitting on the operating table, tilt the table 5° towards you (to reduce the lumbar lordosis)
- If using the lateral position:
  - Place a pillow under the woman's shoulders
  - Place another pillow between her knees to prevent the pelvis tilting away from you

## Preparation prior to epidural insertion

### *Patient*

- Explain the procedure with risks to patient and document on the anaesthetic chart.
- Establish IV access with a 14 or 16G cannula and take blood for FBC / G+S. UHB transfusion policy states that the person taking the G+S must complete the details on the bottle/form.
- Routine IV fluids are not required (see administration of IV fluids in special circumstances).
- Measure and record maternal blood pressure and heart rate prior to insertion.
- Position patient and mark up your spaces prior to scrubbing.

### *Anaesthetic Assistant*

- Wear a hat and a mask.
- Wash hands thoroughly.
- Wash procedure trolley with soap and water.
- Clean trolley with alcohol wipes and allow to dry before placing pack on trolley.
- Open all packs and solutions using aseptic technique.

### *Equipment and drugs required*

- Sterile pack.
- Sterile gown.
- Sterile gloves.
- Theatre hat and mask.
- Pink 0.5% chlorhexidine in 70% alcohol delivered by a pump-squirt bottle.
- 10 ml lidocaine 1% for infiltration.
- 20 ml saline 0.9%.
- Portex epidural minipack.
- IV 3000 dressing.
- 4 inch Mefix. (sleek should not be used).
- Steristrips.
- Lock-it device.
- Epidural giving set (BD BodyGuard™ MicroSet).
- Local anaesthetic bag (250ml bag of 0.1% levobupivacaine + 2mcg/mL fentanyl).
- BD BodyGuard Epidural Pump.

### *Anaesthetist*

- Wear theatre hat and mask.

- Identify the anatomy prior to skin preparation.
- Fully scrub, then wear sterile gown and sterile gloves.

### *Skin Preparation*

- Assistant to spray the back with pink 0.5% chlorhexidine in 70% alcohol, including the area on the upper back where epidural catheter is to be taped to skin.
- Rub the back for ~30 seconds using foam sticks or forceps and sterile swabs, in a circular motion from the centre to the periphery, whilst the solution is still wet.
- Assistant to spray area again with pink 0.5% chlorhexidine in 70% alcohol solution.
- Avoid contamination of the epidural or spinal tray with chlorhexidine spray.
- Skin must be allowed to dry for 2 minutes before commencing the procedure.
- Use iodine if the woman is allergic to chlorhexidine.
- Use sterile drapes.

## Catheter insertion

- Place the woman in the sitting/or lateral position.
- Aim for L2-3 or L3-4 space.
- Use the midline or the paramedian approach.
- Use lidocaine 1% to infiltrate the skin and subcutaneous tissue using 10 ml luer syringe.
- Use 16g Portex Tuohy needle.
- Use loss of resistance to saline as this has lower incidence of accidental dural puncture and missed segments. Also, to minimise the risk of pneumocranium.
- Make a note of the depth of the epidural space.
- Feed the epidural catheter slowly and carefully. Some resistance will be encountered once the catheter becomes in contact with dura.
- 4 cm of catheter length should be left in the space (additional 1-2 cm in the morbidly obese).

It is unacceptable to withdraw the catheter through the needle as this can result in the catheter shearing. Remove needle and then pull catheter back to required length

- Flush the catheter with 1 ml saline through the filter.
- Perform meniscus drop test: disconnect the catheter from the yellow adapter, slowly raise the flushed catheter upwards to the level of the vertex and look for the fluid drop within the epidural catheter. This is a good indication that the epidural catheter is in the epidural space.
- In addition, lower the open proximal end of the catheter below the epidural insertion point. A few drops of clear fluid dripping is normal but continuous dripping of clear fluid may indicate inadvertent intrathecal placement.
- While performing the last step, look also for passive flow of blood in the catheter.
- Connect the yellow adapter. Aspirate the catheter and look for possible blood or CSF:
  - If clear fluid is aspirated (more than 0.5 ml or continuously aspirating) then very likely to be an intrathecal placement.
  - If frank blood is aspirated, flush the catheter with saline and check for aspiration of blood again. If frank blood is still aspirated, withdraw the catheter 0.5 cm. Flush and aspirate the catheter again. If frank blood is still aspirated, withdraw the catheter another 0.5 cm, flush and aspirate the catheter again. If blood is still aspirated, repeat the same process again. If 3 cm or less of epidural catheter is left in the epidural space and still aspirating blood, resite the epidural catheter.
- If aspirating catheter is negative, connect the epidural filter.

- Ensure epidural filter is tightly attached to the yellow adapter (risk of catheter disconnection)
- Fix the catheter to skin using Portex LOCKIT Plus® Epidural Catheter Securement Device. If the LOCKIT device is not available, use 2 steristrips from a cannula dressing, cover with a sterile transparent occlusive dressing.
- Use 4 inch Mefix to make a window around the dressing and secure epidural catheter up the back. Ensure sufficient markings of the epidural catheter are visible to determine whether the catheter has moved.
- Ensure that the filter is secured to the front of the patient.
- Consider taping the filter and yellow hub together with a cannula dressing to minimise risk of catheter disconnection.
- Dispose of sharps safely.
- Do not connect the epidural pump at this stage.

*If the epidural hasn't been successful after 20 minutes or 3 attempts seek senior/more experienced help. Repeated attempts when in difficulty will increase the risk of ADP*

## Epidural documentation

- Name and grade of anaesthetist
- Date and time.
- Verbal request for epidural for labour or indication for therapeutic epidural - verbal consent.
- Risks such as failure/headache/nerve damage, etc as per the anaesthetic chart.
- IV access site and gauge 14 or 16.
- Position of patient (e.g. sitting/left lateral).
- Full asepsis (Gown, Gloves, Hat, Mask, Drape and number of chlorhexidine sprays)
- Intervertebral space and approach (midline or paramedian).
- Lidocaine 1% to skin.
- Type and gauge of needle (e.g., Portex 16G).
- LOR to saline or air.
- Presence of paraesthesia
- Distance to epidural space.
- Length of catheter left in epidural space.
- Blood/CSF in catheter.

## Establishing epidural analgesia

- Aim for good epidural analgesia without motor block.
- The solution used is 0.1% bupivacaine (or levobupivacaine) + 2 mcg/ml fentanyl in pre-filled bags.
- Programmed Intermittent Auto epidural Bolus (PIEB)/Patient Controlled Epidural Analgesia (PCEA) has been our new method of delivering labour epidural analgesia since May 2022. We are no longer using manual intermittent top ups from prefilled syringes.
- After establishing the block, the anaesthetist should attach the epidural giving set (BD BodyGuard™ MicroSet) to the LA bag (250ml bag of 0.1% levobupivacaine/bupivacaine + 2mcg/mL fentanyl), prime the giving set, program the pump and attach to the epidural filter. This is the prime responsibility of the attending anaesthetist.
- The PIEB/PCEA pump will deliver a mandatory bolus every hour:

  - 10 ml in protocol A
  - 7 ml in protocol B
- The PIEB/PCEA pump also allows the mother to receive PCEA boluses of 5 ml to augment analgesia, if necessary, with a lockout of:
  - 20 min in protocol A
  - 30 min in protocol B
- Clinician Bolus (range 1-20 ml) is also available in addition to the chosen protocol.
- **Clinician Boluses will not automatically delay the next Programmed Auto-bolus or patient's bolus.**
- If catheter is intrathecal, refer to 'Management of Accidental Dural Puncture'.

## How to dispense local anaesthetic bag safely from CD cupboard?

- The midwife caring for the woman should inform the midwife in charge about the epidural request.
- The midwife in charge/or the anaesthetist should dispense the epidural local anaesthetic (LA) bag from the CD cupboard (250ml bag of 0.1% levobupivacaine + 2mcg/mL fentanyl) and double confirm with another registered healthcare provider and sign the CD book.
- **The local anaesthetic bag must be placed inside the pump and locked with the specific key before leaving the equipment room. The pump with the locked local anaesthetic bag is then taken into the labour room.**

## How to establish the block?

- After catheter insertion, unlock the pump compartment to release the LA bag.
- Check the solution is bupivacaine/levo 0.1% + 2 mcg/ml fentanyl. Check expiry date.
- Withdraw 20 ml out of the bag and lock the bag inside the pump compartment.

**Give 10 ml of the standard mix as "1st Test Dose".**

- Following this test dose, the midwife should check maternal pulse and blood pressure every 5 minutes for 15 minutes.
- After 5-7 minutes, confirm the absence of signs of intrathecal placement (motor block and rapid drop of pain scores) before giving the 2nd test dose.

**Give the remaining 10 ml of the standard mix as "2nd Test Dose"**

- Following the 2nd test dose, the midwife should check maternal pulse and blood pressure every 5 minutes for 15 minutes.
- Proceed with pump set up and attach to epidural filter.

***After 10 minutes from 2nd test dose, assess the block fully (SLR, pain scores and ice test)***, and:

  - If adequate block and the woman is comfortable, then you should delay 1st auto-bolus and hand the PCEA button to the woman to use for breakthrough pain.
  - If still uncomfortable, 1st auto-bolus should be given (smaller volumes can be given as a Clinician Bolus).
- Ice should be used to establish the extent of loss or reduction of cold discrimination. The ice freezer is in the clean utility room opposite room 12.
- Ethylchloride can be used if ice is not available.
- **The woman should be comfortable within 40 minutes from epidural insertion or after a total of 30 ml of the standard epidural bag mix.**
- Do not give more than 30 ml of the standard mix to establish the block.
- Do not use the pump for the 1st and 2nd test doses. Use manual top ups as above.

**The bag containing the epidural solution (250ml bag of 0.1% levobupivacaine + 2mcg/mL fentanyl) must be kept locked inside the pump at all times to mitigate against the risk of accidental IV connection and administration**

## Pump protocols

There are three protocols:




**Protocol A – Standard**

***Use this protocol as a default***

- Bag volume 220 ml
- Patient's bolus 5 ml (lock out 20 min)
- Auto bolus 10 ml (interval 60 min)
- Patient's bolus to Auto bolus lockout 30 min
- Auto bolus to patient's bolus 20 min
- Maximum clinician bolus 20 ml
- No background infusion

**Protocol B – Reduced**

***Use this protocol for extreme short stature (shorter than 148cm) and for those who develop a dense block with protocol A (higher than T6 and unable to perform SLR)***

- Bag volume 220 ml
- Patient's bolus 5 ml (lock out 30 min)
- Auto bolus 7 ml (interval 60 min)
- Patient's bolus to Auto bolus lockout 30 min
- Auto bolus to patient's bolus 30 min
- Maximum clinician bolus 20 ml
- No background infusion

**Protocol C – Intrathecal Catheter**

***Use/switch to this protocol for intrathecal catheters*** *(anaesthetists top ups only)*

- Bag volume 220 ml
- No auto-bolus
- No patient's bolus.
- No background infusion.
- Maximum clinician bolus 3 ml

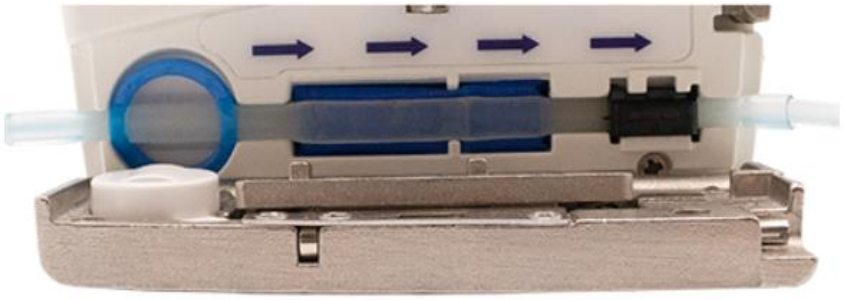
## *Preparing the pump*

## *Initial pump set up*

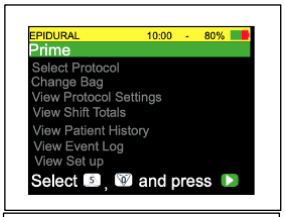
### *Loading the infusing set*

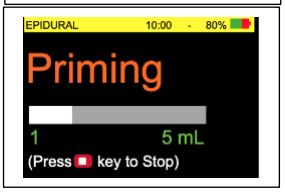
- Ensure the appropriate infusion set is used (BD BodyGuard™ MicroSet)
- Check that the package of the infusion set is sealed and not damaged.
- Unlock the pump compartment to release the LA bag.
- Insert the infusion set spike into the local anaesthetic bag.
- Lift the latch holder to open the door.

- Insert the infusion set, load both the key set (black) and the anti-stretch locator (blue) and avoid stretching, pulling or twisting the tubing. Ensure that the set key (black) and the anti-stretch locator (blue) are inserted in their correct position before closing the pump door.
- Close the door fully until a click his heard.



### *Priming the infusion set*

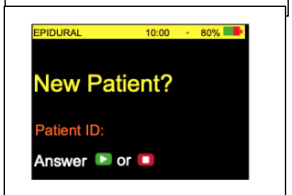


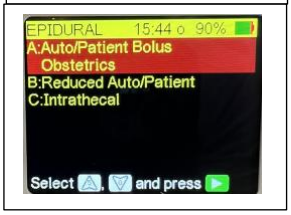




- Ensure the infusion set is not connected to the patient.
- Turn the pump on by pressing key.
- Press key for menu.
- Enter Level One Code.
- Select prime and press the key.
- Enter the level one code and press the key.
- When the prime warning appears, press the key.
- Press key to start the priming procedure.

## Maintaining the block/Selecting protocol




### *How to select a protocol*

- Once priming is complete, you will be prompted to select a protocol.
- Press key to confirm.
- Enter the level one code and press the key
- Press key to confirm “New Patient”. No need to enter patient ID.
- If necessary, press to scroll through the protocols.
- Select a protocol.
- Press key to confirm.
- Read the warning and press key to confirm again.
- Review the selected protocol details then hit key.
- See below for completing the set up.

## *Starting a protocol*

**Protocol A**

- ***Select this protocol as a default.***
- Start this protocol as soon as you completed establishing the block.
- If you start this protocol and the woman is not very comfortable, you can deliver an autobolus of 10 ml at the start of the protocol. If comfortable, then you should delay the autobolus (default delay is 60 min). See below for details.
- The mother will be able to use PCEA function 20 min from starting the protocol.

**Protocol B**

- ***Use this protocol for extreme short stature (shorter than 148cm) and for those who develop a dense block with protocol A (higher than T6 and unable to perform SLR).***
- If you start this protocol and the woman is not very comfortable, you can deliver an autobolus of 7 ml at the start of the protocol. If comfortable, then you should delay the autobolus (default delay is 60 min). See below for details.
- The mother will be able to use PCEA function 30 min from starting the protocol.

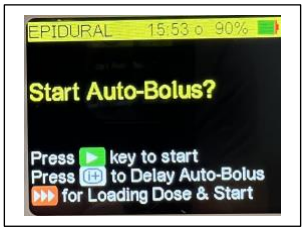
**Protocol C**

- ***Use this protocol to establish a block through an intrathecal catheter.***
- Switch to this protocol once you diagnose an intrathecal catheter.
- This protocol only allows clinician boluses (maximum 3 ml of the standard mix)
- Epidural catheter/filter must be labelled “intrathecal catheter”.
- Label the pump “intrathecal catheter”.
- Inform midwife in charge.
- Inform consultant anaesthetist.
- Must be highlighted on the white board in the hand-over room.

## *Should I give or delay the 1st Autobolus?*

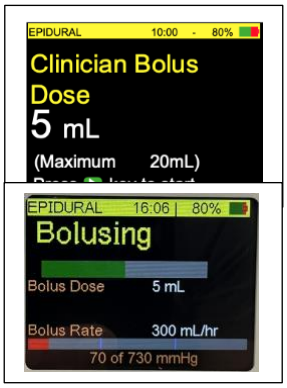
While in the process of selecting protocol A or B, the pump will ask you whether to give an autobolus or not. At this stage, the woman should have received 20 ml of the standard mix:

- If the block is adequate and the woman is comfortable, then you should delay the 1st auto-bolus. To delay, press button on the left. The pump will delay for 60 min.
- If still uncomfortable, press to start Auto-bolus.
- If you wish to give a different volume than the auto-bolus volume, press the key and follow the prompts.



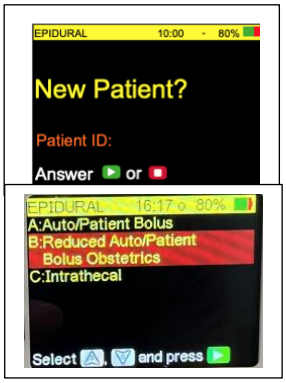

**Now, the pump is fully set up and running**

## *How to administer a clinician bolus*




- Press key to stop the pump.
- Press key.
- A prompt of the timing of the next auto-bolus will appear.
- Press key to confirm.
- Enter the level two code and press the key.
- Enter volume required and press.
- (If you make a mistake, click to delete).
- Bolus progress is displayed on the screen.
- Press to stop the bolus at any time.

## *How to change to a different protocol*




- Press key to stop the pump
- Press/hold to access menu.
- Enter the level one code and press the key.
- Scroll to “Select Protocol” and press the key.
- Enter the level one code and press the key.
- Answer No to “New Patient?” by pressing key.
- Press key to confirm you read the warning.
- Press and to scroll through the protocols.
- Select the protocol then press key to confirm.
- Read the warning and then press key to confirm again.
- Review the selected protocol details then hit key.
- Press key to start the infusion.

## *How to change the local anaesthetic bag*




- Press to stop the pump.
- Press/hold to access menu.
- Enter level 1 code and then press .
- Scroll to “Change Bag” and press .
- Unlock the box, change the bag and click to confirm.
- Confirm protocol details then press key.
- Press to start the infusion.

## Safety facts

- Clinician Boluses will not automatically delay the next Programmed Autobolus.
- **The red Stop button “” will not pause the programme (the stop button only stops the background infusion which is zero ml/hour in all protocols).**
- **To pause the programme, you must shut down the pump completely.**
- If you decide to resite an epidural, the pump must be shut down completely to pause the programme, otherwise, the programme will continue to run and cause delivery of an automatic bolus prematurely once reconnected later.

- The auto-bolus is automatically administered by the pump every 60 minutes from commencing the pump protocol.
- **If for any reason, you wish to withhold the next auto boluses, the pump must be switched off (completely shut down) for a short period.**
- Shutting down the pump will not delete patient's history. The protocol can be resumed once the pump is turned back on.
- **If the clinician bolus volume is larger than 10 ml, the pump programme may have to be suspended (shut down) for a while.**
- **All additional boluses should be delivered as a Clinician Bolus to avoid disconnection of the epidural pump.**
- **Additional boluses of solutions stronger than the premix are discouraged unless absolutely necessary. This may require pausing the PIAB/PCEA programme to avoid next Autobolus.**
- Shut down and disconnect the pump once epidural is no longer required.

**To shut down the pump, press key then press and hold on/off**

- To restart the pump, press and hold on/off, press key to resume previous setting, enter level one code and press the key, review the protocol details then hit key to confirm and press key one more time to start infusion.

## Observations

**The midwife should:**

1. Check maternal pulse rate (PR) and blood pressure (BP) every 5 mins for 15 mins after every test dose, clinician bolus and auto-bolus.
2. Check maternal PR and BP once, 5 mins after patient's bolus.
3. Record all auto-boluses and patient's boluses.
4. Record total volume given and volume remaining hourly.
5. Record the name of the protocol (A, B or C) hourly.
6. Check feet temperature every hour (hand touch only).
7. Check pain scores every hour (0-100 verbal rating scale).
8. Perform straight leg raise (SLR) every hour.
9. Test the upper end of the block with ice every two hours. Inform the anaesthetist if higher than T6.

**Document step 1 and 2 in the notes** and **3-9 in the anaesthetic chart**

**The anaesthetist should:**

- Document (in the anaesthetic chart) the initial protocol, all test doses and clinician boluses.
- Perform/document pain scores and SLR before and after the test doses.
- Assess the epidural block 15-20 minutes after establishing pain relief (pain scores, sensory level and SLR) and document in the anaesthetic chart. Ask the patient if pain relief is adequate. In practice, if S1 (largest sacral nerve root) is blocked the rest of the sacral roots should also be blocked (testing the perineum is not required). Test the lateral borders of the feet (S1) for loss of cold discrimination. Both soles of the feet should be warm and dry. The mother should be able to SLR although with a bilateral block to ice to at least T10.
- Assess the block (as above) at every shift change or at the request of the midwife.

Auto-bolus of 10 ml in the standard protocol and 7 ml in the reduced protocol is programmed to be administered automatically every 60 min once the protocol is commenced. The midwife is expected to be in the room at that time to perform the above observations

## Maternal hypotension

Maternal hypotension (fall >20% systolic or < 100 mmHg) may cause maternal dizziness and nausea and fetal heart rate abnormalities.

- Ensure aortocaval compression is relieved by placing the mother in the full left lateral position.
- Give 25-50 mcg of phenylephrine or 3-6 mg ephedrine IV every 1-2 minutes until BP is satisfactory.
- 200 ml fluid bolus may also be required.

## When should the midwife call the anaesthetist?

The midwife should call the anaesthetist if:

- The woman is uncomfortable (inadequate block, unilateral block and sacral sparing).
- The woman has demanded more than one patient bolus after an auto-bolus.
- The woman has a dense block (unable to perform SLR and/or block to ice higher than T6).
- Maternal hypotension (systolic < 95 mmhg).
- LA bag needs changing.
- Midwife has any other concern.

## Combined Spinal/Epidural (CSE) for labour

- This is a useful technique where rapid onset of analgesia is desirable (e.g., request for epidural late in labour).
- This may be conducted as needle through needle technique, or insertion of spinal needle followed by epidural catheter in the usual manner. The latter is more suitable in less experienced hands or if the mother is very restless.
- Consent, planning, observations, and documentation should be the same as for epidurals.
- Ephedrine and phenylephrine should be immediately available.

### Needle-through-needle technique

- Aim for L3-4 or L4-5 interspace. Locate epidural space with the standard length Tuohy needle.
- Pass a long (120mm) 25G spinal needle through the Tuohy needle (insert without stylet).
- There should be a palpable 'click' as the spinal needle passes through the dura into the subarachnoid space, and a flash back of CSF. If the stylet is removed from the spinal needle before insertion, then CSF is seen almost immediately on puncturing the dura.
- If saline has been used for loss of resistance it can be confused with CSF. Ensure free aspiration of CSF from spinal needle.
- Inject drug (see below), remove spinal needle and insert epidural catheter as per standard epidural insertion.

### Separate spinal and epidural injections

- Aim for L3-4 or L4-5 interspace.
- Use 90mm or 103mm spinal needle.
- Once the spinal is performed, proceed with the epidural insertion.
- The midwife should check maternal pulse rate (PR), blood pressure (BP) and fetal heart rate (FHR) every 5 mins until the epidural is completed.

### Drug management for both techniques

- Inject 4-5ml of the standard epidural bag solution. This should be taken out of the epidural bag using 5 ml syringe prior to commencing the spinal and then decanted into the epidural

tray by the ODP. The anaesthetist should use the filter needle to draw the mix into the final 5 ml syringe.

- Alternatively, use 1.5-2 ml of levobupivacaine 0.25% +/- 10-20 mcg of fentanyl.
- Assess pain relief after 15 minutes. Most women will have complete analgesia. If analgesia is inadequate top-up epidural manually using the standard epidural mix (use 5ml at a time as the epidural injection will squeeze the CSF with a risk of cephalad spread.
- When the intrathecal dose starts to wear off (usually after 45 minutes), the epidural should be managed in the usual way and the first epidural dose given as a test dose by the anaesthetist manually before commencing the pump.
- Establish epidural block using 10-20 ml of the standard epidural mix.
- Commence PIEB/PCEA protocol A or B (as above).

**The bag containing the epidural solution (250ml bag of 0.1% levobupivacaine + 2mcg/mL fentanyl) must be always kept locked in the pump to avoid accidental IV administration**

## Troubleshooting – epidurals

- **Inadequate analgesia**: if analgesia is inadequate, i.e., pain scores remaining > 30-40, consider re-siting the epidural. Failure to establish an adequate block or any doubt concerning the suitability of the epidural for operative delivery should be discussed with the Obs2 or consultant. Any complication must be discussed with the Obs2 or consultant.

- **Failed block**: suggests catheter in the wrong place: i.e., outside the epidural space or in an epidural vein. Resite epidural early.

- **Blood in catheter**: gently flush with saline and aspirate. If still aspirating blood, withdraw the catheter (if able) and repeat flush/aspiration until a minimum of 3cm of catheter within the epidural space. Hold the open end of the epidural catheter below the level of the insertion and confirm that blood is no longer seen in the catheter. If it is still in a vein, resite the epidural. Any blood in the catheter will make a dextrose stick +ve

- **Fluid in catheter**:
  - Possible CSF Dextrose +ve
  - Possible saline from epidural placement Dextrose –ve (will become mildly +ve with time)
  - Possible oedema in epidural space Dextrose +ve. (common in women with pre-eclampsia)

  If the catheter is in the CSF, aspiration is usually easy and often continuous. If other fluid (saline or oedema) is seen, then aspiration of more than a few drops is unusual. If in any doubt, give 5-10 ml bolus of standard solution into the catheter and look for a spinal effect i.e., instant profound analgesia and/or inability to SLR.

- **Unilateral blocks/missed segments**: There is usually a difference in temperature between the two feet and/or the soles of the feet are not equally warm and dry. Try positioning the patient with the unblocked side down if possible before administering another bolus (clinician bolus).

If this fails try withdrawing the catheter 1-2 cm, if possible, and then administer another bolus**. If this fails, resite the epidural early**.

- **Inadequate sacral analgesia** (in late 1st stage or 2nd stage) - frequently associated with an OP presentation. Remember to test and record the S1 component of the block.
  - Sit patient up
  - Give 10 ml clinician bolus to encourage a wider spread of drug.
  - Consider adding extra fentanyl to the solution, 25-50 micrograms bolus in addition to the standard top-up.
  - Occasionally a stronger solution is needed (0.25% levobupivacaine).

- **Missed segment** (i.e., mother complains of pain in the groin) is **usually a unilateral block**, or inadequate height of block on one side, and can be identified by careful assessment of temperature discrimination and by examining the sympathetic block in the feet (**warm/dry soles of feet**). Treatment is as for unilateral block.

- **Dense block:** If the block becomes dense (unable to do SLR and the block is higher than T6 to ice), you should delay the next autobolus. The woman should be reviewed/assessed every 20 min and analgesia resumed timely without compromising analgesia.

- **More concentrated local anaesthetic solutions should only be used when there is breakthrough pain (suggesting insufficient density of block) in the presence of adequate block distribution.**

## Epidurals and pyrexia

- You may be asked to provide epidural analgesia for a woman who is pyrexial, e.g., induction of labour for prolonged rupture of membranes and chorioamnionitis.
- There is no good evidence in the literature as to what is safe.
- If WBC ≤ 25 and Temp ≤ 38° C, an epidural may be inserted provided blood cultures have been taken and antibiotics have been given.
- If WBC > 25 and Temp > 38° C, discuss each case with the consultant.
- Explain to the patient that if epidural is refused the clinical picture will be kept under review and if circumstances change, it may be allowed later in labour. Consider remifentanil PCA.

## PCA Remifentanil in labour: For anaesthetists

### Indications:

- For mothers unable to receive epidural analgesia. This includes mothers with coagulopathy, thrombocytopenia or taking anti-coagulants. Also, major abnormalities of the lumbar spine including major surgical procedures and in the presence of proven or possible sepsis (see guidelines on temperature and white cell count in labour).
- Patient choice or previous bad experience with an epidural.

### General analgesic management

- Mothers may be offered Entonox and/or TENS in addition to remifentanil.
- Mothers MUST NOT have received IM pethidine or any other opioids within the last four hours.
- The mother must be in established labour.

## Contrindications

- Allergy to opioid drugs
- Unestablished labour
- Post-operative analgesia

The use in the following cases must be discussed with a consultant anaesthetist

- Multiple pregnancy
- Pre-eclampsia
- Premature labour

## Before setting up the PCA

- The patient should be informed of the possible side-effects of drowsiness, itching, nausea, dizziness and inadequate analgesia and documentation of this made in the notes.
- The patient must be shown how to use the PCA and should be told to press the button just before or at the start of a contraction i.e., when she first feels a 'tightening 'not when the 'tightening 'becomes painful.
- The anaesthetist must have attended the pump training session and be familiar with the Arcomed SP6000 PCA pump.
- An anaesthetist with the required training must be available while pump in use.
- A dedicated IV cannula must be used (pink 20g or blue 22g).

## Preparation

The standard regimen for Remifentanil in labour is 40mcg bolus with 2-minute lockout.
There is scope to reduce the bolus to 30 or 20mcg and to increase to 60mcg, but it is rare for this to be required.

- Remifentanil should be obtained from the theatre CD cupboard (from the ODP) and checked and signed by the anaesthetist preparing the PCA.
- 2mg of Remifentanil should be reconstituted and diluted in 50ml of normal saline in a 50ml Luer-lock syringe (the final solution contains 40 micrograms/ml).
- A "Drug additive" label must be placed on the syringe and clearly visible, with "Remifentanil 2mg/50ml", the time it was made up and signed by the anaesthetist.
- A Vygon "Protect-a-line" with built in anti-syphon valve (priming volume 2mls) should be connected to the syringe and primed. Alternatively, use the Wescott Sae-flo with anti-siphon and anti-reflux valves (priming volume ~ 4mls).
- Prime the line manually.
- The Remifentanil must be prescribed on the patient's drug chart and a PCA record of administration chart used for observations. Pre-printed prescription stickers are available in theatres.
- Remifentanil is stable for 24 hours at room temperature after reconstitution.

## Pump programme

- Open PCA side door using the specific key.
- Open front screen using the silver latch on the left-hand side.
- Open barrel clamp (the pump will automatically switch on).
- Insert syringe with the graduations visible.

- Close the barrel.
- Close front screen and then press and hold the blue icon until the drive mechanism is fully engaged.
- Confirm size and syringe brand by clicking on the green tick icon.
- Select “obstetrics” folder.
- Enter code 8565 then click on the green tick icon.
- Select Remifentanil PCA option. Enter code 5101.
- The default bolus is 40mcg (can be increased to 60mcg or decreased to 20mcg).
- Confirm bolus dose.
- The default lockout time is 2 min and cannot be changed (0:02hr = 2min).
- Confirm lock out time.
- Shut and lock the side door.
- Press the hard key start button.

Set up is now complete

- If initial programme is inadequate and the mother does not show signs of excessive sedation, consider increasing the bolus to 60 mcg (1.5ml).

**Setting up a PCA must be documented in the green book and on the electronic database**

## Codes

Maternity: 8565, Adult: 5101, Paeds: 7359, CITU: 3265.

Code when selecting a protocol: 5101.

## Observations for the first 30 minutes

- **All maternal observations including “Neuro response” should be recorded on the “Obstetric Early Warning Chart” or the “HDU Chart”**.
- Sedation score “Neuro response” should be recorded at 10, 20 and 30 min (using AVPU scale).
- Oxygen saturations must be measured continuously during remifentanil PCA usage.
- A pulse oximeter should be placed on the mother’s toe (less likely to be dislodged than a finger).
- If oxygen saturation falls below 94% the PCA should be taken away from the mother and the anaesthetist contacted.

## Observations after this

- **All maternal observations including “Neuro response” should be recorded on the “Obstetric Early Warning Chart” or the “HDU Chart”**.
- If no issues in the first 30 min, the neuro response should be monitored and recorded every 30 minutes afterwards until PCA is discontinued.
- All other maternal observations should be measured and recorded ½ hourly for 2 hours. If satisfactory, these observations should be recorded 2-hourly until PCA discontinued.
- Take the PCA away from mother and call anesthetist if:
- Oxygen saturations <94%
- Inappropriate response to verbal stimulus
- Responding only to painful stimulus.

- Unresponsive.
- A respiratory rate < 11/min.

- Pump hourly recordings of “syringe balance”, “volume infused”, “patient boluses”, “refused boluses” and “clinician boluses” should be recorded hourly by the midwife on the PCA chart.
- Balance in syringe = volume left in syringe in mls.
- “Volume infused” can be read from the “DATA” display in red digits (not from the touch screen).
- Record of “patient bolus”, “refused bolus” and “clinician bolus” can be obtained by pressing the green syringe icon on the touch screen.
- Following any dose/lockout change or period of discontinuation, observations should restart as for new PCA.

### Indications for contacting anaesthetist

- Oxygen saturations <94%
- Inappropriate response to verbal stimulus
- Responding only to painful stimulus.
- Unresponsive.
- A respiratory rate < 11/min.
- Syringe change.

### Safety points

- Always use a dedicated cannula.
- Always flush the cannula with 5ml saline immediately after PCA is removed.
- Do not give any other drugs via the PCA cannula.
- Only the mother is to use the PCA button.
- The PCA button must not be pressed by the midwifery staff or patient’s relatives.
- The PCA can be used during delivery and repair of tears or episiotomies.
- A neonatologist should be contacted to attend the delivery and **naloxone must be available** to administer to the baby if required.

### Sedation score to be recorded using AVPU scale

**A**: **A**lert
**V**: responds to **V**erbal stimulus (grunt, moan or movement are considered inappropriate responses)
**P**: responds to **P**ainful stimulus
**U**: **U**nresponsive to verbal or painful stimulus

## PCA Remifentanil in labour: for midwives

### Remifentanil

- Remifentanil (Ultiva™) is a potent, ultra-short-acting, synthetic, opioid analgesic drug
- It is administered via a patient-controlled-analgesia (PCA) pump which is set up by the anaesthetist
- The drug is delivered on demand from the patient by pressing the button attached to the pump
- The pump will automatically lock out for 2 minutes after each demand
- Remifentanil can cause marked respiratory depression, therefore careful observation is necessary during use. The mother should not be left unattended.
- Remifentanil can transfer across the placenta but is metabolised rapidly by the fetus.

## Indications

- For mothers unable to receive epidural analgesia. This includes women with coagulopathy, thrombocytopenia or taking anti-coagulants. Also, major abnormalities of the lumbar spine including major surgical procedures and in the presence of proven or possible sepsis.
- Patient choice.
- Remifentanil is suitable for all stages of labour.

## Contraindications

- Allergy to opioid drugs.
- Unestablished labour.

The use in the following cases must be discussed with a Consultant Anaesthetist:

- Multiple pregnancy.
- Pre-eclampsia.
- Premature labour.

## Other information

- Mothers may be offered Entonox and/or TENS in addition to Remifentanil.
- Mothers MUST NOT have received IM pethidine or any other opioids in the last 4 hours.
- The mother must be in established labour.

## Observations for the first 30 minutes - mandatory

- **All maternal observations including "Neuro response" should be recorded on the "Obstetric Early Warning Chart" or the "HDU Chart"**.
- Sedation score "Neuro response" should be recorded at 10, 20 and 30 min (using AVPU scale).
- Oxygen saturations must be measured continuously during remifentanil PCA usage.
- A pulse oximeter should be placed on the mother's toe (less likely to be dislodged than a finger).
- If oxygen saturation falls below 94% the PCA should be taken away from the mother and the anaesthetist contacted.

## Observations after this

- **All maternal observations including "Neuro response" should be recorded on the "Obstetric Early Warning Chart" or the "HDU Chart"**.
- If no issues in the first 30 min, the neuro response should be monitored and recorded every 30 minutes afterwards until PCA is discontinued.
- All other maternal observations should be measured and recorded ½ hourly for 2 hours. If satisfactory, these observations should be recorded 2-hourly until PCA discontinued.
- Pump hourly recordings of "syringe balance", "volume infused", "patient boluses", "refused boluses" and "clinician boluses" should be recorded hourly by the midwife on the PCA chart.
- Balance in syringe = volume left in syringe (in ml).
- "Volume infused" can be read from the "DATA" display in red digits (not from the touch screen).
- Record of "patient bolus", "refused bolus" and "clinician bolus" can be obtained by pressing the green syringe icon on the touch screen.
- Following any dose change or a period of discontinuation, observations should restart as for new PCA.

## Indications for contacting anaesthetist

Take the PCA away from mother and call anesthetist if:

- Oxygen saturations <94%
- Inappropriate response to verbal stimulus

- Responding only to painful stimulus.
- Unresponsive.
- A respiratory rate < 11/min.

You may also contact the anaesthetist for syringe change.

## Safety points

- Always use a dedicated cannula (22g or 20g).
- Upon completion of PCA usage, immediately remove cannula without flushing.
- Do not give any other drugs via the PCA cannula.
- Only the mother is to use the PCA button.
- The PCA button must not be pressed by the midwifery staff or patient's relatives.
- The PCA can be used during delivery and repair of tears or episiotomies.
- A neonatologist should be contacted to attend the delivery and **naloxone must be available** to administer to the baby if required.
- A midwife, who has undergone local training in the use of remifentanil, must be assigned to give one to one care. The patient should under no circumstances have access to the PCA if the midwife is not present.

## Sedation score to be recorded using AVPU scale

**A**: **A**lert
**V**: responds to **V**erbal stimulus (grunt, moan or movement are considered inappropriate responses)
**P**: responds to **P**ainful stimulus
**U**: **U**nresponsive to verbal or painful stimulus

# PCA Remifentanil in labour: for patients

## What is remifentanil?

Remifentanil is a short acting pain killer, similar to pethidine. It starts to work very quickly, and wears off very quickly, so you can have pain relief timed with your contractions.
Remifentanil was not originally designed for use in labour (i.e., is being used outside of the license); however, it has now been used safely in the UK for many years.

## How is it given?

Remifentanil is administered via a pump (called a PCA), which is pre-programmed. It gives a dose directly into your vein via a drip when you press a button. It has a safety 'lock out '- a short period when no more doses will be given, so you cannot give yourself too much. The pump is set up by the anaesthetist on duty.

The drug starts to work very quickly, so you should try to press the button right **at the start of a contraction when you first feel a 'tightening 'but before it becomes painful**. The drug will then take effect as the contraction builds. Try not to press the button when you do not have a contraction.
It is extremely important that **only you press the button**. Your birth partner should never press the button for you.

### Who is it suitable for?

Anyone in labour can have a remifentanil PCA. We commonly use them for women who cannot have, or do not want an epidural.
There are a few people who it may not be suitable for, particularly those who are allergic to related drugs such as morphine. In certain circumstances, we may advise you that an epidural would be better.
Having a PCA does not prevent you from using gas and air or TENS at the same time, and does not prevent you changing to an epidural later if you would prefer provided you can have one.

### What are the side effects?

Some people experience a light headed or dizzy feeling when using the PCA, this is not harmful, but may feel unusual to you.
Around one in ten women experience low oxygen levels.
You will be monitored closely when you have the PCA connected. If your oxygen levels become low, you may need to be given oxygen, and we may have to stop the PCA.

Although remifentanil does transfer to the baby, the short acting effect means that it is very unusual for it to affect the baby once born.
Although the pain relief using this PCA may start well, you may find the PCA less effective near or at full dilatation.

### Where can I get more information?

The anaesthetist on duty can give you more information about remifentanil and answer any questions that you might have.

## Caesarean section

### Assessment

All patients should be seen before surgery. The front page of the anaesthetic chart is the pre-operative assessment form. Take and document history on the anaesthetic chart, with special emphasis on:

- Indication for LSCS (e.g., placenta previa)
- Past medical/anaesthetic/obstetric history
- Drug history
- Allergies
- Airway assessment
- Discuss anaesthetic options (GA v regional), including complications
- For regional:
    - Technical difficulty, failure and conversion to general anaesthetic
    - Often experiencing pressure, touch, tugging and movement
    - Possibility of discomfort/pain and conversion to general anaesthetic
    - Severe nausea and vomiting associated with low blood pressure
    - 1:200 risk of headache (PDPH) with spinal
    - Nerve damage/infection/haematoma (very rare)
    - Regular blood pressure measurement
    - Shivering and itching

•Also explain:
- Preop Omeprazole
- Starvation instructions and energy drink on morning of surgery.
- PR Diclofenac

## Basic requirements

• Anaesthetic machine and intubation equipment are checked at the beginning of each day.
• Functioning large-bore iv cannula (14g is preferred)
• No patient in the third trimester should be lying on her back. Either place a wedge under the right hip or 12°-15° left lateral tilt of the table to minimise aortocaval compression. In case of fetal distress, the only reliable way to avoid aortocaval compression is the full left lateral position until immediately prior to surgery.
• Trained assistant
• Full (ECG, NIBP, pulse oximeter, ET CO2) monitoring before commencing anaesthesia.

## WHO checklist – Safer Surgery

The WHO 'Sign In' 'Time Out' and 'Sign Out' checklist should be performed for every theatre case. Please include the checklist in the patient's care plan.

## Electives

• Elective patients are seen on the Day assessment unit for a short period the day before surgery, and then go home for the night. Please see as early as possible to avoid delay.
• Assess; prescribe and explain 2 doses of Omeprazole 20mg before surgery (usually 22:00 and 07:00).
• Sodium citrate can be omitted for elective CS under regional anaesthesia because it:
  •Contributes to N/V, especially if hypotension occurs.
  •May be ineffective if GA required >30 mins after beginning regional technique (e.g. conversion post-delivery).

## Emergencies

Emergency LSCS fall into three categories agreed by RCA, RCoG and adopted by NICE/WRP:
Grade 1: immediate threat to life of woman or fetus
Grade 2: maternal or fetal compromise which is not immediately life-threatening
Grade 3: No maternal or fetal compromise, but needs early delivery

•The decision as to which anaesthetic technique is most appropriate will depend on
- Discussion with obstetricians as to urgency
- Confidence and experience of anaesthetist
- Patient factors such as recent solid intake, weight, airway assessment, coagulation studies, medical problems (PET, asthma)
- Presence of working epidural

• Each patient must be individually assessed - medical problems should have been identified early in labour and, following discussion with senior SpR or consultant, a plan formulated.
• Full assessment (see above)
• Consider 10mg iv metoclopramide
• Sodium citrate 0.3M 30mls.

## General Anaesthesia

This standard technique can be modified to suit special circumstances. Refer to checklist below:

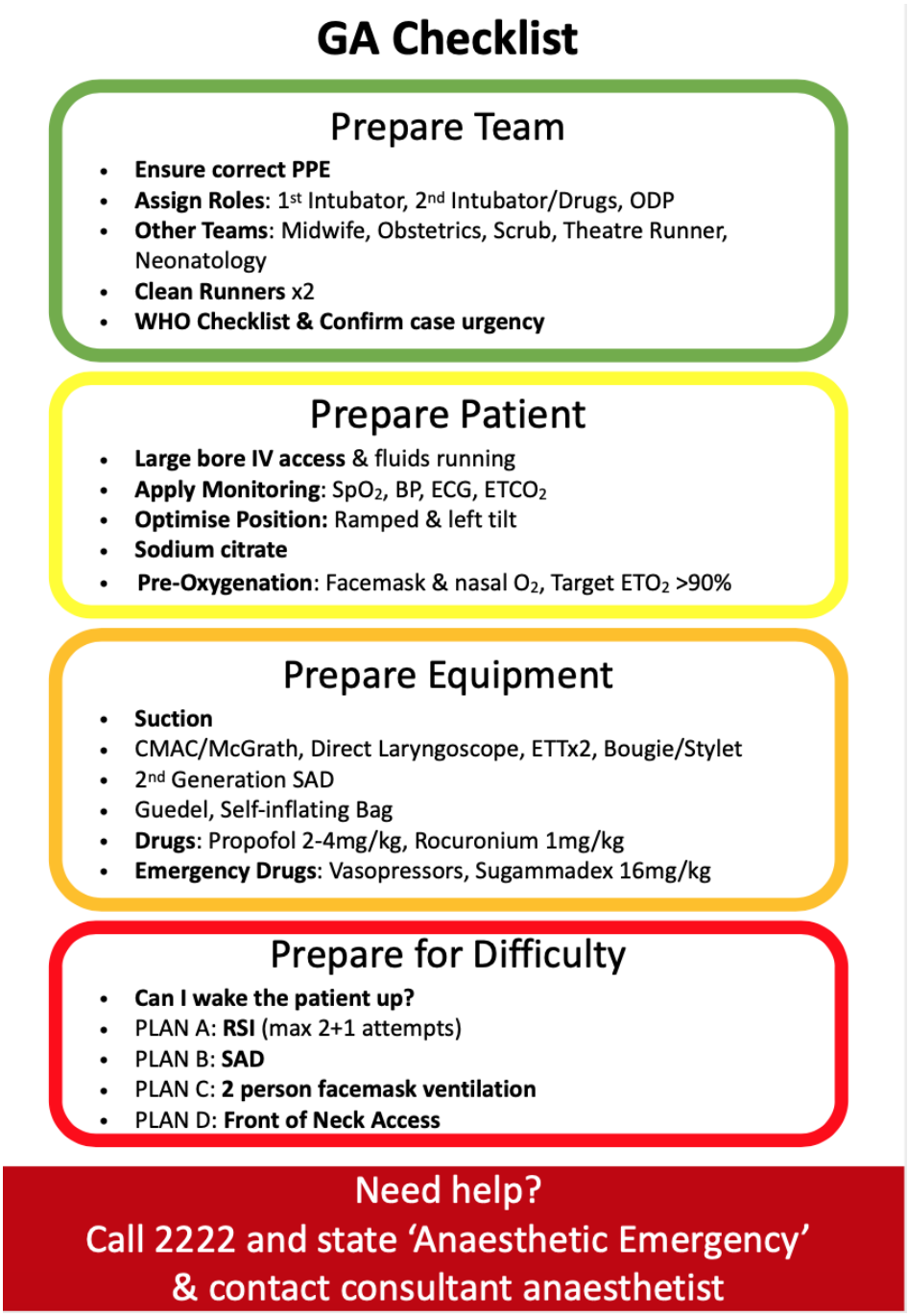
- Ensure correct PPE.
- Check suction/table tilt.
- Ensure oral ranitidine 150mg or omeprazole 40mg has been given within the last 6 hours. If not, administer 20mg Omeprazole or 50mg ranitidine IV as a slow bolus.
- Give sodium citrate 0.3M 30mls orally.
- Optimise H+N/Oxford HELP pillow.

• Pre-oxygenate: apply O2 via nasal cannulae at 4L/min and a tight fitting facemask >10 L/min 100% O2 until ETO2 >90%. Ensure the head is correctly positioned, with flexion of the neck and extension of the head on the neck. 15° head up tilt will speed up pre-oxygenation.

• Induction: RSI with Propofol and Rocuronium. Thiopentone and Suxamethonium are also available.

- Consider Alfentanil 0.75-1mg immediately prior to induction for all cases.
- For PIH/PET, 20mcg/kg alfentanil immediately prior induction agent +/- 8mmol Mg as slow injection over 5-10 minutes.

• Increase nasal flow to 12lites/min when losing consciousness.
Cricoid force: 30N as soon as consciousness is lost (practice on scales: 1kg = 10N). Ideally bimanual with one hand supporting patient's neck. Single-handed cricoid tends to reduce atlanto- occipital extension and may contribute to poor view at laryngoscopy. However, it has the advantage of freeing one of the assistant's hands.



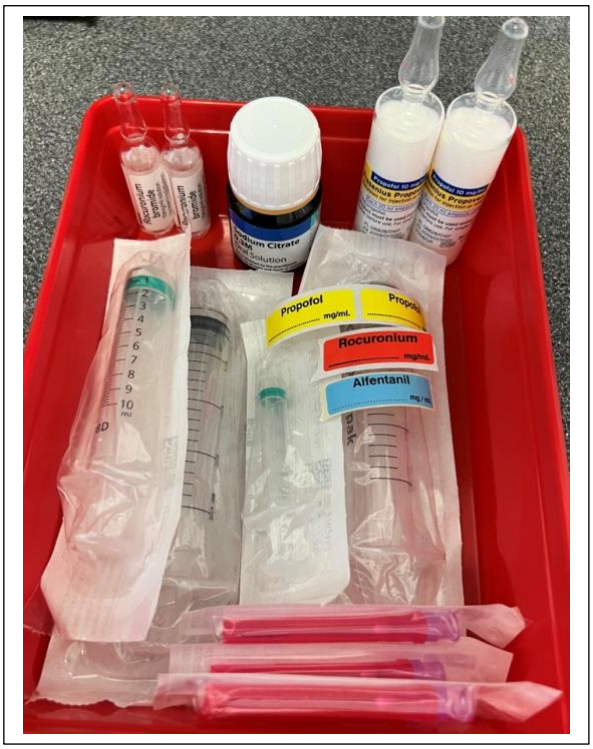

• Maintenance: 50% $O_2$ in $N_2O$ (or adjust $FiO_2$ to keep $SpO_2$ > 95%) and Sevoflurane with overpressure to rapidly increase the ET agent. IPPV to ET $CO_2$ to 4.0Kpa. Avoid hyperventilation. The resulting alkalosis will result in a left shift of the oxyhaemoglobin dissociation curve and may worsen or cause fetal hypoxia.

• After delivery:
- Give IV syntocinon 5 IU slowly after clamping of cord, with additional 5 IU if required.
- $FiO_2$ can be reduced to 0.3.
- Give opioid of choice e.g., morphine 10-15mg IV +/- fentanyl 100mcg.

• During emergency GA LSCS consider trying to empty stomach by carefully passing a large orogastric tube and aspirating while manipulating tube. This should be removed before the end of the anaesthetic.
• Consider bilateral TAP blocks with 20ml 0.25% levobupivacaine on each side OR bilateral Quadratus Lumborum blocks, as set out in Appendix 1.
• Prior to extubation, give PR diclofenac 100 mg or IV 75mg (unless contraindicated) and IV paracetamol 1g.
• Extubation: check reversibility with nerve stimulator and administer appropriate dose of Sugammadex or Neo/Glyco then extubate awake in the sitting position when fully awake. Patients with PIH/PET may become hypertensive at extubation- consider further 8mmol of Mg IV or labetalol if not contraindicated.

## GA drugs

There is no need to draw the drugs every morning. The correct size syringes, needles, syringe labels and drug ampoules should all be placed in a tray in the fridge in both theatre 1 and 2 (not T2) and drawn up when GA is required.




Contents:
- **Propofol 1% (20 ml ampoule x2)**
- Two 20 ml syringes.
- **Rocuronium 100 mg (10 ml)**
- One 10 ml syringe
- 2 ml syringe for Alfentanil
- 4 filter needles
- **Sodium citrate**
- Drug labels

## Postoperative analgesia

• Continuous epidural analgesia can only be provided if the mother remains on delivery suite and receives high dependency care.
•If mother has an epidural in situ give morphine 4mg through catheter, even if general anaesthesia has been given for the CS.
•If no regional block, give PCA morphine with 1mg bolus and 5 min lockout (see below).
•Balanced analgesia:
- Diclofenac (unless contraindicated) 100mg po/pr 12 hourly for two days, then 50 mg tds.

- Paracetamol 1g QDS. This may need to be increased to Co-codamol on the second postoperative day. Consider Lactulose 15 mls BD for mothers receiving Codeine.
- Tramadol as per 'spinal opioid' sticker.
- Ondansetron 4mg PRN 4hrly for antiemesis (max 24mg/24hours).

## Setting up Morphine PCA

- Indications:
  - Part of balanced analgesia for caesarean section in the absence of regional analgesia
  - Analgesia for women with intrauterine death.
- Protocol:
  - The standard protocol is 1mg bolus with 5-minute lockout time.
  - There is scope to reduce bolus to 0.5mg or increase to 1.5 or even 2mg.

### *Preparation*

- Morphine should be obtained from the theatre CD cupboard (from the ODP) and checked and signed by the anaesthetist preparing the PCA.
- 100mg/50ml vial should be drawn up in 50ml Luer-lock syringe (the final solution contains 2mg/ml).
- A "Drug additive" label must be placed on the syringe and clearly visible, with "Morphine 100mg/50ml", the time it was made up and signed by the anaesthetist.
- A Vygon "Protect-a-line" with built in anti-syphon valve (priming volume 2mls) should be connected to the syringe and primed. Alternatively, use the Wescott Sae-flo with anti-siphon and anti-reflux valves (priming volume ~ 4mls).
- Prime the line manually.
- The Morphine must be prescribed on the patient's drug chart and a PCA record of administration chart used for observations. Pre-printed prescription stickers are available in theatres.

### *Pump programme*

- Open PCA side door using the specific key.
- Open front screen using the silver latch on the left-hand side.
- Open barrel clamp (the pump will automatically switch on).
- Insert syringe with the graduations visible.
- Close the barrel.
- Close front screen and then press and hold the blue icon until the drive mechanism is fully engaged.
- Confirm size and syringe brand by clicking on the green tick icon.
- Select "Obstetrics" folder.
- Enter code 8565 then click on the green tick icon.
- Select Morphine PCA option. Enter code 5101.
- The default bolus is 1mg (can be increased to 1.5 or even 2mg).
- Confirm bolus dose.
- The default lockout time is 5 min and cannot be changed.
- Confirm lock out time.
- Shut and lock the side door.
- Press the start/stop hard key button.

Set up is now complete

- If initial programme is inadequate and the mother does not show signs of excessive sedation, consider increasing the bolus to 1.5 or 2.0mg.

**Setting up a PCA must be documented in the green book and on the electronic database**

### *Clinician bolus*

- Do not press start/stop button.
- Press the blue double arrow icon on the touch screen.
- Enter password 5101 and click the green tick icon.
- Set the bolus amount (range 1 – 3mg) then press the start/stop hard key to deliver.

### *Codes*

Maternity: 8565, Adult: 5101, Paeds: 7359, CITU: 3265.

Code when selecting a protocol: 5101.

### *Observations*

- **All maternal observations including "Neuro response" should be recorded on the "Obstetric Early Warning Chart" or the "HDU Chart"**.
- Maternal observations should be measured and recorded ½ hourly for 2 hours. If satisfactory, these observations should be recorded 2-hourly until PCA discontinued.
- Take the PCA away from mother and call anesthetist if:
  - Oxygen saturations <94%
  - Inappropriate response to verbal stimulus
  - Responding only to painful stimulus.
  - Unresponsive.
  - A respiratory rate < 11/min.
- Pump hourly recordings of "syringe balance", "volume infused", "patient boluses", "refused boluses" and "clinician boluses" should be recorded hourly by the midwife on the PCA chart.
- Balance in syringe = volume left in syringe (in ml).
- "Volume infused" can be read from the "DATA" display in red digits (not from the touch screen).
- Record of "patient bolus", "refused bolus" and "clinician bolus" can be obtained by pressing the green syringe icon on the touch screen.
- Following any dose change or a period of discontinuation, observations should restart as for new PCA.

## Sedation score to be recorded using AVPU scale

**A**: **A**lert
**V**: responds to **V**erbal stimulus (grunt, moan or movement are considered inappropriate responses)
**P**: responds to **P**ainful stimulus
**U**: **U**nresponsive to verbal or painful stimulus

## Epidural LSCS - Fractionated top-up of epidural

20 ml of Levobupivacaine 0.5% plus 75-100µg fentanyl.

A minimum of 20ml, in divided doses, is usually required to extend an epidural that has only had standard epidural top-ups for labour. Occasionally more local anaesthetic is required, and up to 30mls levobupivacaine may be used.

Anaesthetists may start the fractionated top-up in the delivery room before transfer to theatre (especially in the presence of fetal distress). Anaesthetist must stay with the woman at all times and have ephedrine and phenylephrine immediately available. Additionally, there must be a mechanism to measure maternal blood pressure and heart rate.
Top-ups can only be started in the delivery room if the theatre is immediately available. Never start top up in the room for Cat 3 section.

The block required for caesarean section should demonstrate:

- Loss of cold sensation from S2 to above T4
- Loss of light touch on the soles of the feet up to T5
- Loss of motor power of hip flexion
- Reduced motor power of ankle flexion

• The adequacy of regional blockade must be fully tested before commencing surgery and clearly documented in the anaesthetic chart. Inadequate epidural or subarachnoid anaesthesia can then be more safely converted to general anaesthesia.

• $O_2$ via Hudson mask if $SpO_2$ <95%.

• Treatment of hypotension should be aggressive (see below).

• 4mg of morphine or 2.5mg diamorphine epidurally provides good postoperative analgesia. (Remember that the epidural filter and catheter have a combined dead space of 1ml)

• The epidural should be removed immediately postoperatively (provided platelets and clotting are satisfactory).

• If the epidural catheter is left in place for postoperative analgesia, it is essential to time its removal to 12 hours after the last dose of Clexane.

## Subarachnoid block for LSCS

• Easy to perform even when time is limited and produces a more reliable block compared to epidural anaesthesia.

• Anaesthesia is usually delivered as a single shot spinal. Occasionally as part of a CSE.

• Preferably performed in the sitting position.

• Greater incidence of hypotension than epidural blockade.

- Use left lateral tilt to avoid aorto-caval compression.
- Give boluses of phenylephrine if the systolic blood pressure falls by 20% or if the mother feels nauseous or light-headed.
- If the fall in BP is persistent then increase the tilt of the table or turn the mother into the full lateral position.
- The mother must be placed in the full lateral position until the start of surgery if she gives a history of troublesome aorto-caval compression symptoms or if she has a multiple pregnancy.
- Place pillow/wedge under head and shoulders to prevent excessive cephalad spread of block.

Spinal anaesthesia should never be performed above the 3rd lumbar vertebra. For safety, the L3/4 interspace is preferred. Remember that assessment of spinal level is inaccurate and for that reason it is best to avoid the L2/3 inter-space as it may be L1/2 and consequently risk spinal cord trauma. Use the line between the iliac crest (Tuffiers line) as your upper margin for spinals and CSEs.

Pencil point needles (24 - 25 Sprotte or Whitacre needles) should be used.

The standard spinal needle length is 90mm. This may not reach the dura in women with higher BMI. The 103 mm needle is ideal in this situation with the added advantage that its introducer is longer.

For super obese mothers, you may use 22g Sprotte (90mm, 120mm or 150mm).

**2.5 ml of heavy bupivacaine 0.5% in combination with fentanyl 10-20µg and morphine 100µg usually provide an adequate block to T4** or above. You may increase/decrease this volume by 10% for shorter or taller woman.

In the event of an inadequate height of block after a 'single shot' spinal, an epidural catheter may be inserted (with patient in the lateral position) to extend the block.

Diamorphine 300 mcg is an acceptable alternative to the fentanyl/morphine combination (but see bacterial filter below).

Aspirate drugs from glass ampoules using a filter needle (the filter needle supplied in spinal packs is a 5 µm particle filter).

Because of the risk of contamination during aspiration, spinal drugs not in a wrapped, sterile ampoule should ideally be drawn up using a bacterial filter (0.2 µm).
Although the block is more reliable than epidural blockade, the block must be tested and documented in the same way as for an epidural.

## Measures to prevent hypotension during regional anaesthesia

• CVS instability is more of a problem during subarachnoid anaesthesia.
• NIBP readings every 2 minutes during establishment of spinal anaesthesia and until the baby is delivered.
• Crystalloid co-loading of Hartmann's solution is recommended.

• Aorto-caval compression is less in the lateral than in the supine wedged or tilted position. Therefore, the lateral position is preferred (changed from one side to the other to ensure a bilateral block) whilst the block is being established. If the wedge or tilted position is chosen then visible uterine displacement must be present.

• Phenylephrine is the preferred vasopressor. It is currently supplied prefilled as 50mcg/ml and can be titrated to effect. Phenylephrine may result in a reflex bradycardia.

• Alternatively use ephedrine 3mg/ml (6mg boluses), particularly if the pulse rate is <70/min.
• Be alert to clinical symptoms and signs of sudden hypotension - light headedness, nausea, loss of colour, bradycardia

• Nausea is a common feature during LSCS under regional anaesthesia and its aetiology is multifactorial. In addition to acute hypotension and cerebral hypoperfusion, visceral vagal stimulation may be the cause. In such cases, IV cyclizine may provide symptomatic relief, usually given slowly after delivery. Intrathecal opioids also contribute to nausea.

• Beware of the 10mg/ml concentration of phenylephrine – if you find any ampoules on delivery suite please notify the consultant immediately.

## Management of pain during CS under regional anaesthesia

• Establish whether patient is feeling pressure or pain. If in pain, the management will depend on the grade of the caesarean section, the type of regional anaesthetic and at what stage of the procedure the pain occurs.

• If the pain occurs before uterine incision, it is likely that general anaesthesia will be required.
• If pain occurs at uterine incision, the baby must be delivered without delay (before GA).

• If pain occurs after delivery:
  Give N2O/ O2 from anaesthetic machine via tight-fitting mask.
  If an epidural or CSE is in place, a further top-up can be given.
  Try incremental iv doses of short-acting opioid (fentanyl/alfentanil).
  If the pain occurs on wound closure, ask the obstetrician to infiltrate with lignocaine 1%

• The mother should always be asked whether she wishes to receive general anaesthesia. If the mother wishes it, then provided it can be carried out safely, inadequate anaesthesia should be treated with conversion to a GA.

• If general anaesthesia is offered but declined this MUST be documented in the anaesthetic chart.

## Spinal anaesthesia after failed epidural blockade

• There is an increased incidence of high block when giving a spinal anaesthetic in this situation.

If this anaesthetic is chosen, then pay attention to:

- Motor block in the upper limbs. NB the mother does not have a total spinal if she can squeeze the anaesthetist's hand with hers.
- Mother complaining of difficulty breathing.
- Excessive sedation.

• If the epidural has failed because the catheter has fallen out and the last epidural top-up was more than 45 minutes before, then a usual spinal dose 2-2.5ml heavy bupivacaine can be used.

• If the epidural has failed after repeated epidural top-ups, then because fluid in the epidural space squeezes the CSF and reduces its compliance, a reduced spinal dose must be used. Reduce the amount of heavy bupivacaine by at least 25%. Low dose CSE is ideal solution here if time allows. Be prepared for a high block and position the mother with an extra pillow or wedge behind her shoulders and head.

• Consider keeping the patient in the full lateral position to minimise aorto-caval compression.

• If you are uncertain then it may better to give a controlled general anaesthetic.

# Other procedures requiring anaesthesia

## Manual removal of placenta

Spinal anaesthesia is the technique of choice. Use 2.5 ml of heavy bupivacaine 0.5% with 20 mcg of fentanyl. If epidural is already in place, this can be topped up. A dense block to T6 or above is required i.e., loss of light touch sensation to T8 (although the innervation of the uterus is no higher than T10, movement of the uterus within the peritoneal cavity, requires a higher block). If general anaesthesia is indicated, a rapid sequence induction should be carried out for the first 48 hours after delivery.

## Perineal tears

Spinal anaesthesia is the technique of choice. Use 2.0 ml of heavy bupivacaine 0.5% with 20 mcg of fentanyl. Intrathecal morphine can be added if NSAIDs are contraindicated. If epidural is already in place, this can be topped up.

## Trial of instrumental delivery (in theatre)

Communication with the obstetrician is paramount:

1. If epidural in situ and has been effective during labour then this should be topped up as for caesarean section.
2. If epidural in situ and has been inadequate/ineffective during labour then the catheter should be removed and replaced with spinal anaesthesia suitable for a C-section.
3. If there is no epidural in situ, then spinal anaesthesia suitable for a C-section is considered the optimal choice.
4. You may consider CSE if trial of instrumental delivery +/- C-section is expected to be complicated.

• The block should be tested prior to starting the trial with a block adequate for a C-section.
• If intrathecal morphine is given for what turns out to be an instrumental delivery, they must be nursed in the appropriate area. The drug chart should clearly state the administration of intrathecal morphine and a clear hand-over to the midwife.

## Lift out forceps/ventouse (in the labour room)

- If labour epidural has been effective, 10ml of 0.25% levobupivacaine should be adequate.
- If labour epidural has been problematic/ineffective, 10ml of 0.5% levobupivacaine should be considered with 50mcg fentanyl.
- Anaesthetist must be present until the placenta is delivered, and haemostasis is achieved. Full monitoring and WHO checklist should be performed as usual. If obstetric difficulty is anticipated, the delivery should be attempted in theatre as above.

# Prophylactic Antibiotics

All operative deliveries should receive one dose of prophylactic antibiotics at the time of delivery.
**Check allergies.** Refer to latest UHB MicroGuide under Guidelines for Specialty use only.
Current practice for C Section: Cefuroxime 1.5g and Metronidazole 500mg.
Current practice for instrumental deliveries: Co-amoxiclav 1.2gm IV, provided not allergic to penicillin.
**Check drug chart and discuss with obstetricians and midwife before giving antibiotics.**
**Beware some women are on the sepsis pathways and may have already received antibiotics.**
http://microguide.horizonsp.co.uk/viewer/cavuhb/

# Guidelines for the use of non-steroidal anti-inflammatory drugs (NSAID) after delivery

## *Background*

- NSAIDs have been shown to reduce opioid requirements when combined with paracetamol after operative delivery.
- Concerns exist regarding their use in patients with known renal impairment / risk factors for its development.
- NSAIDs act by inhibiting cyclo-oxygenase, thereby inhibiting prostaglandin synthesis which leads to constriction of the afferent renal arteriole and consequently reduces renal perfusion pressure.
- The normal physiological changes of pregnancy are associated with a 40-50% increase in glomerular filtration rate, with a resultant decrease in serum creatinine and urea (table 1).

| | Non-pregnant | Trimester 1 | Trimester 2 | Trimester 3 |
|---|---|---|---|---|
| **Urea (mmol/L)** | 2.5-7.5 | 2.8-4.2 | 2.5-4.1 | 2.4-3.8 |
| **Creatinine (µmol/L)** | 65-101 | 52-68 | 44-64 | 55-73 |

**Table 1 – Values for urea and creatinine in pregnancy**

- A creatinine which may be considered normal within the non-obstetric population may in fact indicate acute kidney injury (AKI) in a pregnant patient.

## Recommendations

***1) NSAIDs should be avoided in patients with any of the following:***

- Pre-eclampsia
- Acute kidney injury of any cause
- Reduced urine output
- Pre-existing renal disease
- Severe sepsis
- Major obstetric haemorrhage
- Thrombocytopaenia/ platelet dysfunction

NSAIDs should only be prescribed for these patients when the renal function has returned to normal, urine output is adequate and any precipitating factors for AKI have resolved. The U+Es should be repeated 6 hours after delivery.

***2) NSAIDs should only be given after careful consideration in the following patients:***

- Sepsis
- Hypertensive disease
- Diabetes mellitus
- Obstetric cholestasis

If used, monitor closely for any signs of renal dysfunction

***3) Renal function should be checked 6 hours after delivery in patients with any of the following:***

- Pre-eclampsia
- PPH >1000ml
- Sepsis
- Reduced urine output

# Management of Accidental Dural Puncture (ADP)

CSF can usually be distinguished from local anaesthetic or saline by temperature (warm) and positive reaction to glucose testing.

• If ADP is caused by the needle, feed the epidural catheter intrathecally, secure in place and label clearly "Spinal Catheter". **Give a small dose of bupivacaine to establish analgesia using protocol C** (see "Establishing Spinal Catheter Block" below).

• If unable to thread the epidural catheter intrathecally, then resite catheter in the space above and manage the catheter with the reduced protocol B.

• If the dural puncture is caused by the catheter, then leave in the subarachnoid space and **manage using protocol C** (see "Establishing Spinal Catheter Block" below).

• Explain to the mother.

• Inform SpR/consultant anaesthetist and document in anaesthetic workbook and the electronic database.

• Inform midwife in charge and obstetric staff.

• **Epidural catheter/filter must be labelled "intrathecal catheter".**

• Label the pump "intrathecal catheter".

• Must be highlighted on the white board in the hand-over room.

• There is no reason to depart from the normal management of the 2nd stage.

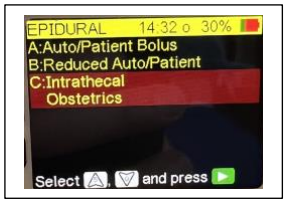
• If the catheter is resited following dural puncture, top up for CS must be carried out very carefully (use small increments of LA) due to risk of LA migration into the CSF through the dural puncture.

## *Establishing the Spinal Catheter Block*

- **Use protocol C.** This protocol allows Clinician Boluses only (max 3 ml).
- If spinal catheter was recognised at time of epidural insertion, then use protocol C and establish with 3 ml of the standard epidural bag mix (250ml bag of 0.1% levobupivacaine + 2mcg/mL fentanyl). Assess the block after 10 minutes, if still inadequate, a further 1-2 ml of the standard bag mix should be given. Assess the block hourly. Subsequent top ups of 1-2 ml can be repeated every hour as Anaesthetists Clinician Boluses only.
- If spinal catheter was recognised after epidural insertion (usually following the 1st test dose), then switch immediately to protocol C. Assess the block hourly. Administer a Clinician Bolus of 1-2 ml of the standard bag mix hourly or when required (Anaesthetists Clinician Boluses only).

## *How to change to protocol C*




- Press key to stop the pump.
- Press/hold to access menu.
- Enter the level one code and press the key.
- Scroll to "Select Protocol" and press the key.
- Enter the level one code and press the key.
- Answer No to "New Patient?" by pressing key.
- Press key to confirm you read the warning.
- Press and to scroll through the protocols.
- Select the protocol C then press key to confirm.
- Read the warning and then press key to confirm again.
- Review the selected protocol details then hit key.

- Press key to start the infusion.

## Post Dural Puncture Headache (PDPH)

A post-dural puncture headache (from whatever cause) is characteristically felt across the forehead radiating to the temples, occiput, or neck and is aggravated by the upright posture. It is variable in severity but may be quite incapacitating. If left alone it usually disappears within 7-10 days but if distressing, an epidural blood patch should be offered usually after 24-48 hours. It may be associated with hearing and visual disturbance.

• Exclude infection before considering any treatment
• Mild PDPH can sometimes be treated with sumatriptan 6mg SC or 50mg PO. Please note that mothers should discontinue breastfeeding for 24 hours following a dose of sumatriptan.
• If the headache is severe after 24 hours or persistent after 48 hours despite other treatments, consider a blood patch.
• Discuss case with Consultant on call.

## Performing Epidural Blood Patch

Because of the theoretical danger of producing an epidural abscess, systemic infection is a contraindication to performing a blood patch. Check WBC, temperature and CRP. Note that the WBC may be raised after an operative delivery.

Explain the procedure to the patient including the risk of a second dural puncture and an estimate of the likely success: 75% of mothers will have significant relief after one patch, rising to 90% after three patches.

• Blood patch should be performed in the delivery suite (by a senior StR /Consultant) and requires the assistance of a second doctor to aseptically draw blood.
• Epidural performed under usual full aseptic conditions using a convenient interspace, ideally at the level of the previous puncture or one level below.
•When the epidural space is located, the second anaesthetist aseptically draws 30 ml of blood from the patient. The first anaesthetist then slowly injects up to 20 ml blood through the Tuohy needle retaining the remainder for blood cultures.
• Injection of blood must be stopped if mother complains of pain in her back or radiating down her legs.
• Afterwards the patient should remain in bed for at least 30 minutes before attempting mobilisation.
• The patient must be followed up regularly until discharge and the blood culture result chased to confirm no growth. If any problems, contact the senior SpR or Consultant.
• If the mother is well, she may be sent home at 3 hours, but she must know how to contact the obstetric anaesthetist.

- A PDPH leaflet detailing the direct telephone numbers and who to contact on delivery suite, must be given to every patient with a suspected headache.
- A letter to the GP must be completed on all suspected PDPH patients and patients who have received an epidural blood patch. The letter template is on the desktop of the PC behind reception.

• Phone patient at home the next day and record your findings in the diary.
• If blood patch fails to relieve headache, consider other causes.

# Management of Total Spinal

Total spinal occurs when the block extends to the upper cervical dermatomes and brainstem which leads to respiratory failure, airway compromise, rapid desaturation and cardiac arrest if not managed swiftly.

## *Causes*

- Total spinal may occur after any epidural top-up due to catheter migration from the epidural space to the subarachnoid space.
- If an epidural catheter is re-sited following an inadvertent dural puncture there can be flux of local anaesthetic from the epidural space into the subarachnoid space leading to total spinal.
- It may occur with a spinal injection following a failed epidural top-up (subarachnoid space is squeezed by volume of local anaesthetic already in the space).

## *Presentation*

- The mother may initially complain of nausea and vomiting, tingling of the fingers, upper extremity weakness.
- This progresses to difficulty breathing (due to paralysis of intercostal muscles), followed by inability to speak (patient starts to whisper) and loss of airway reflexes (paralysis of cranial nerves). Respiratory arrest may occur without warning.
- Hypotension (due to blockade of sympathetic outflow T1-L2) and bradycardia (due to blockade of cardio-acceleratory fibres T1-T4) occur. If aortocaval compression is avoided she should not suffer complete cardiovascular collapse.
- The patient will then become unconscious if LA spreads to brainstem.

### *Assessment and Management*

- Total spinal can be life threatening - call for senior help and manage in an ABC manner.
- Ensure adequate oxygenation with O2 and commence IPPV using bag and mask if hypoventilating.
- It is likely the patient will need intubating in order to prevent aspiration and ensure adequate oxygenation and ventilation. Intubate using standard precautions (induction agents and an intubating dose of muscles relaxant should be used).
- Treat hypotension with the lateral position, IV fluids and vasopressors. Treat bradycardia with IV atropine and consider sympathomimetic agent i.e., ephedrine or adrenaline (10 µg aliquots = 1ml of 1:100,000). An adrenaline infusion may be required to maintain a satisfactory BP and HR.
- If good cardiovascular stability has not been achieved after 5 minutes, the mother must have an immediate caesarean section.
- When mother is stable, check foetal wellbeing by means of the foetal heart rate.
- The duration of block depends on the type and dose of LA injected in the subarachnoid space.
- If the CVS and respiratory features of total spinal are recognised early and treated effectively the outcome for mother and baby is good.

# Postnatal Neurological Review

## *Background*

The majority of postnatal neurological complications are due to compressive neuropathy as a result of prolonged labour, patient positioning or mode of delivery. The temporal relationship between anaesthetic interventions and onset of neurological symptoms often means that anaesthetists are consulted early in the presentation of postnatal neurological deficit (despite the majority of nerve injury being related to factors other than regional anaesthesia). It is thus important to have knowledge of diagnosis, investigation and management of neurological injury.

## *Compressive Neuropathies*

| **Injury** | **Nerves affected** | **Common causes** | **Presentation** |
|---|---|---|---|
| Lumbrosacral plexus injury | L4/5, L5/S1 | Compression of lumbrosacral plexus against the sacrum by the head of the foetus | Sensory: Lateral aspect of thigh, lower leg and foot. Motor: Foot drop |
| Common peroneal neuropathy | L4/5, S1/2 | Compression of common peroneal nerve over the head of the fibula (associated with lithotomy) | Sensory: Lateral aspect of lower leg and dorsum of foot. Motor: Foot drop, Ankle reflex intact. |
| Femoral Neuropathy | L2/4 | Forced flexion of hips causes the femoral nerve to be compressed against the inguinal ligament | Sensory: Anterior thigh and inner aspect of lower leg Motor: Weak knee extension. Weak knee jerk reflex. |
| Obturator neuropathy | L2/4 | Compression of nerve by the foetal head or forceps. 25% bilateral, hence often confused for an intraspinal lesion. | Sensory: Inner thigh Motor: Weak hip adduction and internal rotation. |
| Perineal Nerve Injury | S3/5 | Deep arrest of the foetal head | Saddle anaesthesia and bladder disturbance. |
| Sciatic Nerve Injury | L4-S1 | Compression due to prolonged periods of sitting. | Sensory: Posterolateral thigh and leg Motor: Foot drop Ankle reflex may be weak |
| Lateral cutaneous nerve of thigh ("Meralgia parasthetica") | L2/3 | Compression of the nerve as it passes under the inguinal ligament (usually with prolonged lithotomy) | Sensory: Anterolateral aspect of thigh |

## *Injuries related to regional anaesthesia*

| Injury | Causes | Symptoms | Prevention |
|---|---|---|---|
| Nerve root damage | Direct needle or catheter trauma or due to intraneural injection of LA | Pain or paraesthesia at time of insertion. Paraesthesia, pain, loss of sensation and muscular weakness in the distribution of the nerve | If severe or persistent pain felt on insertion of epidural catheter, the catheter and needle should be removed |
| Spinal cord damage | Direct damage to the conus medularis (usually L1 level). | Pain on needle insertion. Prolonged motor and sensory weakness at and below the level of injury. Can be | If pain on needle insertion or injection of LA then withdraw needle. |

| | | | |
|---|---|---|---|
| | | unilateral or bilateral. May have urinary symptoms. | The conus medularis usually ends at L1 but can be L2 (20% people). |
| Epidural/Spinal haematoma | Usually occurs in the epidural space. Nerve damage occurs due to compression of expanding haematoma. | Back pain, nerve root pain, weakness and paralysis (late). | Consider patients coagulation status and review any anticoagulation medication. |
| Epidural/spinal abscess | Causative organism usually staph aureus. | Backache, nerve root pain, weakness, paralysis, fever, raised inflammatory markers. Warrants urgent MRI. | Caution in placement of epidural in infection, especially if pyrexial (WCC may be raised in labour). Strict aseptic technique for epidural insertion. |
| Arachnoiditis | Inflammation of the arachnoid meningeal layer and subarachnoid space (association with chlorhexidine use) | Pain and progressive symptoms of paraesthesia, numbness or leg weakness. | AAGBI guidance on use of chlorhexidine for CNB. |
| Meningitis | Complication following dural puncture (spinal or CSE). | Headache, fever, backache, nausea. | Asepsis on insertion of CNB. |
| Cauda Equina Syndrome | Damage to cauda equina nerves due to compression or trauma | Backache, nerve root pain, saddle anaesthesia, paraplegia, sphincter dysfunction | Asepsis on CNB insertion. Observe cautions in patients with coagulopathies, bleeding disorders and anticoagulants. |

## *Assessment and management*

Appendix 2 (postnatal neurological review) will aid assessment, management and investigation of postnatal neurological injuries/deficits. Rapid assessment of neurological injury should include appropriate history, examination and investigation.

**History**

- Neurological - including conditions predisposing to neuropathy e.g., backache, obesity, disc disease, diabetes, malignancy, coagulopathy, infection, previous trauma.
- Deteriorating symptoms or onset after a symptom free interval should be treated seriously (this implies changing pathology i.e., compression from enlarging mass.
- Labour/Mode of delivery - Instrumental delivery (type), posture during labour, use of retractors or diathermy, period of full dilatation, injections given by obstetrician, and hypotension.
- Drugs - particularly anticoagulants, steroids, hypoglycaemics.
- Anaesthetic - type of block, degree of technical difficulty, possibility of inadvertent dural puncture, bloody tap, spinal catheters, type/baricity/concentration of anaesthetic, additives, details of aseptic technique, site of injection, pain/paraesthesia during procedure.

**Examination**

- Full neurological examination including examination of the back.

**Investigations**

- If sinister symptoms elucidated (acute onset back pain, radicular leg pain, urinary and anal dysfunction, lower limb numbness and weakness) urgent MRI is required to exclude central lesion. Neurology referral should also be considered.
- If nerve injury is suspected, nerve conduction studies and outpatient neurological review at 6 weeks postdelivery is appropriate. Early and close liaison with neurology should be considered.

## Management of Hypertensive Disease of Pregnancy

Please familiarise yourself with the obstetric guidelines for the management of PET.

### *The key principles of anaesthetic involvement are:*

- The anaesthetist should be aware of and involved in the management of all pre-eclamptic patients on the delivery suite. Do not wait to be invited but become involved early.
- Anaesthetic intervention on patients with severe hypertensive disease of pregnancy should first be discussed with the anaesthetic senior StR or consultant.

### *Blood pressure measurement in pre-eclamptic and eclamptic patients*

- Always check blood pressure with 2 different devices (Dinamap and manual) before starting treatment.
- Obtain normal width, but long BP cuffs for obese woman with short but thick upper arms.
- In an obese woman where it is difficult to get accurate BP readings - have a low threshold to use an arterial line.
- When IV infusions are used to control BP consider the use of an arterial line.

### *General anaesthesia in PET*

- General anaesthesia is hazardous because of potential for laryngeal oedema and an exaggerated pressor response to laryngoscopy and intubation.
- A microlarygoscopy tube (or uncut size 5 or 6 tube) should be available to aid intubation in laryngeal oedema.
- The pressor response can be obtunded by adequate blood pressure control prior to induction and the administration of alfentanil 10-20 micrograms/kg (booking weight) at induction. The attending neonatologist should be informed of any opioid administration before delivery.
- Reduce dose of non-depolarising relaxant if MgSO4 given, and measure N-M block with peripheral nerve stimulator. MgSO4 may have to be continued into the recovery period.
- If general anaesthesia is required in a patient with severe pre-eclampsia, consider insertion of a central line when patient is asleep.

### *Regional anaesthesia in PET*

- Epidural and spinal anaesthesia are contraindicated in the presence of abnormal coagulation. See below for guidelines on platelet counts.
- Hypotension secondary to spinal anaesthesia is less severe in preeclampsia (even in patients with severe PET). There is no more cardiovascular instability compared with epidural anaesthesia.

### *Oxytocic Agents and PET*

- Mechanical methods to facilitate uterine contraction should be utilised
- Syntocinon is the drug of choice for uterine contraction in the setting of severe hypertension and should be titrated to haemodynamic responses.
- Ergometrine has been associated with hypertensive crisis and death in women with pre-eclampsia and should not be used.
- Misoprostol is associated with elevation in blood pressure (to a lesser extent than ergometrine).

# Fluid balance in pre-eclampsia

### *Antenatal Fluid Management*

Careful fluid balance is aimed at avoiding fluid overload. Total input should be limited to 80ml/hour (approximately 1ml/kg/hr). If syntocinon is used, it should be at high concentration and the volume of fluid included in the total input. Oliguria at this point should not precipitate any specific intervention except to encourage early delivery. As these women are at high risk of caesarean section oral fluids should also be limited.

### *Anaesthesia and Fluids*

Patients with pre-eclampsia tend to maintain their blood pressure, despite regional blockade. When this happens, fluid load is unnecessary and may complicate fluid balance. Hypotension, when it occurs, can be easily controlled with very small doses of ephedrine/phenylephrine. In women with pre-eclampsia fluid requirements at caesarean section should be carefully considered and use of no more than 500mls of fluid, unless to replace blood loss.

### *Postpartum Fluid Management (see Flowchart below)*

The risk of death from pulmonary oedema is much greater than that from oliguric renal failure. The cause of pulmonary oedema in pre-eclampsia is often multifactorial; iatrogenic fluid overload, severe diastolic dysfunction, increased pulmonary capillary permeability and hypoalbuminaemia. Consequently, fluid restriction to 80ml/hr (oral, drugs and IV fluid combined) is recommended for women with severe pre-eclampsia, provided there are no ongoing fluid losses. It is important to avoid excessive use of crystalloid solutions, and never >2 litres/day. After caesarean section, withhold Diclofenac for 6 hours until urine output and renal function have been reassessed. Consider TAP or Quadratus Lumborum blocks. Consider reducing volumes of infusions i.e., Syntocinon 40 units in 50mls (instead of 500ml) and oral or PR Paracetamol instead of intravenous.

Fluid management requires frequent clinical assessment (RR, SpO2, HR and BP) with meticulous attention to charting of input and output and calculation of fluid balance. Urine output should be recorded hourly, and each 4-hour block should be totalled and recorded on the chart. Each 4-hour block should total in excess of 100 ml. If two consecutive blocks fail to achieve 100 ml then further action should be as follows (see also appendix 1):

1) If total input is more than 700ml in excess of output since delivery or in the last 24 hours (whichever is the shorter) then 20 mg of IV frusemide should be given

OR

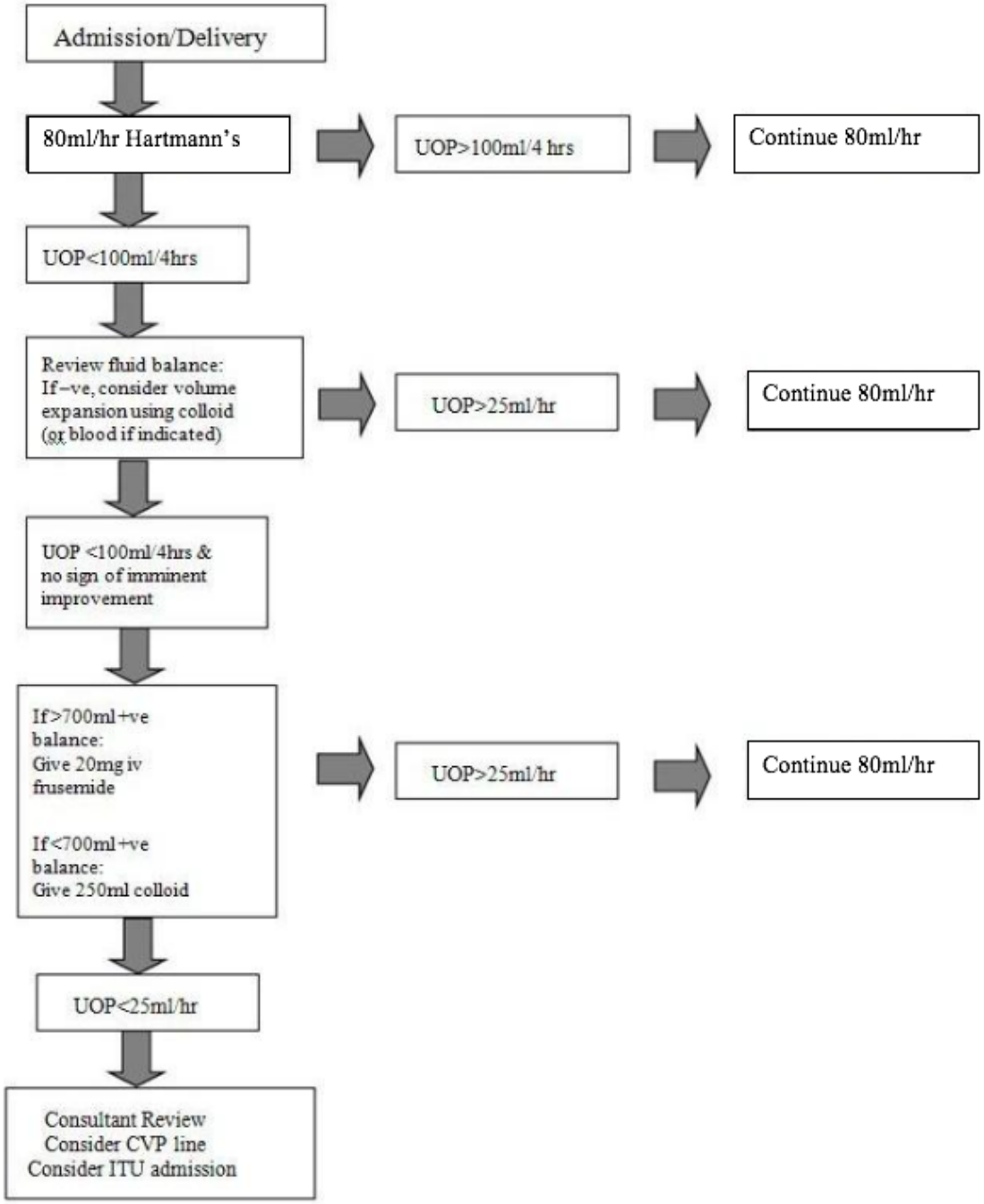
2) If total input is less than 700ml in excess of output since starting delivery or in the last 24 hours (whichever is the shorter) then 250ml of Gelospan over 20 minutes should be given.

The urine output should be recorded until the end of the next 4-hour block. If the urine output remains low, then 20mg of IV frusemide should be given. If after the frusemide a diuresis in excess of 250 ml occurs in the next hour the fluid should be replaced with 250ml of Gelospan in addition to baseline fluids. If the urine output fails to respond to frusemide in either situation then the patient should be reviewed by the consultant (if not done so already). If persisting oliguria, then the electrolytes need to be carefully assessed and checked six hourly and renal referral should be considered. If the woman has dropping oxygen saturation it is

most likely to be due to fluid overload – a portable chest x-ray is probably the most sensitive detector of early pulmonary oedema.

Significant haemorrhage or HELLP needs to be managed by someone with plenty of experience. Cases requiring large volumes of colloid such as fresh frozen plasma, blood or platelets can easily lead to fluid overload.

## Algorithm for Fluid management in pre-eclampsia




## Pre-eclampsia, coagulation, and regional blockade

Pre-eclampsia is commonly associated with a coagulopathy that may range from a mild thrombocytopenia to full-blown DIC. This clearly has implications for the use of neuraxial blockade in pre-eclamptic patients.

If the platelet count is >150,000, experience shows that coagulation will be normal. In reality, both platelet count and coagulation screen should be checked. If relying on just the platelet

count before inserting an epidural/spinal in a patient with severe pre-eclampsia, the result should not be more than 2 hours old.

If the platelet count is <150 but >100 and the INR is ≤ 1.2, and APTT is within the normal range it is safe to proceed with neuraxial anaesthesia/analgesia.

If platelet count is <100, trainees should discuss epidural analgesia with consultant. However, you may proceed with spinal anaesthesia with a platelet count of ≥ 70. This assumes INR/APTT is ≤ 1.2

If in doubt, discuss the case with the consultant on call.

## Obstetric Cholestasis, coagulation, and regional blockade

Patients with obstetric cholestasis are at risk of deranged coagulation secondary to vitamin K malabsorption.

All OC patients should have a coagulation screen on admission for induction, elective section and when admitted to delivery suite during labour.

## DVT/PE prophylaxis and neuraxial blockade

Increasingly, patients with or at risk of DVT/PE are being treated with low molecular weight heparins such as enoxaparin, in doses ranging from 20 to 80mg per day.

| **Prescription of postnatal thromboprophylaxis** | **Enoxaparin dose (mg)** | |
|---|---|---|
| **Most recent weight (kg)** | **In patient** | **Outpatient** |
| <50 | 20mg OD | 20mg OD |
| 50-100 | 40mg OD | 40mg OD |
| 101-150 | 40mg BD | 60mg OD |
| >150 | 60mg BD | 80mg OD |

Conventional coagulation screens appear normal in patients treated with LMW heparin, and the anti-Xa assay is impractical as a clinical investigation prior to central neural blockade.

The following is a guide for insertion of epidurals or spinals:

- 20mg enoxaparin Wait 12 hours
- 40mg enoxaparin Wait 12 hours
- > 40 mg enoxaparin If >101kg, this is a prophylactic dose - Wait 12 hours

  If <100kg – Wait 24 hours
- 5000U SC heparin Wait 12 hrs or do clotting screen.

If normal, it is safe to proceed before 12 hours.

- Heparin infusion Stop, check KCCT after 90 minutes.

Discuss with senior anaesthetist.

The above guide also applies to the removal of epidurals.

For DVT/PE prophylaxis after LSCS, the first dose of enoxaparin can be safely given 4 hours following the spinal/CSE procedure or removal of the epidural catheter.

If an epidural or spinal has been performed in association with heparin of any type, then close follow up of the mother is essential to recognise any neurological problems early.

Below is the comprehensive table from the 2013 AAGBI guidelines for regional anaesthesia in patients with problems with coagulation.

## Cardiac Arrest

### *Background*

Cardiac arrest is rare in pregnancy; it is estimated to occur once in every 30000 deliveries.

Significant changes in maternal physiology occur in pregnancy, with increases in cardiac output, blood volume, minute ventilation and oxygen consumption. Furthermore, the gravid

uterus may cause significant compression of iliac and abdominal vessels when the mother is in the supine position, resulting in reduction in cardiac output and hypotension.

It is also important to recognise that the aetiology of cardiac arrest may be different and includes amniotic fluid embolism, pulmonary embolism, eclampsia, drug toxicity (magnesium sulphate, local anaesthetics), congestive cardiomyopathy, aortic dissection, trauma and haemorrhage.
Prompt consideration of immediate Caesarean section (within 5 min of arrest) must be made. This may improve the outcome for both mother and foetus.

### *Key interventions to prevent arrest*

Place pregnant patient in the left lateral position (or manually displace uterus).
Give 100% oxygen
Give fluid bolus
Immediate re-evaluation of any drugs being administered

### *BLS modifications*

Relieve aortocaval compression by manually displacing gravid uterus or using a wedge (pillow, rescuers' knees or upturned chair)

### *ALS modifications during arrest*

Standard ALS practice applies to the pregnant patient with the following modifications:

- The patient must be resuscitated with a left lateral tilt of at least 15degrees to minimise aortocaval compression
- Perimortem C-section should be commenced within 4mins of arrest and accomplished by 5mins (relieves aortocaval compression thus improving venous return and encourages transfusion of blood from placental bed).
- Consider possible aetiologies e.g., MgSO4 overdose (treat with IV calcium).
- Involve obstetric and neonatal personnel wherever possible (especially if >20weeks gestation).

## *Resuscitation following bupivacaine toxicity*

There is increasing evidence from the literature to suggest that an infusion of intralipid can help in the resuscitation of patients suffering cardiac arrest as a result of bupivacaine toxicity.

### LipidRescue™

**TREATMENT FOR LOCAL ANAESTHETIC-INDUCED CARDIAC ARREST**
**PLEASE KEEP THIS PROTOCOL ATTACHED TO THE INTRALIPID BAG**

In the event of local anaesthetic-induced cardiac arrest that is unresponsive to standard therapy, in addition to standard cardio-pulmonary resuscitation, Intralipid 20% should be given IV in the following dose regime:

- Intralipid 20% 1.5 ml/kg over 1 minute
- Follow immediately with an infusion at a rate of 0.25 ml/kg/min,
- Continue chest compressions (lipid must circulate)
- Repeat bolus every 3-5 minutes up to 3 ml/kg total dose until circulation is restored
- Continue infusion until haemodynamic stability is restored. Increase the rate to 0.5 ml/kg/min if BP declines
- A maximum total dose of 8 ml/kg is recommended

In practice, in resuscitating an adult weighing 70kg:

- Take a 500ml bag of Intralipid 20% and a 50ml syringe.
- Draw up 50ml and give stat IV x 2
- Then attach the Intralipid bag to a giving set and run it IV over the next 15 minutes
- Repeat the initial bolus up to twice more – if spontaneous circulation has not returned.

If you use Intralipid to treat a case of local anaesthetic toxicity, please report the case at www.lipidrescue.org and ensure that a new bag of Intralipid replaces what's been used.

# Management of Post-Partum Haemorrhage

## *Introduction*

The process of childbirth is inexorably associated with risk of maternal haemorrhage. Physiological adaptions occur during pregnancy to help the body cope with haemorrhage.

Estimated blood volume rises 40% from non-pregnant levels to 100 ml/Kg at term (an average 70 kg woman-total blood volume of 7000 ml).

The pregnant woman is in a hyper-coagulable state. Apart from FXI and FXIII, plasma concentrations of all the clotting factors and fibrinogen increase during pregnancy. The normal range of fibrinogen rises to 4-6g/L at term.

Uterine blood flow at term rises to 700 ml per minute, hence when PPH occurs blood loss can be very rapid, resulting in a quickly deteriorating patient requiring effective teamwork to resuscitate.

## *Definitions*

Primary PPH loss of 500 ml or more of blood from the genital tract within 24 hours of birth
Secondary PPH occurs after this time
PPH is classed as **minor** (500–1000 ml) or **major** (more than 1000 ml)
Severe obstetric haemorrhage is generally defined as an estimated blood loss >1500 ml, peripartum fall in haemoglobin concentration >40 g/l, or acute transfusion of 4 or more units of blood.

'Usual' blood loss associated with vaginal birth is 300-500ml. For caesarean delivery this is up to 1000ml.

Any patients showing signs of shock should be treated as for massive obstetric haemorrhage. However, other causes such as inverted uterus, amniotic fluid embolism, ruptured uterus and sepsis must be considered.

## *Causes of PPH*

Causes of PPH can be largely divided into 4 categories.
**There will often be contribution from more than one of these to any bleed**. It is useful to use the pneumonic of the 4 T's

**1)Tone** Failure of uterine contraction, or atony. A well contracted uterus will physically tamponade and crush vessels to stop bleeding. This is a common cause of PPH.

**2)Tissue** Retained products within the uterine cavity need to be removed to allow uterine contraction and haemostasis

**3)Trauma** Tears and lacerations to tissue will often bleed until surgically repaired

**4)Thrombin** Impaired ability of the blood to clot due to an impairment of the coagulation system. This is **important to identify and correct** to allow haemostasis to occur.

Although it can be unexpected a large number of PPH can be predicted and it is therefore important to identify mothers with risk factors for haemorrhage. **Many women on the consultant led unit will have one or more risk factor and haemorrhage in these women should be anticipated and acted upon**

### *Risk factors for PPH*

These can be classified in terms of the 4T's

**1) Atony**
Grand multip, induced labour, syntocinon augmentation, obstructed/prolonged labour, uterine overdistension (macosomia /multiple births/ polyhydramnios), fibroid uterus, previous PPH.

**Remember**- other causes of obstetric haemorrhage will often result in uterine atony, thus compounding the problem

**2) Trauma**
Perineal tears, instrumental delivery, caesarean section- particularly emergency at full cervical dilation, difficult foetal extraction

**3) Tissue**
Retained placenta/ membranes
Abnormal placental implantation- praevia, accreta, percreta
**There is increased risk of accreta in patients with placenta previa and previous caesarean delivery.**
**Women with placenta accreta/percreta are at very high risk of major PPH**.

**4) Thrombin**
There are multiple causes of coagulopathy which should be considered. Coagulopathy may precede the haemorrhage and be causal or develop secondary to the haemorrhage as a consequence of consumption and dilution of clotting factors. Profound coagulopathy may occur in placental abruption, especially when associated with an intra-uterine death. Other causes include HELLP**,** severe sepsis and amniotic fluid embolus.

**Risk factors for PPH should be documented in the OBS Cymru risk assessment and amended during labour if they alter.**

In any woman identified as being at increased risk of haemorrhage:

- **Ensure blood is available from blood bank**- either with 2 appropriate BBS samples to enable electronic issue of blood, or by requesting cross matched blood where electronic issue is not available.

- **Ensure adequate venous access is in place**
- **Ensure team awareness and planning** for high-risk cases
- **Plan for active management of the 3rd stage**
- **Consider setting up cell salvage, fluid warmers and rapid infusion devices in theatre**

# Management of Obstetric Haemorrhage

The OBS Cymru paperwork is present in every mother's notes (Appendix 1). This should act as the documentation and checklist for management. There is also a PPH protocol poster on the wall in each theatre (Appendix 2).

**Remember**

- Young and fit patients compensate very effectively for hypovolaemia. They will become peripherally shut down (capillary refill > 2 seconds) and tachycardic
- Hypotension is a late sign of haemorrhage
- Hypotension must be assumed to be due to haemorrhage until proven otherwise
- large amounts of blood loss can be concealed in the abdomen, uterus and vagina

## *Uterotonic drugs*

**Active management of the 3rd stage**
**Vaginal birth**

- Mothers with no risk factors for PPH should receive 10 IU syntocinon IM (unless CI)
- Mothers with any risk for PPH should receive syntometrine 5/500 IM (unless CI)

**Caesarean birth**

- Mothers should receive 5 IU slowly IV. In women with major cardiovascular disease a bolus may cause severe hypotension and an infusion may be indicated
- In high-risk cases, an infusion of 40 IU syntocinon to run over 4 hours may be prescribed. The usual dilution is 40 IU in 500ml Hartmann's solution (125ml/hr). The volume can be reduced if appropriate.

**PPH management**
**Vaginal birth**

- Syntometrine 5/500 IM (Max dose ergometrine 1000mcg, avoid in PET)

**Caesarean birth**

- **Syntocinon**
  - A second dose of 5 IU syntocinon may be appropriate in emergency caesarean section cases when patients have received IV syntocinon during labour
  - An infusion of 40 IU syntocinon to run over 4 hours may also be prescribed.
- **Ergometrine**
  - Dilute 500 mcg in 20 ml normal saline and administer slowly IV. It is strongly emetogenic so give after/with an antiemetic. Max dose 1000mcg, avoid in PET – may cause severe hypertension and intracranial bleeding.

**All births**

- **Carboprost**
  - Intra-muscular dose 250mcg every 15 minutes (Max 8 doses), avoid in asthma, may cause hypotension and fever
- **Misoprostol**
  - PR administration 800mcg

**Once haemorrhage is on-going it is vital that a tally of on-going blood loss is kept,** enabling timely action. Ensure swabs and clots are **weighed** and blood volume in the suction is

**measured**. The tally should be documented on the OBS Cymru paperwork and communicated to the team.

**OBS Cymru Stage 2 action: 1000ml blood loss with ongoing bleeding or clinical concern**

- Ensure adequate venous access
- Take blood for: FBC, clotting x 2 (one for the lab and one for ROTEM), crossmatch (if not already sent), U&E and a venous blood gas. This will give you an immediate value for Hb, lactate and acid-base status of the mother.
- Give tranexamic acid 1g IV.

**OBS Cymru Stage 3 action: 1500ml blood loss with on-going bleeding**
**OR *1000ml blood loss with on-going bleeding AND FIBTEM A5 of <12***

- Ask the Bank 7 Coordinator to activate the **'massive obstetric haemorrhage protocol'**
- Ensure correct patient's details when activating.
- Inform Consultant Anaesthetist
- Consider asking the Cardiac anaesthetist for help if immediate assistance is required

## Activation of the massive obstetric haemorrhage protocol

**The Band 7 Coordinator should activate the 'massive obstetric haemorrhage protocol'**
This will include alerting:

a. The Obstetric Emergency Team
b. The Blood bank 'massive obstetric haemorrhage protocol'
c. Porters via Portertrac

**Blood bank will release 2 units of red blood cells on activation of the protocol.** These can be collected by the porter and will be available in a bag to be used within 30minutes. A further 4 units of red blood cells will be made available and remain in blood bank until requested by the clinical team.

**All coagulation products should be requested following the ROTEM protocol** when needed (Appendix 5). No coagulation products are thawed automatically.

Close communication between blood bank and the clinical team is essential. Once the massive obstetric haemorrhage protocol has been activated, the extension 41229 is available at all times.

### *Team roles*

**Delivery Suite Co-ordinator**
Ensures all relevant staff are aware of protocol activation

- Contact porters via Portertrac, The Obstetric Emergency Team and Blood bank
- Direct manual delivery of samples via porters
- Notify labs that samples have been sent and ensure they have received samples
- Contact consultant obstetrician and anaesthetist if not already done
- Ensure on-going measurement of blood loss

- Confirm documentation taking place
- Inform switch board (if not already done) and main theatres

**Anaesthetists and ODPs**

- ABC assessment, consider oxygen
- Wide bore IV access
- Bloods – FBC, Coag x2 (ROTEM and lab samples) X-match, U&E, venous blood gas.
  - Repeat bloods every 500ml blood loss, after administration of coagulation products or if clinical concern
- Consider uterotonics (See above)
- Liaise with blood bank re products required

Unless otherwise advised on being informed of Major Obstetric Haemorrhage blood bank will release 2 RBC

- Prepare Level 1 infuser
- Tranexamic acid 1g
- Consider cell salvage
- Maintain temperature with warmed fluids and Bair hugger
- Arterial line
- Ensure normal calcium

**Obstetricians**

- Identify source of bleeding (4 T's)
- Consider
  - Bi-manual uterine compression
  - Uterotonics (See below)
  - Pressure and packing
  - Intra-uterine balloon tamponade
  - Haemostatic suture
  - Tisseel spray
  - Arterial ligation
  - Radiological embolisation (if CV stable)
  - Hysterectomy
- Liaise with gynaecology consultant (if hysterectomy)
- Liaise with vascular consultant (if arterial ligation)
- Liaise with radiology (if embolisation possible)

### *Surgical options*

- EUA
  - On-going bleeding consider EUA to check for retained products and / or trauma
- Packing and pressure
- B-Lynch suture
  - On-going bleeding with atony then consider exploratory laparotomy and insertion of haemostatic brace suture (e.g., B-Lynch suture)
  - Have a low threshold for insertion of haemostatic brace suture with atonic PPH at caesarean section

- SOS Bakri Balloon
    - Consider insertion of SOS Bakri Balloon for bleeding from lower uterine segment following placenta praevia
- Hysterectomy
    - Potentially life saving
    - Usually quicker and safer than internal iliac artery ligation
    - Decision to be made and surgery carried out by Consultant

## Anaesthesia for major obstetric haemorrhage

- Careful consideration must be given to the anaesthetic choice
- Patient may have a strong preference
- Massive haemorrhage and haemorrhage with strong suspicion of coagulopathy are both indications for GA, however, remember volatile anaesthetics will make uterine atony worse
- If epidural in-situ, then it is reasonable to use this
    - Useful to be able to discuss decisions about care with the awake patient e.g., need for hysterectomy
    - GA "on top of" regional may make haemodynamic instability worse
- If time allows and no coagulopathy CSE would be the regional technique of choice
    - Gives good density of block for surgery
    - Duration of block can be extended for long surgery
    - Can communicate with patient

**Fluids**

- If crystalloids used will need to give 3 times as much volume as blood lost
- Transfuse blood to maintain Hb at 80 when haemorrhage is on-going.
- Times for blood to be available from lab after receipt of sample. This does NOT take into account portering time to /from lab

    - O Negative Almost immediate
    - Electronic issue 5 minutes
    - Group specific 10 minutes
    - Fully cross matched 45 minutes, longer with antibodies

**Coagulation products**

- Give 1g IV bolus of tranexamic acid at 1000ml ongoing blood loss.
- Follow the OBS Cymru ROTEM protocol for administration of blood products UNLESS patient has severe sepsis (in which case liaise with consultant coagulation haematologist)

**Monitoring / IV access**

- All patients must have minimum mandatory monitoring
- All patients must have a urinary catheter to **measure hourly urine** output
- If haemodynamically unstable consider an arterial line for monitoring and sampling. Do not delay resuscitation or surgery to site this
- 2 large bore (14G) peripheral cannulae are the IV access of choice for resuscitation

- If IV access in the peripherally shut-down patient is difficult consider using ultrasound to locate a vein in the cubital fossa. Consider intra- osseous (IO) access as a temporising measure. The EZ-IO kit is in the ODP room in theatres. Blood may be taken from the IO needle for cross match and FBC, although platelet count may be unreliable. It is unsuitable for assessment of coagulation or blood gas analysis. Alternatives for emergency vascular access are requesting a surgical cut-down or external jugular cannulation.
- CVP is seldom necessary in healthy patients but consider in patients with difficult IV access

**On-going Care**

• Once the patient is haemodynamically stable, adequately resuscitated and bleeding is controlled consideration needs to be given to on-going level of care i.e., HDU / ICU

- **The team plan should be discussed at the WHO sign out and documented in the OBS Cymru post event checklist**

**Consideration should be given to:**

- Safety of extubation
- Analgesia
- Anti-emetics
- Timing of epidural removal (ensure clotting normal and no risk of further bleeding)
- Enoxaparin dosing

- If the patient is acidotic, hypothermic, coagulopathic or oliguric then it may be appropriate for them to remain intubated whilst these are corrected.

**All patients should have at least HDU level care after a major haemorrhage >1500mL**

- HDU chart including: 15 minutely NIBP, HR, Oxygen Saturations, Resp Rate; Hourly blood loss and urine output, temperature, analgesia and nausea and vomiting scale and close monitoring of PV loss, Backri and drains

- Re-check bloods FBC, coag, lactate, (possibly ROTEM) 4-6 hours after bleeding episode or earlier if unstable
- NSAIDs should be avoided initially until urine output is adequate and renal function and coagulation is confirmed as normal
- **Remember thromboprophylaxis**. All patients need TEDs. Prescribe appropriate dose for 6 hours post epidural catheter removal once haemodynamically stable.

Debrief for patient and relative - Senior anaesthetic and obstetric doctors should update the relatives and patient as soon as is feasible

*1. RCOG "Heavy bleeding after birth (postpartum haemorrhage) - information for you." http://www.rcog.org.uk/womens-health/clinical-guidance/heaving-bleeding-after-birth-postpartum-heamorrhage-information-*

# Interventional Radiology for Obstetrics

***Intervention options*** (requires discussion between Consultant Anaesthetist, Radiologist and Obstetrician):

1. Internal iliac/aortic balloon placement on labour ward theatre to reduce bleeding and enable surgical control and or stabilisation of patient prior to transfer to radiology suite for embolization (remote site, patient must be stable).
2. Transfer to radiology suite for balloon placement and embolization (remote site, patient must be stable).

## *Specific considerations for providing anaesthesia*

1. Potentially long duration of anaesthesia required
2. Potentially unstable patient
    a. Monitoring, blood products
3. Need to minimise patient movement once femoral catheters are inserted
4. Options:
    a. GA
    b. Epidural top-up (be prepared for conversion to GA at any stage)
5. Post-operative analgesia
6. Post-operative monitoring in appropriate area

## *Emergency*

Indication: PPH

Institute massive haemorrhage protocol
Obstetric and Anaesthetic Consultants should be present
Contact Radiologist on call via switchboard (Interventional Radiology 24hr on call rota)

## *Elective*

Indications: Abnormal placental implantation with expected PPH
Any other indication for major PPH

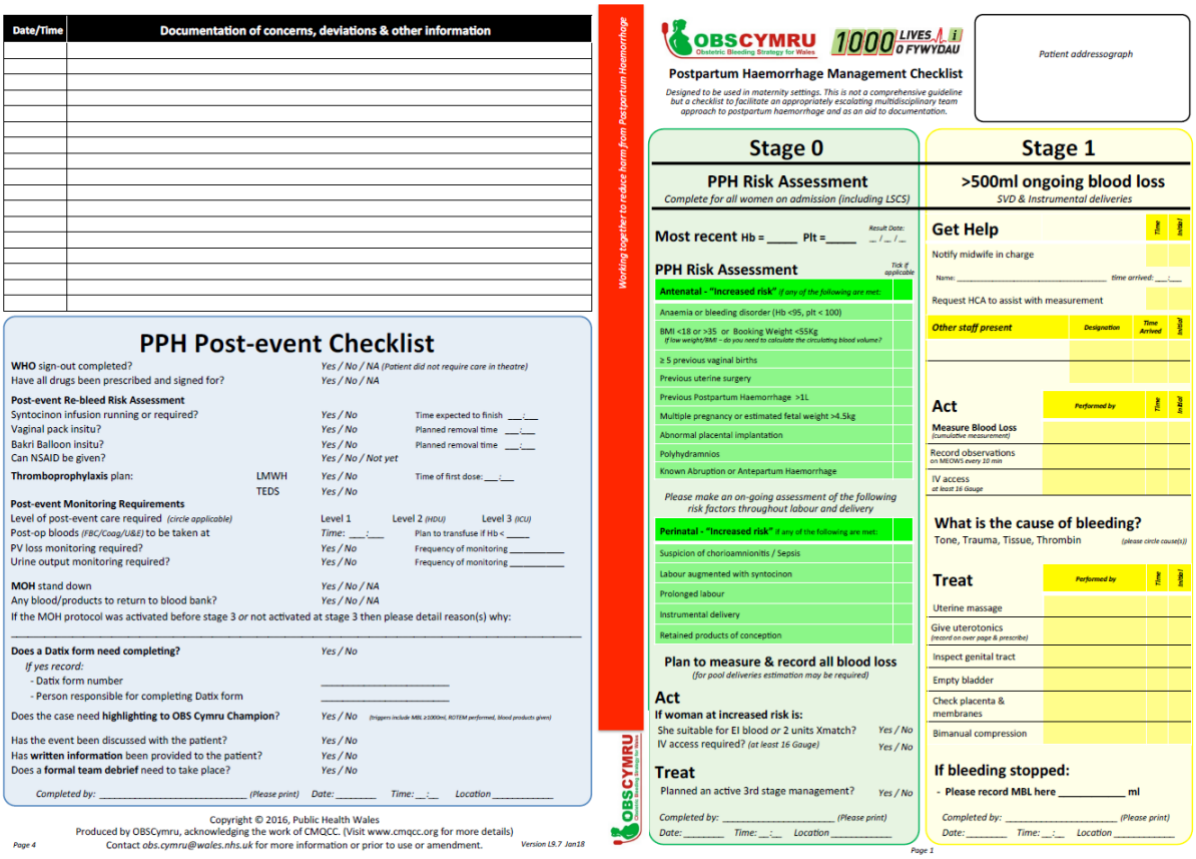
Communication:

1. Delivery date
2. MDT (2-3 weeks prior to planned delivery date)
    a. Anaesthetics, Obstetrics, Midwifery, Radiology to be present.
    b. Delivery plan documented in patient notes (green sheet) and anaesthetic plan (white sheet) and in folder on delivery suite.
    c. Consider whether other surgical specialities need to be involved.
3. Discussion with neonatology

Preparations:

1. These patients will be identified antenatally and so should have consultant input in planning the timing and location of interventions and delivery.
    a. Max 1 additional elective LSCS to be booked on chosen date of delivery
2. Major PPH should be expected and planned for.
    a. Ensure availability of cell salvage, Level 1 transfusion device, patient warming, blood bank, porters.
3. Radiology, obstetric and anaesthetic consents to be completed prior to any intervention.
4. Ensure team briefing prior to any intervention:
    a. Discuss labour ward workload and prioritisation of deliveries.
    b. Plan for designated team of midwifery, obstetric and anaesthetic support in radiology suite
    c. Complete WHO checklist
    d. Continuous foetal monitoring
    e. Routes of contact for labour ward coordinator
    f. Theatre availability during radiology intervention
    g. Awareness and preparation for emergency LSCS in radiology suite/transfer to theatre
5. Anaesthetic options and considerations:
    a. Need to be ready for a GA at all times
    b. Intervention catheters placed under LA and then patient returns to theatre for GA (need to consider post op analgesia – TAP catheters/blocks and morphine PCA)
    c. CSE or epidural alone (low dose spinal if CSE, morphine in epidural component, aggressive treatment of hypotension)
    d. Large bore cannulae and arterial line placed prior to intervention
    e. Urinary catheter inserted prior to transfer to radiology suite
    f. Close attention to left tilt prior to delivery
6. Intraoperative
    a. Plan regarding balloon inflation and how to contact Interventional Radiologist if haemorrhage occurs despite balloon inflation
    b. Close monitoring and treatment of patient parameters (cardiorespiratory, haematological etc)
7. Post-operative discussion regarding removal of arterial catheters, location of patient for monitoring and anticoagulation.

# PPH: Appendix 1 OBS Cymru Checklist



| Date/Time | Documentation of concerns, deviations & other information |
|---|---|
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## PPH Post-event Checklist

**WHO** sign-out completed? *Yes / No / NA (Patient did not require care in theatre)*
Have all drugs been prescribed and signed for? *Yes / No / NA*

**Post-event Re-bleed Risk Assessment**
Syntocinon infusion running or required? *Yes / No* Time expected to finish ___:___
Vaginal pack insitu? *Yes / No* Planned removal time ___:___
Bakri Balloon insitu? *Yes / No* Planned removal time ___:___
Can NSAID be given? *Yes / No / Not yet*

**Thromboprophylaxis** plan: LMWH *Yes / No* Time of first dose: ___:___
TEDS *Yes / No*

**Post-event Monitoring Requirements**
Level of post-event care required *(circle applicable)* Level 1 Level 2 *(HDU)* Level 3 *(ICU)*
Post-op bloods *(FBC/Coag/U&E)* to be taken at *Time:* ___:___ Plan to transfuse if Hb < ____
PV loss monitoring required? *Yes / No* Frequency of monitoring _____
Urine output monitoring required? *Yes / No* Frequency of monitoring _____

**MOH** stand down *Yes / No / NA*
Any blood/products to return to blood bank? *Yes / No / NA*
If the MOH protocol was activated before stage 3 *or not activated at stage 3* then please detail reason(s) why:
_____

**Does a Datix form need completing?** *Yes / No*
*If yes record:*
- Datix form number _____
- Person responsible for completing Datix form _____

Does the case need **highlighting to OBS Cymru Champion**? *Yes / No* *(triggers include MBL ≥1000ml, ROTEM performed, blood products given)*

Has the event been discussed with the patient? *Yes / No*
Has **written information** been provided to the patient? *Yes / No*
Does a **formal team debrief** need to take place? *Yes / No*

*Completed by:* _____ *(Please print)* *Date:* _____ *Time:* __:__ *Location* _____

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Contact *obs.cymru@wales.nhs.uk* for more information or prior to use or amendment.



*Working together to reduce harm from Postpartum Haemorrhage*

OBSCYMRU Obstetric Bleeding Strategy for Wales 1000 LIVES 1000 O FYWYDAU

## Postpartum Haemorrhage Management Checklist

*Designed to be used in maternity settings. This is not a comprehensive guideline but a checklist to facilitate an appropriately escalating multidisciplinary team approach to postpartum haemorrhage and as an aid to documentation.*

*Patient addressograph*

### Stage 0

**PPH Risk Assessment**
*Complete for all women on admission (including LSCS)*

**Most recent Hb = ____ Plt = ____** *Result Date: __/__/__*

**PPH Risk Assessment** *Tick if applicable*

**Antenatal - "Increased risk"** *if any of the following are met:*
- Anaemia or bleeding disorder (Hb <95, plt < 100)
- BMI <18 or >35 or Booking Weight <55Kg *If low weight/BMI – do you need to calculate the circulating blood volume?*
- ≥ 5 previous vaginal births
- Previous uterine surgery
- Previous Postpartum Haemorrhage >1L
- Multiple pregnancy or estimated fetal weight >4.5kg
- Abnormal placental implantation
- Polyhydramnios
- Known Abruption or Antepartum Haemorrhage

*Please make an on-going assessment of the following risk factors throughout labour and delivery*

**Perinatal - "Increased risk"** *if any of the following are met:*
- Suspicion of chorioamnionitis / Sepsis
- Labour augmented with syntocinon
- Prolonged labour
- Instrumental delivery
- Retained products of conception

**Plan to measure & record all blood loss**
*(for pool deliveries estimation may be required)*

**Act**
**If woman at increased risk is:**
She suitable for EI blood *or* 2 units Xmatch? *Yes / No*
IV access required? *(at least 16 Gauge)* *Yes / No*

**Treat**
Planned an active 3rd stage management? *Yes / No*

*Completed by:* _____ *(Please print)*
*Date:* _____ *Time:* __:__ *Location* _____

### Stage 1

**>500ml ongoing blood loss**
*SVD & Instrumental deliveries*

**Get Help** *Time* *Initial*
Notify midwife in charge
Name: _____ *time arrived:* ___:___
Request HCA to assist with measurement

| *Other staff present* | *Designation* | *Time Arrived* | *Initial* |
|---|---|---|---|
| | | | |

**Act**

| | *Performed by* | *Time* | *Initial* |
|---|---|---|---|
| **Measure Blood Loss** *(cumulative measurement)* | | | |
| Record observations *on MEOWS every 10 min* | | | |
| IV access *at least 16 Gauge* | | | |

**What is the cause of bleeding?**
Tone, Trauma, Tissue, Thrombin *(please circle cause(s))*

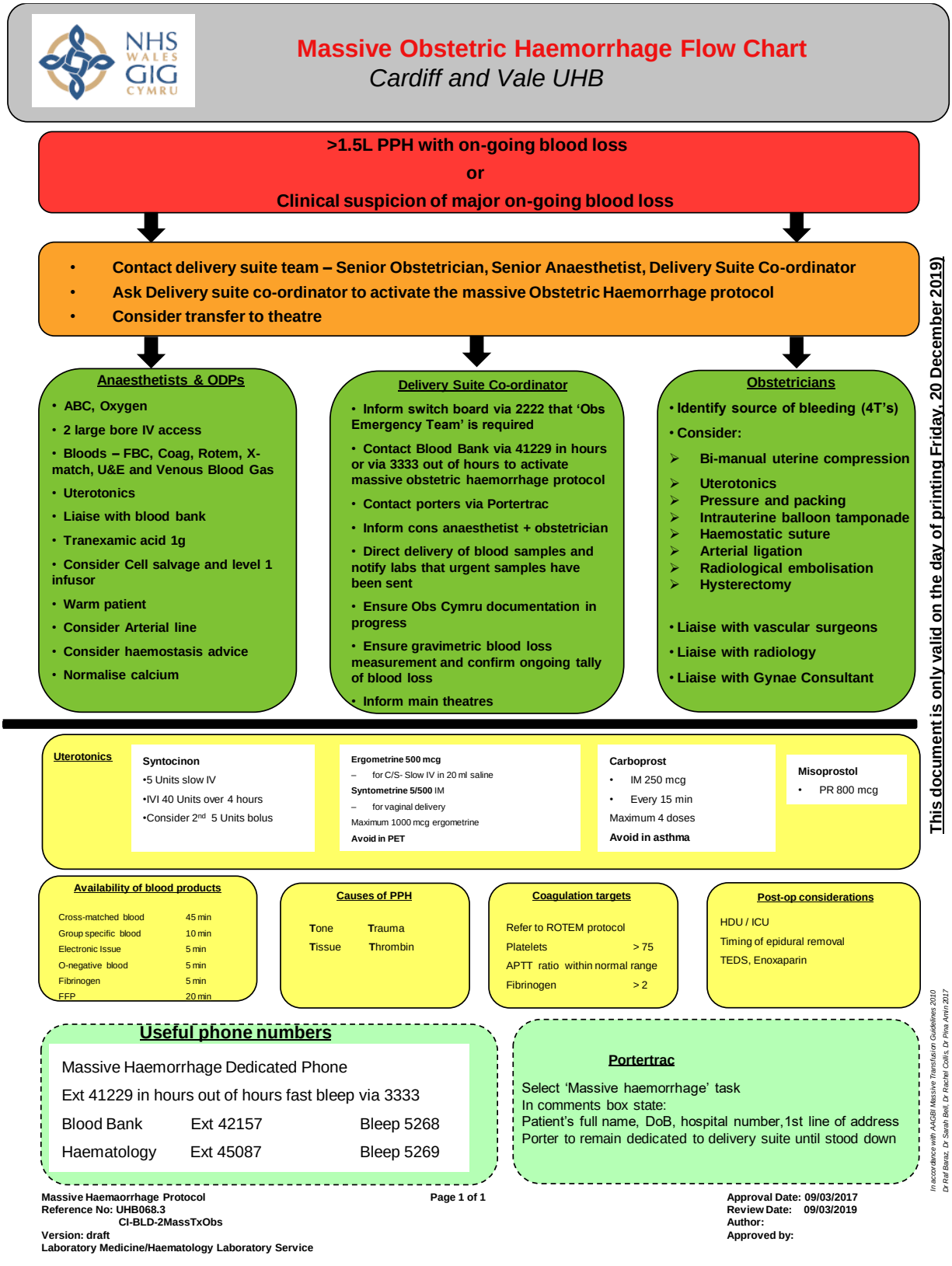
**Treat**

| | *Performed by* | *Time* | *Initial* |
|---|---|---|---|
| Uterine massage | | | |
| Give uterotonics *(record on over page & prescribe)* | | | |
| Inspect genital tract | | | |
| Empty bladder | | | |
| Check placenta & membranes | | | |
| Bimanual compression | | | |

**If bleeding stopped:**
- **Please record MBL here** _____ **ml**

*Completed by:* _____ *(Please print)*
*Date:* _____ *Time:* __:__ *Location* _____

## PPH: Appendix 2 Cardiff & Vale UHB PPH Flowchart

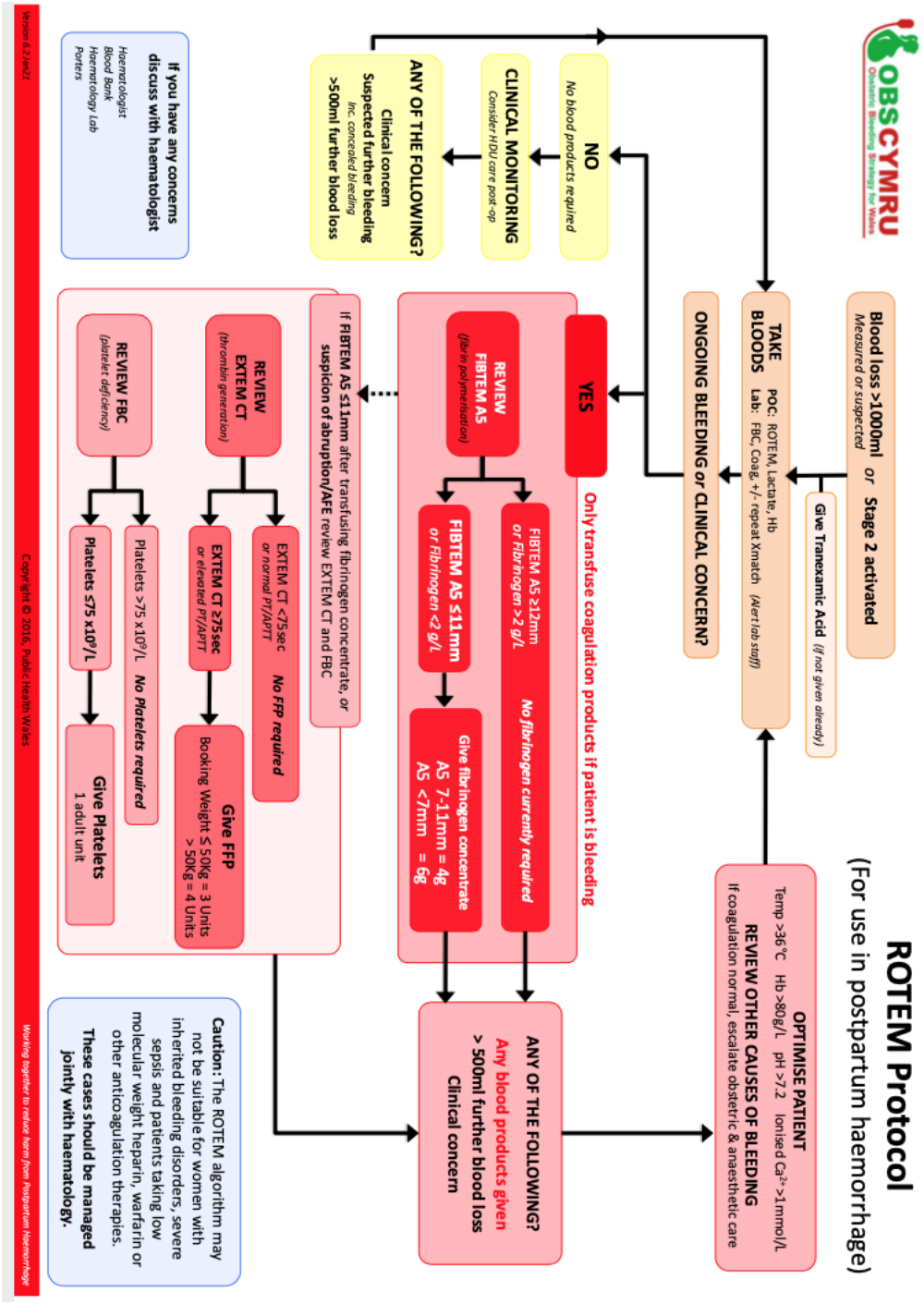


## PPH: Appendix 3 Portertrac

- Select “massive haemorrhage” task
- In comments box state patient’s full name, date of birth, hospital number and first line of address
- State where you want porter to go and what to do
  e.g., “Porter to take urgent blood samples from delivery suite to lab and return with 4 units red blood cells”

**Porter to remain dedicated to delivery suite until further notice**

## PPH Appendix 4: Algorithm for the use of FIBTEM during PPH follows:




## Difficult and Failed Intubation

### Pre-operative Assessment

**Ideally potentially difficult patients should be flagged up before it becomes an emergency.**

Clinical assessment of airway and risk of difficult intubation (can be performed in a matter of seconds):
• Mouth opening (should be greater than 5 cm or three finger breadths)
• Mallampati view (pharynx should be visible)
• Jaw protrusion (should be able to push the lower incisors anterior to the upper incisors)
• Neck movement (full, unhindered range of at least 90 degrees)
• Weight (original 'booking' weight less than 90 kg)
• Evidence or possibility of laryngeal swelling (severe pre-eclampsia or URTI)
If two or more of the above are abnormal - avoid general anaesthesia and/or summon senior help. The findings should be recorded on the anaesthetic chart.

**Equipment that Should be Immediately Available**:
• Selection of laryngoscopes (MAC 3 and 4).
• CMAC (MAC 3 and 4 and D-blade) and stylet.
• Other laryngoscope blades (short-handled, polio blade.
• Selection of tracheal tubes (including microlaryngeal tube or uncut size 5 tube).
• Gum elastic bougie.
• Selection of oral and nasal airways.
• Laryngeal mask airway (size 4).
• Surgical airway kit.

**Standard Precautions at Induction of Anaesthesia**:
• Ensure adequate pre-oxygenation to ETO2 of 0.9. Use nasal specs or THRIVE if available.
• Ensure proper positioning of patient – ideally head up, with head in best position, breasts not pushed into midline by folded-up arms) – this may require pillows under the shoulders as well as the head, but can usually be optimised using the operating table. The chin should be above the height of the breasts.
• Use Oxford HELP pillow when appropriate.
• Ensure adequate equipment (see above).
• Ensure all are briefed including what to do if things go wrong (plan A, B, C and D) as in GA checklist.
• Rapid sequence induction.

**Problems that might be encountered**:
Insertion of the Laryngoscope may be impossible because of:
• Suboptimal head and neck positioning. Ensure this is optimised prior to induction of anaesthesia.
• Cricoid hand in the way (adjust without releasing).
• Breasts in the way (retract breasts or use short-handled or polio blade laryngoscope) – use a rotational technique i.e., left molar approach – see below
• Relaxant has not had time to work **(wait – note the time the relaxant is injected)**
• Muscle rigidity (masseter muscle spasm from suxamethonium)
• Undiagnosed anatomical abnormality (should have been identified in pre-operative assessment)
• If unable to insert the laryngoscope, abandon attempts and proceed to Failed Intubation Drill.

**View at Laryngoscopy may be restricted**:
• If whole, or posterior portion of the glottis is visible, intubation should be possible (may need to use gum elastic bougie to guide tube).
• If only the epiglottis is visible, use bougie with a smaller than usual tube, e.g., size 6.5mm, and the tube should be rotated through 90 degrees anticlockwise to aid passage through the larynx.
• If epiglottis is not visible, try moving the hand applying cricoid, from left to right while maintaining a 'view 'of the larynx.

• If still no view, try reducing or releasing the cricoid pressure momentarily. Over vigorous application of cricoid pressure can occlude the cricoid ring and distort laryngeal anatomy. If still not visible, reapply cricoid pressure and attempt intubation using CMAC with the D-blade.

Even if the glottis is visible, be prepared for laryngeal/tracheal swelling and have a selection of tracheal tubes readily available.

If intubation has been achieved without full visualisation of the glottis, check tube position very carefully, confirming tracheal position by observing adequate capnography trace during a number of breaths (ideally 6) and if in any doubt, take it out!

Maintain cricoid pressure until completely satisfied with the position.

If intubation is deemed impossible, ask someone to contact senior assistance for help. Give clear, concise instructions and remain calm. Alert everyone in theatre that you have a problem.

The use of a video laryngoscope i.e., in our unit a disposable CMAC, the D-blade can increase the chance of success, but practice using beforehand on the manikin. Additionally, the left molar approach both with a video and conventional laryngoscope can improve your chance of a successful intubation.

**Maximum 3 intubation attempts,** otherwise **declare Failed Intubation**.

**Failed Intubation Drill**:

## OXYGENATE OXYGENATE OXYGENATE

• If suxamethonium was your chosen relaxant, do not give a second does.
• If used rocuronium, do not reverse at this stage.
• Maintain cricoid pressure.
• Ventilate the lungs with 100% oxygen (use oropharyngeal airway).

## **Aim to oxygenate the mother** (fetal wellbeing is second)

• if still unable to ventilate, carefully ease the cricoid pressure. Wrongly or too forcefully applied cricoid pressure can cause airway obstruction.
• Try 4 hand ventilation.
• If still unable to ventilate, insert **Laryngeal Mask Airway** (cricoid pressure will need to be released to allow insertion and then reapplied after the LMA is in place). **Maximum 2 attempts.**
• If still unable to oxygenate, **declare Can't Intubate, Can't Oxygenate**, declare emergency to theatre team, call for additional specialist help (ENT, ICU), give 100% oxygen, exclude laryngospasm, ensure neuromuscular blockade and **proceed with Front of Neck Access** (Cut Twist Bougie Tube). Blood will almost certainly flood the operative field, unlike the manikins that you have practiced on. Ensure correct placement using capnography before attempting ventilation for fear of causing extensive surgical emphysema of the neck if misplaced.

Once oxygenation is possible, the urgency of the need to continue with the anaesthetic should be considered based on the following:

| | Factors to consider | WAKE | | | PROCEED |
|---|---|---|---|---|---|
| Before induction | Maternal condition | • No compromise | • Mild acute compromise | • Haemorrhage responsive to resuscitation | • Hypovolaemia requiring corrective surgery<br>• Critical cardiac or respiratory compromise, cardiac arrest |
| | Fetal condition | • No compromise | • Compromise corrected with intrauterine resuscitation, pH < 7.2 but > 7.15 | • Continuing fetal heart rate abnormality despite intrauterine resuscitation, pH < 7.15 | • Sustained bradycardia<br>• Fetal haemorrhage<br>• Suspected uterine rupture |
| | Anaesthetist | • Novice | • Junior trainee | • Senior trainee | • Consultant / specialist |
| | Obesity | • Supermorbid | • Morbid | • Obese | • Normal |
| | Surgical factors | • Complex surgery or major haemorrhage anticipated | • Multiple uterine scars<br>• Some surgical difficulties expected | • Single uterine scar | • No risk factors |
| | Aspiration risk | • Recent food | • No recent food<br>• In labour<br>• Opioids given<br>• Antacids not given | • No recent food<br>• In labour<br>• Opioids not given<br>• Antacids given | • Fasted<br>• Not in labour<br>• Antacids given |
| | Alternative anaesthesia<br>• regional<br>• securing airway awake | • No anticipated difficulty | • Predicted difficulty | • Relatively contraindicated | • Absolutely contraindicated or has failed<br>• Surgery started |
| After failed intubation | Airway device / ventilation | • Difficult facemask ventilation<br>• Front-of-neck | • Adequate facemask ventilation | • First generation supraglottic airway device | • Second generation supraglottic airway device |
| | Airway hazards | • Laryngeal oedema<br>• Stridor | • Bleeding<br>• Trauma | • Secretions | • None evident |

Criteria to be used in the decision to wake or proceed following failed tracheal intubation. In any individual patient, some factors may suggest waking and others proceeding. The final decision will depend on the anaesthetist's clinical judgement.

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## Factors indicating the need to continue with surgery

This should ideally be assessed before induction of anaesthesia.
There is no option but to continue with surgery if:

- Maternal cardiac arrest
- Major obstetric haemorrhage.
- In both situations, evacuation of the uterus is fundamental to a successful outcome
- No easy alternative to general anaesthesia e.g., clotting disorder.
- Severe fetal distress.

If the procedure is elective or for failure to progress in labour or maternal distress, there is no urgent need to continue immediately with the anaesthetic.

If the airway has been secured with a tracheal tube passed through the LMA with the help of a fibrescope, the surgery can continue

## No Urgent Need to Continue

- Wake up and turn mother into lateral position.
- Utilise a regional technique
- If no fetal distress present, may use either a spinal or an epidural anaesthetic (or a combined approach). If an epidural is used, great care must be taken to avoid an inadvertent total spinal and the block should be established slowly.
- If there is fetal distress, a spinal may be preferable as it will allow surgery with minimum delay.

## Urgent Need to Continue

- Keep cricoid pressure applied (unless already removed to allow ventilation).

• If NDMR has not already been given, use a simple spontaneously breathing technique with whatever airway management was used in the initial establishment of ventilation.
• If NDMR has been given, then it is best to insert LMA if not already in place and ventilate.
• Senior obstetrician to operate.
• Inform neonatal team.
• Minimise aspiration risk: Maintain CP until delivery (if not impending ventilation). After delivery, reapply CP if signs of regurgitation. Empty stomach with gastric drain if using iGel. Minimise fundal pressure. Give IV ranitidine.
• Use any available agents and deepen anaesthetic as quickly as possible.
• Consider total intravenous anaesthesia.
• Ensure adequate depth of anaesthesia before commencing surgery - if too light, may get laryngeal reflexes to surgical stimulation.
• At end of surgery, if not already done, pass an orogastric tube to empty the stomach, turn to lateral position and recover in the head down position.

## Postoperatively

• Ensure that the patient has full control of her airway before handing over care to a nurse.
• Counsel the patient and give advice regards future management.
• If achieved front of neck access, this has to be reviewed by ENT surgeon. With a formal tracheostomy. Transfer to ICU.

In any situation where there has been difficulty with intubation, it is essential to extubate the patient when wide awake, warm, with adequate hydration and analgesia.

In any event, it should be possible to ensure that there is always an alternative if one method of management has failed. Always remember that failure to intubate does not in itself cause permanent harm, but failure to oxygenate does. Maternal oxygenation must, therefore, be the main objective in managing difficult or failed intubation in obstetrics whilst fetal wellbeing is a secondary consideration.

**Further reading**
*The 7 articles below are relevant to the successful management of an obstetric airway. You should have read them if you are doing an exam or intend to be an anaesthetist. We have a manikin in the office that allows you to practice some of the techniques recommended.*

1. DAS guidelines on Awake Tracheal intubation
https://onlinelibrary.wiley.com/doi/full/10.1111/anae.14904

2. Obstetric airway
https://das.uk.com/guidelines/obstetric_airway_guidelines_2015

3. DAS intubation guidelines/Unanticipated difficult Intubation
https://das.uk.com/guidelines/das_intubation_guidelines
https://academic.oup.com/bja/article/115/6/827/241440

4. Extubation
http://files.hsjc-anest.com/200000078-4866f4960e/guideline_extubacao_em_via_aerea_dificil.pdf

5. Failed intubation in obstetrics

https://www.anaesthesiajournal.co.uk/article/S1472-0299(10)00125-6/abstract

6. “Fail to plan, plan to fail”
http://vortexapproach.org
The cognitive approach discussed here is really important.

7. Am J Obstet Gynecol. 1946 Aug;52:191-205.
The aspiration of stomach contents into the lungs during obstetric anesthesia.
MENDELSON CL.
https://www.ajog.org/article/S0002-9378(16)39829-5/pdf

8. The left ear/left molar, right ear/right molar approach to maximising successful tracheal intubation with videolaryngoscopy-Anaesthesia 75, 11, 2020. 1552-1553
https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/full/10.1111/anae.15218.

## Unexpected Intrauterine Death

Causes of unexpected intrauterine death include (1):

- Maternal: Pre-eclampsia, Prolonged pregnancy, DM, infection, etc
- Fetal: Multiple gestations, IUGR, Congenital malformations
- Placental: Abruption, Vasa praevia, cord accident

### Complications include infection, coagulopathy and maternal distress (1)

It is important to maintain a high index of suspicion for women with a diagnosed of IUD and this must be maintained for the duration of their stay on delivery suite.

Women with delayed presentation of IUD or those with abruption can become critically unwell very quickly. Sensitive communication with the bereaved parents is crucial and should occur concurrently with medical management of the parturient. Trainees may wish to utilise SANDS multidisciplinary guidelines for professionals if they feel inexperienced in dealing with parents during this difficult time.

http://www.uk-sands.org

**Infection:**

This can cause severe maternal sepsis and a derangement in clotting, including disseminated intravascular coagulation (DIC).

This seems to occur after 16 weeks gestation and more commonly when the fetus has been dead for >4 weeks.

It should be considered whenever a patient with an IUD presents to the labour ward (1).

**Coagulopathy:**

The risk of a coagulopathy increases in the presence of placental abruption or uterine perforation (2).

Severe abruption resulting in death of the fetus by extensive separation of the placental bed is commonly associated with severe maternal adverse effects (3), including DIC, massive haemorrhage and renal failure. A high index of suspicion should be maintained as haemorrhage is often concealed and may only be revealed after delivery of the fetus and placenta.

Blood tests, including venous blood gas, FBC, U+Es, sample for cross match and coagulation studies including a Fibtem sample should be carried out urgently. Consider serial tests if there is clinical concern.

Early resuscitation of the mother including the identification and aggressive treatment of coagulopathy **prior** to delivery of the fetus is key to successful management.

You must inform the obstetric consultant anaesthetist on-call and liaise with haematology for coagulation advice if a patient has a fibrinogen level of **less than 2 g/l** or if there is clinical concern.

## Analgesia for labour following intrauterine death

It is not uncommon to be asked to provide analgesia +/- sedation for labour following an intrauterine death, in what are always difficult circumstances. Early discussion with the midwife and mother about pain relief options is important.

After confirmation of unexpected intrauterine death, FBC and clotting screen must be checked prior to epidural insertion to exclude sepsis and coagulopathy.

A helpful leaflet is available, which outlines the pain relief options following an IUD. Ask the midwife to offer to the mother and partner.

### Options for analgesia:

Add Entonox, paracetamol and NSAIDs as first option. Avoid NSAIDs in coagulopathy and sepsis.

PCA – consider in all second trimester IUDs, <28 weeks
Morphine 1mg bolus or fentanyl 10mcg bolus, each with 5-minute lock-out time is usually effective.

**Remifentanil is not appropriate for mothers with an IUD.**

May need loading dose if in established labour, plus additional bolus doses on occasions. Using IV opioids has the addition benefit of providing the mother with some sedation during labour and delivery, although this is not considered beneficial for mothers dealing with the aftermath of an IUD in pregnancy.

Hourly monitoring of respiratory rate, sedation score and SpO2 is mandatory.

Epidural – Consider as 1st line analgesia management for all mothers in 3rd trimester, >28 weeks or on request if <28 weeks gestation if safe to do so

- Follow usual labour ward procedure - It is crucial to exclude systemic sepsis or coagulopathy.
- If CS is required (although rarely), a regional technique can be performed but it is a distressing for everyone and often best managed with a GA, especially in the presence of sepsis or coagulopathy.

References:

1. M. Gunawardana et al. SLCOG guidelines, 3.Management of Intra-uterine death; p 60-3
2. Andrew D. Maslow. Prevalence of coagulation abnormalities associated with intrauterine fetal death . *Canadian Journal of Anaesthesia* 1996; **43**: 1237-43
3. Leunen K, Hall DR, Odendaal HJ et al. The profile and complications of women with placental abruption and intra-uterine death. *Journal of Tropical Pediatrics* 2003;**49**:231-4.

## Therapeutic Feticide

•Most feticides are now done in fetal medicine under oral analgesia and oral sedation. However, occasionally the anaesthetist will need to get involved for the very anxious patient or difficult procedure.
•If on moral or ethical grounds you feel unable to help, then ask the midwife in charge first thing in the morning if a feticide is planned and contact senior SpR or consultant in good time to discuss case.
•Assess patient on admission.

### Options for analgesia:

- PCA – Morphine 1mg bolus, 5-minute lock out (should be set up on admission), is usually successful. May need additional bolus doses on occasions.
- Epidural - usual labour ward procedure
    - The mother can have a light diet up to four hours prior to procedure.
    - Small quantities of water or isotonic sports drink (still) can be drunk.
    - Insert 16-G cannula.
    - Give oxygen via Hudson mask.
    - Give Midazolam 1mg incrementally for initial potassium injections, up to 5 mgs.

•This procedure can be conducted in room without an anaesthetic machine, but an Ambu bag must be available, although not necessarily in room.

## Guidelines for transfer of women from Maternity Unit to Critical Care Unit

- Where possible, women should be cared for on the delivery suite with multi-professional care provided by Obstetricians, Anaesthetists and Midwives with opinions sought from other specialists as appropriate.
- There must be a dedicated area on delivery suite, appropriately staffed and equipped, to look after high-risk women in the ante- and postpartum periods.
- When the level of monitoring or degree of nursing care required exceeds that which can be provided on delivery suite, then the patient should be transferred to a Critical Care area.
- The presence of invasive haemodynamic monitoring is not necessarily an absolute indication for transfer.
- The decision to refer a patient to critical care will be made jointly by the Consultant Obstetrician and Anaesthetist responsible for the care of the patient. They will liaise with the Consultant Intensivist to expedite timely and appropriate transfer.
- Transfer may be required either because of a complication of pregnancy or delivery or because of pre-existing co-morbidity in a patient with an uncomplicated delivery.
- In patients at high risk of complications in the puerperium, (e.g. uncorrected complex congenital heart defects) elective transfer should be considered.
- Failure of one or more major organs/systems would always require transfer (e.g. patient requiring ventilatory support or continuous inotropic support of the cardiovascular system).
- Mild to moderate impairment of one or two organs/systems can often be managed on the delivery suite (e.g. minor clotting abnormality and renal impairment in a patient with pre- eclampsia). However, if there is a trend towards worsening of the impairment or an increase in the number of systems impaired, then consideration should be given to transfer

## Patients with opioid dependency

Please refer to these joint anaesthetic midwifery guidelines available through the Clinical Portal. (Select “O&G” in Clinical Speciality, then “Guidelines for Obs and Gynae”, then scroll down “Midwifery Guidelines” in the left hand column)

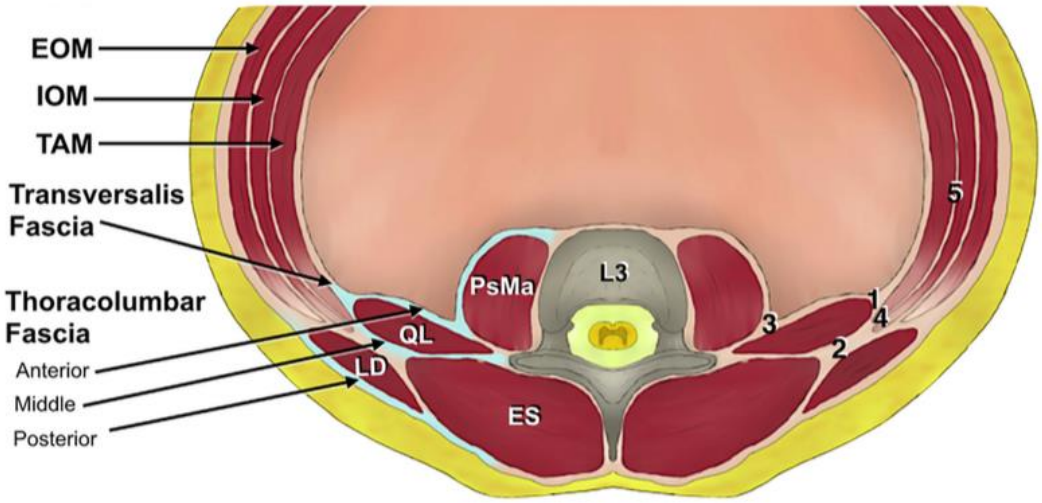
- Subutex- pain relief
  Guidelines for the management of pain relief in maternity inpatients prescribed Subutex (Buprenorphine)

- Substance abuse: guideline for the care of pregnant inpatients with opiate dependency

## Appendix 1 - Quadratus Lumborum Block for analgesia following LSCS

**Background**

The ventral rami of the spinal nerves pass over the anterior aspect of quadratus lumborum (QL), with the potential for T7-L1 to be covered by this block. Injection of local anaesthetic around the quadratus lumborum muscle promotes spread towards the thoracic and lumbar paravertebral spaces and towards the thoracolumbar fascia. Thus, QLBs have the potential to provide both somatic and visceral analgesia. Trials have demonstrated that QLB provides improved analgesia after caesarean section under spinal anaesthesia. Further research has

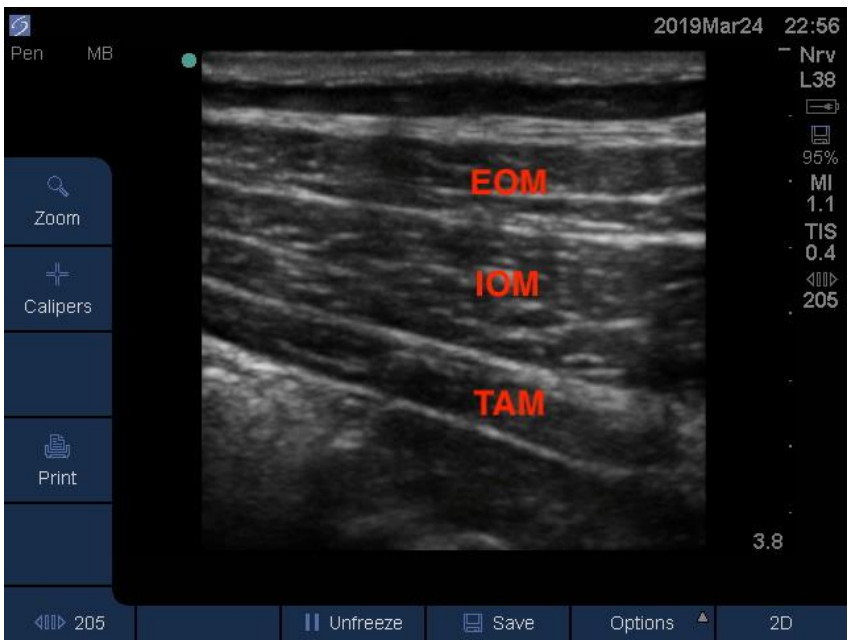



shown that QLBs provide superior analgesia compared to TAP blocks after caesarean section.

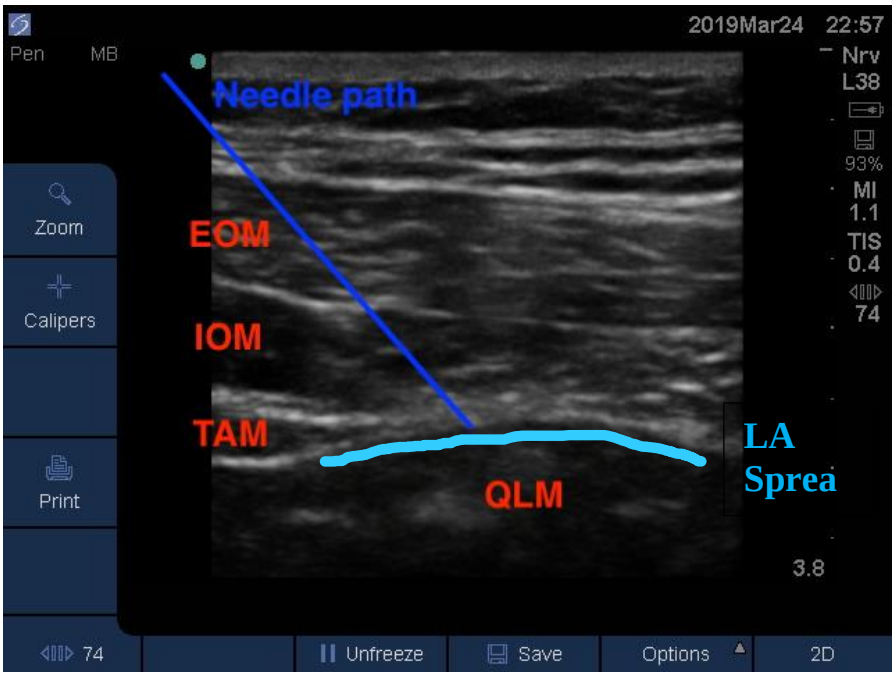
**Procedure**

Set-up and Material

- Position with patient supine/semi-lateral (with pillow under lumbar spine) or lateral
- Curvilinear or straight ultrasound probe depending on size of patient
- Ensure optimal depth and gain have been selected on the ultrasound machine
- 80mm block needle
- Position the probe transversely just above the iliac crest in the mid-clavicular line
- Identify the three abdominal wall muscles
    - External oblique (EOM)(superficial)
    - Internal oblique (IOM) (intermediate)
    - Transversus abdominis (TAM) (deep)



- Slide the probe posteriorly until you see the transversus abdominis muscle taper off to its aponeurosis (approximately at the level of the posterior axillary line), forming a roof over the quadratus lumborum muscle. Tilt/rotate the probe to optimise the image.
- Using an "in plane" technique the needle is passed in an anterior to posterior direction to the TAM aponeurosis. The needle must perforate the TAM aponeurosis/thoracolumbar fascia, giving a "pop".
- Local anaesthetic is deposited at this position at the tapered end of the TAM, at the lateral aspect of the QL muscle. Local anaesthetic should be seen spreading around the QL muscle.




**Dose/Volume**

| | Dose |
|---|---|
| 50-75kg | 20mls of 0.25% levobupivacaine bilaterally |
| >75kg | 30mls of 0.25% levobupivacaine bilaterally |

**Complications**

- Infection (so far not described in the literature)
- Trauma to viscera (so far not described in the literature)
- Nerve injury (so far not described in the literature). It is safe to perform QLBs under GA/Regional.
- Femoral nerve block (leading to quadriceps weakness) due to spread on local anaesthetic in the fascia-iliaca plane. This is less likely with weaker solutions of local anaesthetic such as 0.25% levobupivacaine)
- Local anaesthetic toxicity. Be careful to avoid toxic doses of LA following patients managed with epidural top-up in caesarean section.

**Proposed implementation**

- For analgesia following LSCS under GA.
- Supplementary analgesia for patients in who NSAIDs are contra-indicated at LSCS under spinal anaesthetic (i.e. PET with low platelets, NSAIDs withheld following significant PPH at LSCS).
- As rescue for breakthrough pain following LSCS under spinal.

# Appendix 2 – Postnatal Neurological Review Proforma

| Addressograph |
|---|
| |

**History**

| History of presenting complaint | |
|---|---|
| Onset & duration | |
| Sensory involvement | |
| Motor involvement | |
| Bladder/Bowel involvement | |
| Fever/Rigors | |
| Pre-existing neurology | |
| Labour/Mode of delivery | |
| Anaesthetic interventions | |
| Relevant drug history (anticoagulants/steroids/hypogylcaemics) | |

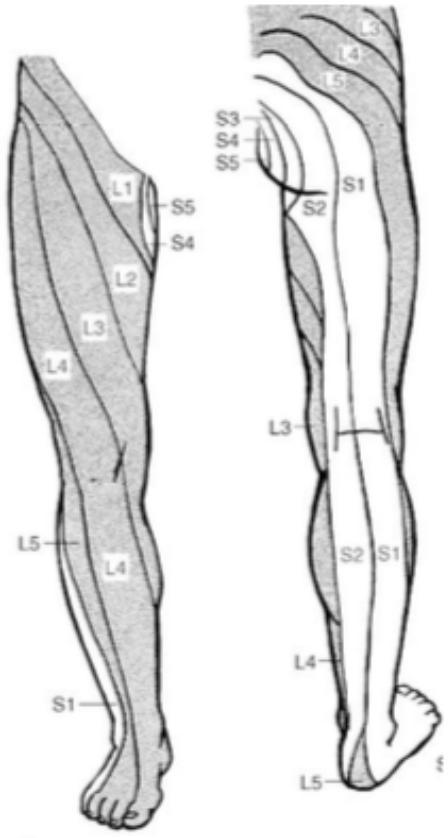
**Examination**

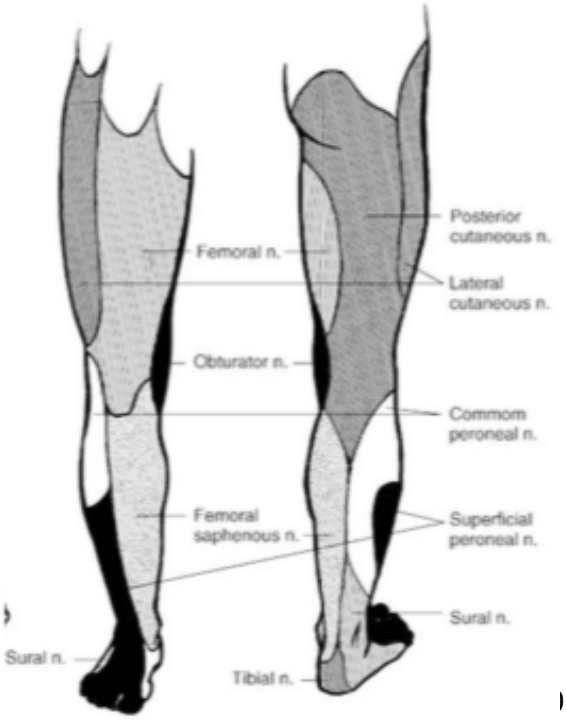
| **Observations** | | | |
|---|---|---|---|
| HR | | $SpO_2$ | |
| BP | | RR | |
| Temp | | | |

| **Tone** | **Left** | **Right** |
|---|---|---|
| | | |
| **Power** | **Left** | **Right** |
| L2 – Hip flexion | | |
| L3 – Knee extension | | |
| L4 – Ankle dorsiflexion | | |
| L5 – Long toe extension | | |
| S1 – Ankle plantar flexion | | |
| Anal tone | | |
| **Reflexes** | **Left** | **Right** |
| Knee (L3/4) | | |
| Ankle (S1) | | |
| Plantar reflexes | | |
| **Sensation** | **Left** | **Right** |
| Sensory deficit consider:<br>• Dermatomal distribution<br>• Cutaneous nerve distribution<br>(Lower limb maps on right) | | |

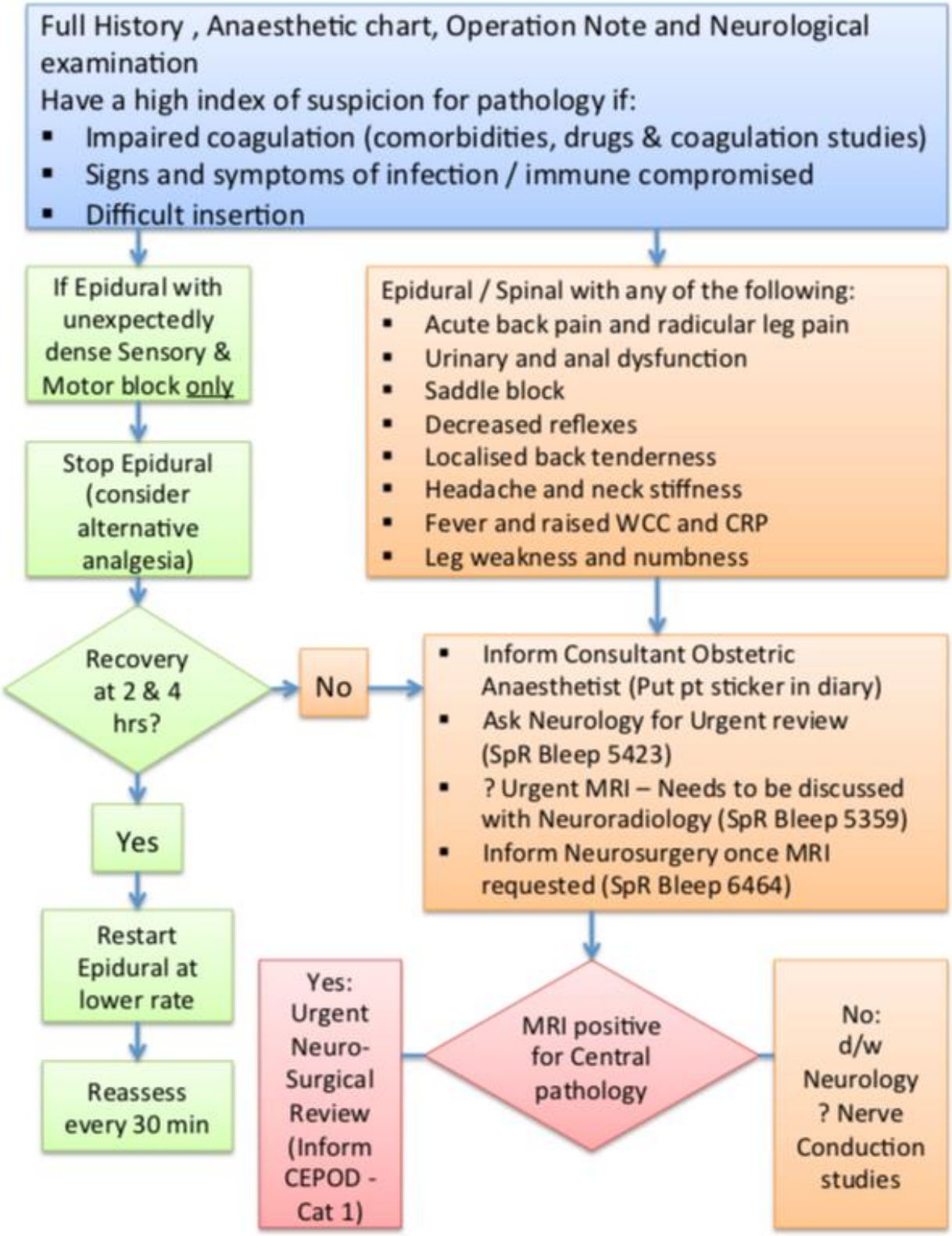
**Impression/Plan**

**Postnatal Neurological Review**



# MANAGEMENT OF NEUROLOGICAL DEFICIT FOLLOWING CENTRAL NEURAXIAL BLOCKADE



# Appendix 3

## Guidelines for the use of Intraosseous access on Labour Ward

### Introduction

Intraosseous (IO) access involves inserting a cannula into the marrow of a bone to provide a non-collapsible entry point into the systemic venous circulation. This technique is used in emergency situations to provide fluids and medications when attempts at intravenous access have failed. Studies have shown that the absorption of fluids and drugs into the central circulation is as at least as quick as from peripheral intravenous access, and that equivalent plasma concentrations of medications are achieved[1,2]. Intraosseous blood samples can be used for blood grouping and crossmatch[3], and correlate well with venous Hb, and most biochemistry, although potassium may be inaccurate[4].

### Suitable sites for IO access

| | |
|---|---|
| Proximal Tibia | 1cm inferior and medial to the tibial tuberosity |
| Distal Tibia | 3cm superior to the medial malleolus |
| Proximal Humerus | Internally rotate the arm by placing the patients hand over their umbilicus. |

The EZ-IO should be placed in the greater trochanter of the humerus 1cm above the surgical neck.

### Contraindications to IO access

Insertion in fractured bone
Infection at insertion site
Inability to locate anatomical landmarks
Previous orthopaedic procedure near insertion site
IO procedure in the same bone in past 24 hours

### Complications

Complications are rare, the most common being fluid extravasation following unrecognised misplacement. Other reported complications include: pain on injection, cellulitis/osteomyelitis, compartment syndrome, bone fracture & fat embolism.

### Infusions

Any drug that can be given by the intravenous route can be given via the I-O route.
Infusions will need to be administered under pressure to overcome the intra-osseous pressure of approximately 30mmHg.

## Insertion Technique

1) Identify insertion site
2) Disinfect skin & maintain asepsis during insertion
3) Inject 1% Lignocaine under the skin & infiltrate down to the peri-osteum
4) Prepare infusion system & ensure driver and needle set are securely seated
5) With the needle at a **90-degree angle to the bone**, insert without activating the drill until the tip touches bone.
6) **Ensure at least 5mm of the needle is visible above the skin.** The black mark 5mm distal to the needle hub **must** be visible once the needle tip has made contact with the bone, prior to commencing drilling.
7) Penetrate bony cortex by squeezing driver trigger and applying **gentle, steady downward pressure**. Release driver trigger when a 'give' is felt, upon entry into the medullary space. Let the drill driver do the work.
8) Remove driver and stylet. Attach extension set. Confirm correct placement by aspirating blood. Send **samples labelled as Intra-osseous.**
9) **Flush catheter with 10mls saline** and check for limb swelling and increased resistance. Remember, **no flush, no flow**.
10) If pain on injection, consider slowly injecting 2-4mls 1% Lignocaine
11) Secure IV access with dressing supplied
12) Connect IV fluids with pressure bag.
13) Remove IO catheter within 72 hours.

Only ONE insertion attempt must be made on any one suitable bone. This is because multiple punctures can result in extravasation of the pressurised fluid injection from the marrow space into the surrounding tissue, and consequent compartment syndrome.

**Indication** – Any situation where IV access is urgently required but is difficult/unsuccessful

**Contraindications** – Fractured bone, local infection, previous orthopaedic procedure at insertion site, IO access in same bone in previous 24 hours

**Insertion sites**

**Proximal tibia**
Below and medial to Tibial tuberosity



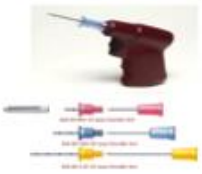
**Distal tibia**
3cm superior to Medial Malleolus



**Proximal humerus**
Adducted and internally rotated arm, into greater trochanter
1cm above surgical neck



**Technique**
Choose appropriate needle size & ensure needle correctly seated on drill. Clean & prepare area, maintaining asepsis during insertion. Infiltrate 1% Lignocaine under skin & down to periosteum



Insert at 90° to skin, without activating drill, until contact with bone is made. Ensure at least 5mm of needle clearance above skin.




Using gentle, steady pressure deploy drill and advance until 'give' is felt. Stop. Remove stylet, and confirm position by aspirating blood. Mark all samples intra-osseous.



Attach connector and flush rapidly with 10ml Saline.
Extravasation indicates incorrect placement. Remove and attempt on a different bone.

For pain on injection consider slowly injecting 3-4mls of 1% Lignocaine
Secure with IO dressing.



# Appendix 4

## Standard Operating Procedure: Medicines for Immediate Use by the Anaesthetist in Obstetric Theatres

| | | | | | |
|---|---|---|---|---|---|
| **Reference No**: | *38* | **Version No:** | 4 | **Previous Trust / LHB Ref No:** | |

| | |
|---|---|
| **Documents to read alongside this Policy , Procedure etc (delete as necessary)** | |

**Classification of document:** Departmental

**Area for Circulation:** Obstetric theatres at Cardiff & Vale UHB

**Author/Reviewee:** Rafal Baraz – Consultant Anaesthetist

**Executive Lead:** Ceri Chinn – Lead Nurse

**Group Consulted Via/ Committee:** Directorate governance forum

**Approved by:** Directorate governance forum

**Date of Approval:**

**Date of next review:**

**Date Published:** February 2016

**Disclaimer**
**When using this document please ensure that the version you are using is the most up to date either by checking on the UHB database for any new versions. If the review date has passed please contact the author.**

**OUT OF DATE POLICY DOCUMENTS MUST NOT BE RELIED ON**

| Version Number | Date of Review Approved | Date Published | Summary of Amendments |
|---|---|---|---|
| 1 | April 2014 | April 2014 | First version.<br><br>** This procedure must be reviewed after one year. Then it may be reviewed every three years.* |
| 2 | January 2016 | February 2016 | Reviewed and rolled over |
| 3 | September 2019 | September 2019 | Reviewed and rolled over |
| 4 | | | |

Disclaimer
When using this document please ensure that the version you are using is the most up to date either by checking on the UHB clinical portal - Surgical Division Quality and Safety group and Obstetric & Gynaecology page - 'Guidelines' for any new versions. If the review date has passed please contact the author.

PRINTED DOCUMENTS MUST NOT BE RELIED ON

## 1. INTRODUCTION

As the majority of cases arriving to the obstetric theatres are emergencies, it is deemed important to have the routine emergency medicines immediately available for use by the anaesthetist. These drugs are necessary to maintain stability of maternal condition.

Following a multidisciplinary meeting in Nov 2012 on medicines management in obstetrics theatres, it was agreed that 'routine emergency medicines' (vasopressors, anticholinergic drugs and Oxytocin (Syntocinon)) should be made available for anaesthetists to use when needed in obstetric theatres. It is acknowledged that preparation of these medicines at the time of an emergency arising may carry more risk of drug errors[1] and cause unnecessary delay.

## 2. AIMS

**2a.** To provide clarity on medicines identified as 'routine emergency medicines', method of preparation and the roles and responsibilities of staff involved.
**2b.** To reduce risk of drug errors during preparation at the time of dealing with an emergency.
**2c.** To minimise delay in commencing anaesthesia during emergency obstetric procedures.
**2d.** To reduce risk associated with drugs being misplaced or wrongly prepared.

## 3. DEFINITION

'Routine Emergency Medicines' in this document include: two vasopressors (phenylephrine and ephedrine), two anticholinergics (atropine and glycopyrronium) and oxytocin (syntocinon).
The anaesthetic practitioner must have successfully completed the UHB Medicines Management Course prior to drawing up these drugs.
The preparation of routine general anaesthetic drugs are not included in this document.

## 4. PROCEDURE

**4a**. The following drugs should be **drawn up/prepared** by the anaesthetist or anaesthetic practitioner (ODP or Registered Nurse) whenever possible (preferably whilst re-setting the theatre for next case:

1. **Ephedrine bolus**: 30mg in 1ml ampoule is diluted in 9ml of 0.9% sodium chloride (total volume 10ml).
2. **Phenylephrine bolus**: Pre-filled 10ml syringe provided by pharmacy (500mcg/10ml). No dilution is required.
3. **Oxytocin (syntocinon) bolus**: 10 International Units in 1ml ampoule is diluted in 9ml of 0.9% sodium chloride (total volume 10ml) then split into 2 x 5ml syringes.
4. **Oxytocin (syntocinon) infusion**: 40 International Units diluted into a bag of 500ml compound sodium lactate (Hartmann's solution).

**4b.** All drugs, at the time of preparation, must be checked/double confirmed by a second responsible healthcare professional (anaesthetist or anaesthetic practitioner).

**4c.** All drawn up drugs must also be clearly signed/initialled, timed and dated on the appropriate label (a second label may be used if required).
**4d. Any drawn up drugs that are not used within 24 hours must be discarded.**
**4e**. The following drugs may be **prepared** (set out but not drawn up) by the anaesthetist or the anaesthetic practitioner to facilitate drawing up when required:

1. **Atropine**: 600mcg in 1ml ampoule.
2. **Glycopyrronium**: 600mcg in 3ml ampoule.

**4f.** Phenylephrine, ephedrine, atropine and glycopyrronium may all be placed in one tray and should stored in a cupboard and only taken out when needed.
**4g.** Oxytocin (syntocinon) bolus and infusion should be stored in the theatre fridge.
**4h.** Any other drug not listed above should not be placed routinely unless specifically requested by the anaesthetist(s).
**4i.** In emergency situations, the anaesthetist may ask the anaesthetic practitioner to prepare/draw drugs that are not in the above list.

**4j.** In all situations when drugs are drawn up, ampoules and diluents must remain with the syringes for double confirmation.

## 5. ACCOUNTABILITIES AND RESPONSIBILITIES

Effective communication and checks of both parties are keys to the safe implementation and sustainability of this SOP.
Both anaesthetic practitioner and anaesthetist are individually responsible for applying standard medicines checks at the appropriate times.
The anaesthetist administering the drug will be responsible and accountable for the final checks prior to administration.

## 6. TRAINING

**6a.** Any anaesthetic practitioner working under this SOP must have successfully completed the UHB Medicines Management Course
**6b.** Any anaesthetic practitioner working under this SOP must attend a training session on implementing this SOP.
**6c.** This training must be recorded in the anaesthetic practitioners training record. This is to be carried out by providing evidence to the theatres professional development team who will maintain a register of staff able to work under this SOP.

## 7. IMPLEMENTATION

The Anaesthetic Clinical Leader will ensure implementation in Obstetric Theatres (a role which can be delegated to a named member of the team who holds professional registration as a Nurse or ODP).

## 8. EQUALITY IMPACT AND ASSESSMENT

This procedure has had an equality impact assessment which has shown that there should be no adverse effect on or discrimination against any particular individual or group.

## 9. AUDIT

It will be necessary to ensure that Obstetric Theatres are adhering to the requirements of this SOP. Audit of compliance against these guidelines will be undertaken periodically during routine observations of practice.

## 10. DISTRIBUTION

Once this SOP is approved by the Directorate Governance Forum, it will be available:

- on the UHB intranet pages.
- on the Obstetrics and Gynaecology home page under ‘Obstetric Guidelines’.
- in the obstetric anaesthetic guidelines.

## REFERENCES

1. Sarah E McDowell, Harriet S Ferner and Robin E Ferner. The pathophysiology of medication errors: how and where they arise. *Br J Clin Pharmacol.* 2009 June; p.67

# Appendix 5

## Standard Operating Procedure: Epidural Blood Patch for Management of Obstetric Post Dural Puncture Headache

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Date Published: January 2024
Date of next review: January 2027

1. **INTRODUCTION:** Post-dural puncture headache (PDPH) is a recognised complication of neuraxial blockade with potential significant maternal morbidity and even mortality. In the 2009 - 2012 MBRRACE report, two deaths were attributed to the unrecognised complications of dural puncture, where the lack of adequate follow up and communication with primary care services being a contributory factor. Following this, the Obstetric Anaesthetists' Association (OAA) set up a working group to produce evidence-based guidelines to aid clinicians in the management of obstetric PDPH[1,2]. More recently, consensus practice guidelines on PDPH have been published[3].
   Epidural blood patch (EBP) is the gold standard treatment of PDPH and should be considered for patients with severe symptoms, including those experiencing difficulties performing daily activities and/or those with symptoms refractory to conservative measures. There remains significant variation in the approach to PDPH and epidural blood patches in the UK and, and similarly within Cardiff and Vale UHB with the lack of standardised guidance on documentation, consent and follow up.
   A retrospective audit of accidental dural puncture (ADP) rate within Cardiff and Vale UHB Maternity Unit between 1st January 2018 and 31st October 2020 showed an ADP rate of 1.3%. There were at least 63 ADP from 4837 epidural procedures, and 38 epidural blood patches were performed. Issues with inconsistent documentation and follow-up were highlighted in the audit[4].
   Proformas have been shown within medicine to improve documentation standards. We plan to introduce an EBP procedure proforma, which will be filed in the patient maternity notes, alongside a standard operating procedure for EBP for obstetric PDPH for all patients.
   Devices incorporating the NRFit ISO 80369-6 for all neuraxial and regional blocks were introduced in CAVUHB on 15th October 2023. Given the combination of intravenous luer connector and epidural NRFit connector required for an EBP procedure, this SOP outlines the revised equipment needed.

2. **DEFINITION:** PDPH is a specific headache caused by large CSF leak following accidental dural puncture with an epidural needle or after spinal anaesthesia. It usually presents as a frontal or occipital headache with a typical postural element (worse with sitting or standing and relieved by lying flat). It may also be associated with neck/shoulder stiffness, neck pain, back pain, vision changes (blurred vision and photophobia), auditory changes (tinnitus or even hearing loss) and nausea.
   Most PDPHs occur within 72 hours after a dural puncture and resolve within two weeks if untreated. Headaches lasting as long as three months have been reported. When severe, it can be very debilitating to the mother especially while nursing her newborn baby, with the potential of further complications such as a subdural haemorrhage or chronic headache. The headache is often worse or has a longer duration following a dural puncture with an epidural needle compared to a pencil point small bore spinal needle.

Epidural blood-patch describes the procedure of injecting a small volume of autologous blood into the epidural space and reducing further CSF leakage to alleviate the symptoms of the low pressure headache. Venous blood is withdrawn from the patient and injected into either the same space or the space below the original site of dural puncture.

3. **AIMS:** This Standard Operating Procedure aims to:
   3.1 Provide clarity on the pre-procedural information, decision-making and consent process prior to EBP in obstetrics.
   3.2 Clarify the revised equipment needed since the introduction of NRFit connectors.
   3.3 Provide standardised documentation of the procedure for the maternity notes.
   3.4 Provide clarity on the post-procedure management and follow-up arrangements after discharge.

4. **SCOPE:** Any patient identified as being symptomatic of post dural puncture headache and has received initial follow up +/- conservative management.

5. **PRE-PROCEDURE PROCESS:** Once a patient has been identified as being symptomatic of PDPH, the following process should be followed. A thorough history and examination should be performed to exclude other potential causes of headache including a Consultant Anaesthetist review, which is documented in the patient's maternity notes.
   5.1 Cardiff and Vale PDPH patient information leaflet should be provided to the patient.
   5.2 Conservative management measures should be attempted:
      5.2.1 Bed rest may provide symptomatic relief but there is no evidence to support its routine use
      5.2.2 Maintenance of adequate hydration (may include intravenous fluids in patients struggling with refractory vomiting)
      5.2.3 Regular multimodal analgesia including Paracetamol and NSAIDs where appropriate, and short term use of an opioid e.g. Tramadol or Oramorph as an adjunct.
      5.2.4 Caffeine (up to 900mg per day) in the form of tea, coffee, coke etc in the first 24hours of symptoms is also encouraged.
   5.3 If conservative measures have failed and/or headache remains severe, an EBP should be considered provided more than 24 hours have passed since the dural puncture.
      5.3.1 Patients should be given the opportunity to discuss the pros and cons of EBP with a senior anaesthetist.
      5.3.2 Contraindications should be carefully considered including patient refusal, platelet count <100, any sign of systemic or localised infection and anti-coagulation treatment.
      5.3.3 The timing of administration of the last prophylactic low-molecular weight heparin should be more than 12 hours pre-procedure.
      5.3.4 There is no absolute requirement for a FBC, CRP or clotting screen to be performed prior to performing the EBP if the patient is well.

6. **CONSENT:** informed written consent should be obtained using the standard Cardiff and Vale UHB consent form, and includes an explanation of:
   - Risk of further accidental dural puncture and worsening headache ~1%
   - Success rate of treating headache - 1st Epidural Blood Patch ~70%
   - Success rate of treating headache - 2nd Epidural Blood Patch >90%

- Transient back pain or paraesthesia in the legs when blood is injected into the epidural space is common ~50%
- Mild post-procedure back pain and bruising of the back is common
- Neurological complications: nerve damage, arachnoiditis and spinal haematoma are rare.

7. **EPIDURAL BLOOD PATCH PROCEDURE:** Once the pre-procedure process has been completed, including formal written consent, the patient should then be provided with a date and time for the procedure with clear communication with the Band 7 for Delivery Suite and obstetric theatre staff. The EBP procedure should take place in the obstetric operating theatre with appropriate personnel – a Consultant Anaesthetist, 2nd anaesthetist and one anaesthetic practitioner should be present and roles allocated. One anaesthetist is needed for blood withdrawal and the other to perform the blood patch. The intervertebral level of the suspected CSF leak from the initial procedure should be checked prior to EBP. An appropriate spinal level, ideally the same level or level below the dural puncture should be selected. Separate sterile procedure trays for blood withdrawal and epidural placement should be prepared as follows:

   7.1 Anaesthetist withdrawing the blood requires:
   - 365 procedure pack
   - 21G NRFit butterfly needle
   - NRFit syringes (10ml and 20ml)
   - ChloroPrep for skin

   7.2 Anaesthetist performing the blood patch requires:
   - 365 procedure pack
   - 16G NRFit Epidural minipack
   - Lidocaine 1% (10ml)
   - Saline 0.9% (20ml)
   - Chlorhexidine spray

   7.3 The anaesthetist performing the EBP should follow the standard epidural technique with the patient either in the sitting or lateral position. The epidural space should be identified with a high level of confidence that the epidural needle is not in the intrathecal space. As soon as epidural space is identified, the 2nd anaesthetist should withdraw 20-30ml of autologous blood from an arm vein and pass to the other anaesthetist to immediately inject into the epidural space. Blood should be injected slowly and the patient should be warned about pain or discomfort during injection.

   7.4 Standardised documentation of procedure – the CAVUHB EBP proforma must be completed and placed in notes, as well as written documentation in the notes to confirm procedure and EBP proforma completed. The procedure should be also documented in the anaesthetic green book and the anaesthetic e-database

   7.5 Regular 30 minute observations (pulse, BP, temperature) should be performed for first 2 hours following the procedure. There is no evidence for routinely taking blood cultures or giving empirical antibiotics at time of EBP.

8. **LONG TERM COMPLICATIONS AND FOLLOW UP:** There is an association between PDPH and chronic headache, backache, neckache, depression, cranial nerve palsy, subdural haematoma and cerebral venous sinus thrombosis. Women who receive EBP should be reviewed at 2 hours following the procedure to agree a plan for on-going management

and/or discharge with oral analgesia. If they remain in hospital, they should be reviewed daily. Those that are discharged should be contacted by telephone the next day.
All patients with PDPH should be discharged with written information (see CAVUHB PDPH leaflet) about the condition and contact information given for direct communication with the obstetric anaesthetists if needed.
A repeat EBP may be considered in those patients who experience partial but incomplete improvement in symptoms or where, with other causes ruled out, a re-occurrence of symptoms occurs. Patients with worsening symptoms despite EBP, changes in the nature of the headache or new neurological symptoms should be considered for neuroimaging with appropriate specialist input. Those providing on-going care for patients who receive EBP, in the community, such as midwives and GPs should be made aware by letter or discharge summary on Welsh Clinical Portal (WCP).
Consideration should be given to anaesthetic clinic follow-up at 6 weeks for any complex PDPH or EBP. Follow up should continue until complete resolution of symptoms.

9. **ACCOUNTABILITIES AND RESPONSIBILITES:** It is the performing anaesthetist's responsibility to ensure that the consent form and EBP proforma is completed and inserted into the patient's maternity notes. The electronic database and procedure book should also be completed. Comprehensive handover of PDPH and EBP patients under review must be completed at each shift change. It is the responsibility of the anaesthetist performing the EBP to complete a GP letter/discharge summary on WCP – see letter template on Delivery Suite desktop.

10. **DISTRIBUTION:** This SOP and proforma will be available on the UHB intranet pages once approved by the O&G Quality and Safety group and on the Obstetric & Gynaecology home page under 'Obstetric Guidelines'.

**11. REFERENCES:**


1. Russell R, Laxton C, Lucas DN, Niewiarowski J, Scrutton M, Stocks G. Treatment of obstetric post-dural puncture headache. Part 1: conservative and pharmacological management. Int J Obstet Anesth. 2019 May;38:93-103. doi: 10.1016/j.ijoa.2018.12.006. Epub 2018 Dec 21. PMID: 30711240.

2. Russell R, Laxton C, Lucas DN, Niewiarowski J, Scrutton M, Stocks G. Treatment of obstetric post-dural puncture headache. Part 2: epidural blood patch. Int J Obstet Anesth. 2019 May;38:104-118. doi: 10.1016/j.ijoa.2018.12.005. Epub 2018 Dec 22. PMID: 30711239.

3. Uppal V, Russell R, Sondekoppam R, Ansari J, Baber Z, Chen Y, DelPizzo K, Dîrzu DS, Kalagara H, Kissoon NR, Kranz PG, Leffert L, Lim G, Lobo CA, Lucas DN, Moka E, Rodriguez SE, Sehmbi H, Vallejo MC, Volk T, Narouze S. Consensus Practice Guidelines on Postdural Puncture Headache From a Multisociety, International Working Group: A Summary Report. JAMA Netw Open. 2023 Aug 1;6(8):e2325387. doi: 10.1001/jamanetworkopen.2023.25387. PMID: 37581893.

4. Kirby J, Baraz R, Operator risk factors for accidental dural puncture rate in obstetrics, Int J Obstet Anesth. 2021 June. DOI:https://doi.org/10.1016/j.ijoa.2021.102996

5. https://www.npeu.ox.ac.uk/assets/downloads/mbrrace-uk/reports/Saving%20Lives%20Improving%20Mothers%20Care%20report%202014%20Full.pdf


**12.** Proforma: See appendix 6.

# Appendix 6

## Epidural Blood Patch proforma

**Cardiff & Vale University Health Board Maternity Unit**
**Management of Post Dural Puncture Headache (PDPH)**
**Epidural Blood Patch (EBP) Proforma**

Addressograph

**Pre-procedure**

- ☐ Documented history and examination in maternity notes
- ☐ Alternative causes of headache considered
- ☐ Alternative analgesia options discussed
- ☐ Local PDPH information leaflet shared with patient
- ☐ Recorded Observations: Temperature …… HR …… BP……
- ☐ Blood results reviewed (if applicable)
- ☐ Level of suspected dural tap …… Depth of Epidural Space ……
- ☐ Senior Review
- ☐ Last dose of Low Molecular Weight Heparin (Must be >12 hours) ……
- ☐ Written Consent obtained on Cardiff & Vale UHB Standard Consent Form to include:
    - Risk of further accidental dural puncture and worsening headache ~1%
    - Success rate of treating headache - 1st Epidural Blood Patch ~70%
    - Success rate of treating headache - 2nd Epidural Blood Patch >90%
    - Transient back pain or paraesthesia in the legs when blood is injected into the epidural space is common ~50%
    - Mild post-procedure bruising of the back
    - Neurological complications : nerve damage, arachnoiditis and spinal haematoma (rare).

☐ Time of EBP confirmed with Band 7 and Maternity theatre team

Procedure

Date …… Time……

Anaesthetist 1 (Epidural) …… Anaesthetist 2 (Blood) ……

Patient position ☐ Lateral ☐ Sitting

Level of Epidural Blood Patch ……..

Volume of Blood instilled ……

Notes/Complications

Signature:

Post Procedure Instructions

Instruct patient to lie flat for 1 hour until Time ……..

Midwife to perform HR, BP every 30 minutes

Instruct patient to sit up gradually over 2nd hour
Mobilise in 3rd hour post-procedure
Anaesthetist to review prior to discharge

- If headache resolved, agree plan for 24 hour telephone call
- If ongoing symptoms, agree plan for further management & document in maternity notes
- Ensure analgesia available on discharge/prescribed if headache returns
- Confirm time of next low-molecular weight Heparin (if applicable): ……
- Consider anaesthetic clinic follow-up appointment – Complete debrief proforma if indicated

☐ Letter to GP completed ☐ WCP Discharge summary completed
Record Procedure and Outcome in Green Book and on Anaesthetic e-database
Additional notes