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Swansea Bay University Health Board

Obstetric Anaesthetic Trainee Guidelines 2024

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Introduction

The delivery suite is a rewarding but demanding place to work for all grades of anaesthetists. However, this is especially true if this is your first experience of obstetric anaesthesia.

You have to be ready to give anaesthesia at very short notice, occasionally without the opportunity to undertake a thorough anaesthetic pre-assessment that you would usually perform. The pressure to proceed with anaesthesia particularly if there are foetal concerns can be very intense, but it is important to put the mother's wellbeing first at all times. Most category 1, emergency or 'crash' Caesarean sections can be anticipated. The mothers have often been on the labour ward for some time.

The key to surviving on the delivery suite is anticipating potentially challenging situations. This means having some knowledge of each of the patients in the labour rooms. Communicate with the other labour ward staff at regular intervals to ensure you have advance warning of any developing situations.

It is important to be part of the handover with the obstetricians at the beginning of each shift so you have an idea of their plans and concerns. You can consider attending Obstetric ward rounds. This is particularly important if patients are having HDU care.

The labour ward handover board is a multidisciplinary board so please use it to communicate and to note the name of the on-call team.

If you are concerned about a patient, contact senior anaesthetists as soon as possible. If the 2nd on is busy elsewhere, then call the consultant. Ensure that you always know who your senior cover is and how to contact them. Please update the name of the consultant every shift on the MDT board (using CLW). Call for help sooner rather than later and always notify the consultant of a serious labour ward emergency. The telephone numbers for internal use only are:

Cardiac arrest or obstetric emergency	2222
Major obstetric haemorrhage	3333
Resident Obstetric Anaesthetist (1st on call)	25857
Second on-call Anaesthetist	25854
Consultant Obstetric Anaesthetist 8:00-17:00	25858
Anaesthetic Assistant	25856

There are 3 keys on a lanyard to carry round with your phone. These are for the remifentanil pump, epidural pump box and one for the fridge in the anaesthetic room. Theatre keys for the CD cupboard are the responsibility of the midwife coordinator (or Anaesthetic Assistant when they are on labour ward). To gain access, one of these needs to be present.

Duties and Responsibilities of Obstetric Anaesthetist

On commencing a shift, the anaesthetic trainee must:

- **Handover**. Ensure that the incoming obstetric anaesthetist is fully informed about patients needing urgent reviews, those with epidurals or remifentanil PCAs, all obstetric HDU patients, antenatal patients with expected problems on ward 19 and post-op cases (recently postop or concern) including any patients who are of concern who need to be phoned at home. There is an Obstetric handover at 8:30 and 20:30 in the multidisciplinary (MDT) room.

Check in each theatre (main and back up):

- **Anaesthetic equipment:** Anaesthetic machines and intubation equipment. Bag-valve-masks are usually kept in the bottom drawer of the intubation trolley and cardiac arrest drugs are in the resuscitation trolley in the anaesthetic room. Check ETCO2 works.
- **IV access tray:** 16G and 14G cannula, 1% lidocaine, 2-3ml syringe, 25G hypodermic needle, tourniquet, dressing, flush and gauze
- **Emergency drugs:** on anaesthetic machine in each theatre. Either prefilled or draw up when used and refresh every 24 hours:
    - Ephedrine 30 mg pre-filled (or 3mg/ml, 10mls-drawn up)
    - Metaraminol 2.5 mg pre-filled (or 0.5mg/ml, 20mls-drawn up)
    - Atropine 1 mg prefilled (or 600 micrograms/ml, 1 ml drawn up)
    - Add Glycopyrrolate ampoule 200mcg/ml to the tray with needle and 5 ml syringe

In anaesthetic room fridge:

- **General anaesthetic drugs:** Ensure that at the start of each 24-hour duty period emergency drugs **ampoules are ready in a tray in the fridge with syringes, needles and labels**. It is your choice if you wish to draw them up, e.g. if you have a high-risk patient or personal preference. If drawn up or needles/syringes open, replace and label with date every 24 hours:
    - Propofol 200mg x 2 (with 20 ml syringe x 2 and blunt fill needles)
    - Thiopental 2.5% x 1 (some anaesthetists prefer it as alternative to propofol)
    - Suxamethonium 100mg x 2 (with 5 ml syringe, filter needle and label)
    - Rocuronium 50 mg x 2 (with 10 ml syringe, filter needle and label)
    - Atracurium ampoule with label
    - Syntocinon 1 unit/ml (supply varies between 5 units/ml and 10 units per ml). Draw up 1 unit/ml so that there is 5 units available in the fridge and label it. Ensure at the start of each case in the theatre that the Syntocinon is moved

out of the tray to avoid giving it in error too early. Be aware of the risk. *In some hospitals, this is routinely drawn up after delivery, but it becomes difficult to give 5 units slowly if the supply is 10 units/ml.*

- **Spinal anaesthetic trays:** Check that there are 2 spinal trays prepared and label them with date and time. Content:
    - Neuraxial opiate label – bright green
    - Cefuroxime 1.5 g ampoule, 20 ml syringe, drawing up needle, 20 ml sterile water and label
    - Metronidazole 500 mg/100 ml bag
        - Note that patients who have a severe penicillin allergy get Clindamycin 600mg and Gentamicin (for dosing table, see 'Eolas Medical' App)
    - Diclofenac 100 mg (suppository)
    - Ondansetron 4 mg ampoule with syringe, needle and label
    - Dexamethasone 6.6 mg with syringe, needle and label
    - Syntocinon 5 units (diluted to 1 unit per ml in 5 ml syringe), *see caution on Syntocinon above*

- **Phenylephrine:** add one ampoule (10 mg) of Phenylephrine from the drug cupboard to 100 ml 0.9% sodium chloride. Used drug added label for the bag. Label with Phenylephrine 100mcg/ml, date, time and your initials. Insert drawing up spike into bag to keep as sterile as possible. From this bag, draw up 2 x 30 ml amounts in 50 ml syringes, label and flush through a Protect-a-line 1 extension line with the coiled part of the line in the packet. Keep all the Phenylephrine in the fridge.

<u>Throughout the duty period the anaesthetic trainee should:</u>

- Be instantly available for labour ward to:
    - provide safe and effective anaesthesia for obstetric operative procedures
    - provide safe and effective analgesia for labour (remifentanil or epidural), ideally within 30 minutes of a request. Any potential delays should be referred to 2nd on anaesthetist
    - early anaesthetic review for any high-risk patients on labour ward e.g. pre-eclamptic, high BMI, twins.
    - review HDU patients with the obstetric team and join the obstetric ward round if clinically available at the time
    - assist with any obstetric emergency calls such as patients with PPH

- Complete audit forms for all patients who have an anaesthetic intervention and enter the details on the database on the PC in the anaesthetic office on labour ward
- Follow-up all postnatal patients who had an anaesthetic intervention and enter the details on the same database (see Postnatal ward round).

Pre-anaesthetic Checks for Patients Needing Surgery

History:
Patient anaesthetic, medical and obstetric history checked (if elective, anaesthetic chart seen, patient asked if they have further questions). See preoperative assessment.

Particularly check fasting time (should be starved for category 3 or 4 Caesarean birth)

Has omeprazole and metoclopramide been given? If GA likely, sodium citrate given in theatre 30 ml 0.3 M

Equipment and personnel:
Ensure the anaesthetic machine has been checked (should be done first thing in morning unless theatre in use at the time) as well as emergency equipment

Ensure your anaesthetic assistant is ready and has been told the plan and ensure the obstetrician and theatre team are ready

Drugs:
Emergency drugs instantly available (should be drawn up in the morning or drawn up fresh when used)

Anaesthetic drugs available – spinal tray and GA tray, phenylephrine.

WHO Checklist must be done:

- "Sign In" before neuraxial block or elective GA (see pink poster in theatre). With anaesthetic assistant, obstetrician ± scrub nurse. Use open questions to check patient details against wrist band and consent, e.g. "please confirm your name?" Consent form or wrist band could then be used for any transfusion as well as verbal confirmation if patient is awake
    - In category 1 Caesareans, there may be verbal consent for surgery only without a written consent form, so check verbally: patient name, DOB and address against their wristband. Wristband would then be used for any transfusion
    - For category 1 cases, use bottom right checklist box on WHO poster.
    - For GAs, use GA checklist A4 laminate which has intubation checklist and refers to the category 1 checklist
- "Time out" – done after neuraxial anaesthesia but before start of surgery (see pink poster in theatre
- "Sign out" – done when surgery finished but before patient leaves theatre. Ensure any connectors/Octopus lines/three-way taps are flushed to avoid drugs such as phenylephrine or muscle relaxants causing problems later

IV access:
IV access of acceptable gauge – if low risk of PPH, 1 x 16G cannula or if poor veins, 2 x 18 G cannula). 2 x 16 G if high risk of PPH, e.g. placenta praevia

Positioning:

- In elective situations, if a spinal is planned in sitting position, it is usually easier for the patient to stay sitting for the WHO sign in, IV access and connection to monitoring
- In an urgent case:
    - if there is not any fetal distress, place patient left lateral or supine with a 15° tilt of the bed to the left (with side supports) to reduce aortocaval compression. Continue any analgesia used in the room if possible, e.g. Entonox, remifentanil PCA
    - If there is fetal distress, and you are not ready to commence anaesthesia (e.g. patient history not taken or cannula not in place), place the patient in a full left lateral position (on her side) until ready to give the anaesthetic.
    - For Caesareans with high risk of impacted fetal head or failed trial of instrumental delivery, after insertion of spinal and confirmation of block height, it is useful to keep the legs in a low lithotomy position to allow midwifery access to push the fetal head up if necessary to aid delivery

Monitoring:
Full monitoring (ECG, NIBP, Pulse oximeter).

- If GA: check ET CO_2 works prior to induction.

In an emergency case midwife must monitor fetal heart on CTG

IV Fluid:
Commence 1L Hartmann's (warmed from warming cabinet if time allows) via a 3-way connector and ensure cannula is fast flowing. NICE guideline 192 is to use warm fluid routinely for volumes > 500 ml. For elective Caesareans, this can be dripped in at a moderate rate. If patient is emergency and dehydrated, run at rapid rate and ensure preload has been given before regional block if time permits. Caution in patients who are fluid restricted, e.g. severe PET or hyponatraemia. Check drip can run quickly by turning it on briefly and then keep off.

If the patient is diabetic and requires an insulin sliding scale, run this throughout surgery using a dedicated second cannula with a 2-way Octopus connector with Actrapid in one syringe attached to an Octopus connector and on the other Octopus limb, the usual fluid is 500 ml of 5% dextrose, 0.9% saline and 20 mmol KCl per 500 ml running at 50 ml/hour.

If diabetic: check blood glucose every 1 hour in theatre or every 30 minutes if on insulin sliding scale

VTE prophylaxis:

- TED stockings if elective, then add intermittent calf compression "Flowtrons" in theatre if Caesarean is planned (or replace TEDs with Flowtrons).
- If no time for TED stockings in emergencies, "Flowtrons" only

Antibiotic prophylaxis IV before knife to skin where practicable:

- Cefuroxime 1.5g and 500mg metronidazole (health board guideline on 'Eolas Medical' App)
- If the patient has a severe penicillin allergy, IV Clindamycin 600mg + gentamicin (for dosing, see 'Eolas Medical' App as dose varies with ideal body weight)

Other

- If a GA is planned, ensure the patient has a urine catheter and the abdomen is prepped and draped before GA drugs are given to minimize time from confirmation of intubation and anaesthetic adequacy to knife to skin
- There is normally "delayed" clamping of the umbilical cord until 1 minute after delivery of the baby (unless the baby needs urgent resuscitation or the umbilical cord is damaged) as this leads to higher Hb concentrations in the baby, decreased risk of iron deficiency and a greater vascular stability.

NICE Quality Standard 105. Intrapartum care. Last updated 28/02/2017
https://www.nice.org.uk/guidance/qs105/chapter/quality-statement-6-delayed-cord-clamping

Post Natal Ward Round

The purpose of the post-natal ward round is to follow up all patients that have had an anaesthetic intervention. All patients should be seen within 24 hours post-delivery.

Why?

- To pick up **complications** of anaesthetic (which has usually been a spinal or epidural), e.g. headache, residual sensory or motor block
- Check that post-delivery **pain control** is adequate
- Check that the mother was generally **satisfied** with the anaesthetic

Having a conversation and explaining about their anaesthetic care is helpful for some women, even when nothing has gone wrong, if for example, things were done in a hurry in an emergency (Ockenden review 2022)

If **significant issues** have occurred, especially where they may impact on anaesthesia management or anxiety during future childbirth, **offer outpatient review in the obstetric anaesthesia clinic** and email anaesthetic secretary in Singleton to arrange (include patient name, hospital ID and when review is required). For example, for patients with:

- Suboptimal epidural pain control with significant consequent distress
- PDPH
- Neurological complications
- Intraoperative pain including conversion to GA
- Awareness

Postnatal headache: see PDPH and differentials

Post-natal neurological deficits

These occur most commonly in women who have laboured and are usually due to neuropraxia from compression and stretching of nerve roots. However, in women who have had neuraxial procedures a full neurological examination including signs of vertebral pain and sepsis should be performed and documented. The proformas for documentation are available on ward 20 (labelled drawer in room with notes and whiteboards) or PC desktop in anaesthetic office on labour ward.

Discuss all patients with neurological deficits immediately with the consultant.

Important diagnoses not to miss include:

- epidural/spinal haematoma
- epidural abscess
- meningism
- cauda equina syndrome

If any of the above are possibilities, urgent imaging (CT/MRI) will need to be discussed and arranged, by phoning switchboard and asking for the neuro-radiologist at Morriston (though the CT or MRI will normally be performed in Singleton).

If the imaging is normal, follow-up may be arranged in the obstetric anaesthetic clinic or neurology clinic (discuss with consultant)

Remifentanil PCA

Remifentanil has been identified as an effective analgesic for use in the intrapartum period, better than pethidine or Entonox, good maternal satisfaction though not as efficacious as the gold standard, a labour epidural.

Onset approx. 1 minute, it offers analgesia that can be timed with contractions. Context sensitive half time is approx. 3 minutes. In common with other opioids, it may cause respiratory depression (apnoea, low respiratory rate, desaturation). It can cause dizziness, sedation, pruritus, nausea and vomiting. It crosses the placenta but has no clinically significant neonatal depressant effects at commonly used doses and in studies Apgar scores are unchanged and it is rapidly eliminated by the fetus.

Remifentanil can be given to any woman requesting its use if they are in established labour and **over 36 weeks' gestation**. Its use in women of gestation < 36 weeks must be discussed with the Consultant Anaesthetist.

IV drug abusers can be offered remifentanil in addition to their normal background analgesia.

Contraindications include:

- Allergy to opioids
- Other opioid administration in preceding **4 hours** (includes pethidine, codeine etc.)
- No PCA trained midwife to administer 1:1 care
- Relative contra-indications include gestation < 36 weeks or cases where an epidural would be better suited, such as:
    - pre-eclampsia
    - multiple pregnancy
    - high BMI > 45
    - obstructive sleep apnoea

Procedure:

- The patient must read the remifentanil PCA information leaflet and be made aware of potential side effects:
    - Dizziness
    - Drowsiness
    - Itching
    - Nausea or vomiting
    - It is common for patients to have some respiratory depression. 1 in 10 require Oxygen. Occasionally the PCA will need to be adjusted to a lower dose or discontinued due to pauses in breathing and very rarely, assistance with breathing may be required.

- Ensure that there is:

  - A midwife trained in remifentanil PCA for 1:1 care
  - SpO_2 monitoring of the mother continuous whilst remifentanil used
  - CTG monitoring of the baby established before the women starts the PCA and continuous whilst remifentanil used.
  - Nasal cannulae in the room
  - A dedicated cannula (usually 20G)

- Preparing remifentanil:
  - For patients ≥ 50 kg: 2mg remifentanil is drawn up by the anaesthetist and diluted into **50 ml saline**. This is 40 microgram/ml final solution concentration.
  - A dedicated remifentanil PCA pump must be used, set to deliver 1 ml (40mcg) bolus over 10 seconds with a 2 min lockout. This is the standard dose.
  - For patients <50 kg or with excessive side effects on the 40 microgram dose (e.g. apnoeas): a low dose programme is also available on the same pump (28 micrograms) which is the same concentration but is 0.7 ml as a bolus rather than 1 ml.

- **The anaesthetist must:**
  - **stay to observe the woman for the first 4 boluses of remifentanil.**
  - ensure it is prescribed on the **Remifentanil Chart** and PRN section of the **Drug Chart** and **ensure that any other opioids are discontinued.**
  - Check that omeprazole and TEDs are prescribed unless contraindicated
  - **Remind midwife of importance of staying 1:1** (as not all apneas are picked up by SpO2 monitoring) and if they need to leave the room for any reason, remind them to remove PCA button from patient and not to let anyone else press it)
  - ensure that the patient knows to press it as soon as a contraction starts to build (right at the onset of tightening)
  - let patient know that they are the only one who should push the PCA button for safety
  - Entonox can be used in addition though it is useful to see the patient's SpO2 without Entonox in the first few presses, to see if supplemental oxygen is required.

- Supplemental oxygen should be given if SpO2 <94%, to maintain SpO2 > 94-95%. If oxygen saturations drop, encourage patient to take some deep breaths.

The Anaesthetist must be contacted if any concern, if the patient no longer responds to voice (i.e. AVPU = P or U), if the respiratory rate is <8 (though this is intermittently monitored) or if SpO_2 < 90% despite oxygen via nasal specs.

See also WISDOM PCA guideline: Swansea Bay Maternity - WISDOM (nhs.wales)

Ronel I, Weiniger CF. Non-regional analgesia for labour: remifentanil in obstetrics. BJA Educ. 2019 Nov;19(11):357-361. doi: 10.1016/j.bjae.2019.07.002. Epub 2019 Sep 9. PMID: 33456858; PMCID: PMC7808087

Labour Epidurals

The time from the Anaesthetist being informed about an epidural until being able to attend the mother should not normally exceed 30 minutes, and must be within 1 hour except in exceptional circumstances. If a delay is expected call another anaesthetist.

Guidelines for the Provision of Anaesthetic Services: Chapter 9: Guidelines for the Provision of Anaesthesia Services for an Obstetric Population 2024 link

Preparation

1. Take obstetric anaesthetic chart and yellow epidural chart into the room

2. Ensure no contra-indications. If in doubt, discuss with senior. Often the patient will not have recent full blood count (FBC) results. If there is no history of abnormal FBC, pre-eclampsia, recent high BP or infection, then there is no need to wait for the FBC.

3. Ensure that the following are in place:
   - A trained midwife present for the procedure and to monitor the mother afterwards
   - A pre-epidural **BP**, **pulse, temperature** and **reassuring CTG** must be obtained prior to insertion
   - Prefilled ephedrine and metaraminol on the epidural trolley.
   - Large bore IV access (14 or 16G). If only smaller IV access is possible, then 2 IV cannulae. IV fluid is not required routinely, but ensure that Hartmann's and a blood giving set is ready in the room. If a patient has not had bloods done yet today, please take FBC and Group and Save when cannulating. The Group and Save should be labelled yourself in the patient room with the patient's verbal details and wristband for safety. If the patient is sweaty and the cannula dressing is not sticking well, this can be stuck better with the white dressing (Hypafix) used to secure epidural catheter. Ensure it is a wide enough piece to cover more than the cannula dressing, but not to go around the whole wrist circumference.
   - Collect epidural pump from theatre store room along with keys
   - Take a patient sticker and ask the midwife in charge for a 250 ml epidural bag (0.1% Levobupivacaine and 2 micrograms/ml Fentanyl) from the medication room on labour ward. This is kept in CD cupboard.

4. **Consent** should be given by the mother. This can be difficult if she is getting frequent contractions. Try to talk in between contractions and when she has pain, that can be an opportunity to talk to the midwife, look at the notes or prepare equipment. Consent can be helped by:
   - A laminated information sheet by the OAA, available in the rooms or on the epidural trolley

- Let patients know that it takes approximately 20 minutes to site and another 20 minutes to work.
- An epidural will be accompanied by a more intensive level of monitoring and intravenous access, so mobility may be reduced.
- It is not associated with long term backache (backache occurs at the same rate in patients who have and have not had labour epidurals)
- Tick boxes of common or serious risks explained on the front page of the obstetric anaesthetic chart. Complications to include:
  - Not working well enough or at all: 1 in 8
  - Headache which may be severe: 1 in 100
  - Low BP, itching
  - Hyperthermia approx. 1 in 5
  - Association with instrumental delivery. Also, can increase in the duration of labour by 1-2 hours (to allow for fetal head to descend)

Note: IV drug abusers can be offered epidurals in addition to their normal background analgesia. For anyone prescribed codeine or pethidine, this can be crossed off when an epidural is used.

Technique

They can be done sitting or lateral. The midline is easier to detect in obese patients if they are sitting. If sitting, the patient should be sat near the edge of the bed on a flat part of the mattress, her feet should be flat on a chair or stool without wheels. Her knees should be 90° in relation to her feet. The CTG straps should be out of the way, e.g. under her buttocks. Any long hair should be confined to a hat. Any clothing should be taped out of the way or a gown should be put on.

Epidurals should be performed under strict asepsis. Ensure the patient's back is sprayed with 0.5% chlorhexidine in alcohol (unless allergic) and that this is allowed to dry. Chlorhexidine is neurotoxic and should not come in to contact with any of the epidural equipment. The Anaesthetist should have a hat and facemask, aseptic hand preparation, gowned with sterile gloves.

A suitable lumbar space is L2/3, L3/4 or L4/5.

Prefilled lidocaine 1% is available in grey packaging (in the labour ward medication room).

Ask the patient to tell you if she has a contraction. Do not advance the needle or catheter or inject drugs into the epidural space during a contraction as the epidural veins become distended.

Be aware that the epidural space may less than 4 cm in thin patients. Depth to epidural space also tends to be less for Asians and Chinese patients. Increased BMI is often associated with increased depth to epidural space, but a standard epidural needle is usually sufficient and should be tried first.

Aim to leave 4 cm of epidural catheter in the space (consider leaving 5-6 cm in obese patients).

To help confirm the correct location, you should have:

- Loss of resistance (LOR) to saline. This is recommended over air. It is a more precise sensation, easier to define, has a lower reported incident of accidental dural puncture and missed segments.
- A meniscus drop is reassuring
- No blood coming into epidural catheter when it the open tip of the epidural catheter is held lower than the level of insertion. A negative aspiration will help to confirm that it is unlikely to be in a blood vessel
- No clear fluid on aspiration (a very small volume < 0.5 ml could be from saline in the catheter)

Establishing an epidural block

After negative aspiration with an empty syringe, inject a test dose of 10 ml of epidural bag mix (0.1% levobupivacaine with 2mcg/ml fentanyl). This can be opened in a sterile manner on the epidural trolley and injected after the "Lock-it" device and clear sterile dressing e.g. Tegaderm, has been applied, before full taping of the epidural catheter, or once the epidural catheter is fully secured if the epidural is being inserted prior to labour pains being frequent. This dose is 10mg of levobupivacaine. This is less than the dose of 25 mg typically used for spinal anaesthesia for Caesarean, is thought to be relatively safe epidural test dose in case it goes intrathecally.

Massoth, Christina; Wenk, Manuel. Epidural test dose in obstetric patients: should we still use it? Current Opinion in Anaesthesiology 32(3):p 263-267, June 2019. | DOI: 10.1097/ACO.0000000000000721

5 minutes after the test dose, check the BP. There should be no evidence of hypotension, fetal distress, motor block (check for straight leg raise), sensory block or paresthesia. If these signs are present this is likely to be a spinal catheter and proceed as per management of intrathecal catheter. Place patient left lateral if hypotensive, give IV fluid and treat hypotension or bradycardia with appropriate drugs.

If there is no sign of hypotension, fetal distress, motor/sensory block or paraesthesia, the main dose of 10-15mls from the PCEA mix bag can now be safely administered.

Continuous CTG and auto 5-minute interval BP must be monitored for 20 minutes after every anaesthetic dose is administered (every 15 minutes after patient doses).

Ensure there is a patient ID label on the epidural bag. Prime and connect PCEA pump so that the patient can take 10 ml boluses of bag mix at a minimum interval of 30 minutes, though often this frequency is not required. Show the patient how to use it and ensure she:

- Knows that nothing is going through the pump except when pressed
- That it normally needs to be pressed about once an hour
- To let the midwife know if she is pressing the button so that BP checks can be started

See PCEA section

Complete:

- the **yellow epidural prescription chart** (which includes pump number and ensure midwife checks the epidural pump programme. This includes writing BP after epidural test doses and pain score before you leave the labour room.
- ensure any sections that you may not have had time to fill on the **anaesthetic chart** are completed, e.g. airway assessment
- the **patient's drug chart**, ensure epidural is circled on the first page. On PRN side, add to "see epidural chart" as reminder. Check that Omeprazole 20 mg BD and TED stockings are prescribed unless contraindicated and ask midwife to administer. She could get these while you are in the room filling paperwork.
- the audit form – paper and computer

Add a dot on the MDT whiteboard to indicate an epidural is sited.

A formal assessment of the epidural must be undertaken 20-30 minutes after administration of the first dose. This may be whilst you are still in the room. On the epidural chart:

- Note pain score. Has the mother noticed a benefit? Is she still using the Entonox? If she is not comfortable after 30 ml epidural bag mix, discuss resite or alternative analgesia.
- Note motor block.

Ensure that you go back to check the epidural within an hour of insertion to document the height and spread of the block with ethyl chloride. Check whether the patient has warm feet. Always ask "will this epidural be good enough to top up for LSCS?"

Adequate analgesia for labour should cover T10-L1 in the first stage and T10-S4 for the second stage.

NICE Guideline235: Intrapartum Care published 29 September 2023
https://www.nice.org.uk/guidance/ng235/resources/intrapartum-care-pdf-66143897812933

Maintaining analgesia with Patient Controlled Epidural Analgesia (PCEA)

Epidural analgesia is maintained in labour using patient controlled epidural analgesia.

This has been shown to confer benefits in terms of reduced total dose of local anaesthetic, reduced lower limb motor blockade, and reduced number of clinician top ups.

The mother should self-administer the PCEA until delivery.

There is no evidence that with holding epidural analgesia in the 2nd stage of labour improves the mother's ability to push or decreases the likelihood of an instrumental delivery. Therefore, the mother should be encouraged to use the PCEA as necessary until the delivery is complete.

Procedure for PCEA

1. Site epidural catheter and establish initial block (as per establishing epidural)

2. Unlock epidural pump with key

3. Set up the PCEA device as follows:

   250ml bag of **0.1%** levobupivacaine with **2** microgram/ml of fentanyl
   (reduce this volume to 230 ml as 20 ml has been removed)
   Bolus dose **10 ml**
   Lockout **30 minutes**

   There is not a background infusion

4. Prime (whilst disconnected from patient)

5. Connect PCEA device to patient epidural catheter. Ensure handset is connected to PCEA device.

6. Tell the patient that whenever the contractions begin to become painful, to inform the midwife. The midwife will then pass the PCEA handset to the mother, who may press the button, which delivers 10 ml of the epidural mixture.

7. The midwife will then monitor the mother's **blood pressure, every 5 minutes, for 15 minutes,** every time the mother presses the button and the PCEA delivers a dose.

8. Then the midwife will assess the block's **upper and lower sensory level,** using ethyl chloride (or ice) and assess the **motor block score** (Bromage Score), and document these on the Epidural Chart.

9. All other observations are to be documented hourly on the Epidural Chart, including pain score.

10. The PCEA lockout will not allow another dose to be delivered within 30 minutes of a previous dose.

11. The midwife will call the 1st on anaesthetist (see Troubleshooting Guide on Epidural Chart) if:
    - The patient has a sensory block T4 or higher
    - the patient complains of moderate-severe pain 15 minutes after a PCEA dose

12. The midwife will pull the emergency buzzer and call the 1st on immediately if:

    - **Respiratory Rate < 8/min**
    - **Sedation Score 3** (Unrousable)
    - **Systolic BP < 80mmHg** (requires Obstetric Crash Call)
    - **Dense Motor Block (Bromage Score 3)**

Problems with epidurals

Immediate:

Dural tap: This may be caused by the green hypodermic needle in thin patients or by the Tuohy needle or epidural catheter (see below). CSF usually leaks out of the hole in the dura under pressure, so is usually obvious. If there is a doubt whether it is saline or CSF, occlude the Tuohy with your gloved finger and ask the midwife to get a urine dipstick from the sluice. This will show dextrose positive. The urine dipstick is not sterile so is held below it by the midwife without touching anything sterile. If it is CSF, at Singleton, we advise withdrawing the needle, noting depth of the epidural space and insert epidural at a different vertebral level. Be cautious with test doses with the resited epidural as some of the local anaesthetic could pass into the CSF.

- Dural puncture may also be caused by the green hypodermic needle for local anaesthesia (in thin patients.

Unable to thread catheter: NEVER attempt to withdraw the catheter back through the needle, or to advance the needle with the catheter through it. Always withdraw the needle and catheter together. Otherwise, the tip of the catheter could be damage or cut off.

Blood in epidural catheter. This could indicate the catheter is placed within a vein. Gently flush with saline and withdraw epidural catheter to ensure that only 4 cm is left in the epidural space. Then hold the tip of the epidural catheter below the level of insertion. If frank blood (venous) is seen, remove and re-site. If it is slightly blood-tinged, flush again with saline and check again whether there is blood seen in the epidural catheter if the tip is held below the level of insertion. A slight blood tinge can be seen with traumatic insertion. If it is frank blood, remove and re-site.

Fluid in epidural catheter. If fluid is freely flowing from the catheter, it could be:

1. Saline from the epidural placement (dextrose negative)
2. CSF (recognized dural tap). This is usually freely aspirated and continuous. If there is any doubt, you can test for dextrose as mentioned in dural tap above. If in any doubt give a 4 ml dose of epidural PCEA mix into the catheter and look for a spinal effect - profound analgesia. This is a recognized dural tap.

Immediate management of a recognised dural tap

Check patient BP. At Singleton we advocate, resiting the epidural and counselling patient about risk of headache. The decrease in CSF pressure is responsible for the post-dural puncture headache (PDPH). The incidence of PDPH is directly proportional to the size of the hole in the dura (approximately 70% following puncture with 16 G Tuohy needle).

If an intrathecal catheter is threaded, inform a consultant anaesthetist and see link.

Any patient with a recognised dural tap should be informed that her risk of headache is around 70%, usually within 3 days and that if she develops headache, she is to ask the midwife to contact an anaesthetist (whilst an inpatient). She should be followed-up daily whilst an inpatient and given written information to take home (See PDPH).

Document the dural tap and print and complete the paperwork for dural tap found on the PC desktop in the anaesthetic office.

After test doses:

Unrecognised dural tap

An epidural catheter can be inserted uneventfully but upon inserting the test dose or the next dose, it behaves as a spinal catheter e.g. hypotension, fetal distress, high block, motor block, rapid sensory block. Ensure patient is laid left lateral, BP is checked and any hypotension corrected. It is advisable to remove the catheter and resite the epidural. Follow up as for recognised dural tap.

Subdural catheter

An epidural catheter can behave unusually, e.g. patchy block with elements of high spread, e.g. high thoracic or cervical dermatomes (ask about face, arm or hand numbness). This can happen if the catheter is subdural but not in the arachnoid and so not in CSF. It is a very variable and unreliable block and any blocks behaving unusually refer to seniors. Note that there is no motor block nor hypotension with a subdural catheter as there would be in an intrathecal catheter. In these cases, it is advisable to remove the catheter and offer a resite.

Intrathecal catheter

Usually, we recommend removal of suspected intrathecal catheter and insertion of epidural for labour or spinal for theatre, because an intrathecal catheter is:

- A relatively unfamiliar technique
- There is increased risk of medication errors especially if local anaesthetic may be in the patient labour room
- There is no patient-controlled programme for intrathecal catheters, so intermittent anaesthetist-delivered boluses are used. This may be difficult to do in a timely fashion if the labour ward is busy.
- Theoretical infection risk from repeated bolus injections.
- **Please discuss with consultant if an intrathecal catheter is in place.**

If a patient has an intrathecal catheter, clear labelling is essential.

- Label the catheter/filter (e.g. with a pen written on white tape on the filter)
- Labour ward door A4 poster saying “Intrathecal catheter”.

- Document on anaesthetic chart
- Document on “epidural” chart
- Document on MDT whiteboard
- Inform the patient, midwife and team especially on handover

Labour analgesia: Initial dose: aspirate before dosing to check it is CSF and not in a blood vessel.

- e.g. “Epidural” bag mix of 0.1% levobupivacaine and 2 micrograms/ml fentanyl: 3.5 ml (this includes approximately 1 ml for the dead space in the epidural catheter and filter, so 2.5 ml of bag mix will be intrathecal)
- or: 0.25% levobupivacaine: 2 ml with 25 micrograms of fentanyl. (1 ml of 0.25% levobupivacaine and 15 micrograms of fentanyl will be intrathecal and 1 ml will be for the dead space in the epidural catheter. Don’t worry that there is some fentanyl in the dead space as this will be intrathecal when flushed in with the next dose.

Labour analgesia further doses: aspirate before each dose

- “Epidural” bag mix 2-3 ml per hour including dead space (1-2 ml intrathecal and 1 ml for dead space).
- This will be likely needed every 40-60 minutes

Inadequate analgesia with an epidural for labour

Ask the patient:

- What is she feeling?
- Where is the pain?
- Has the epidural ever worked?

Ask the midwife about progress of labour

Check:

- epidural site, is it still at appropriate length at skin? If less than 3 cm in epidural space, offer a resite.
- motor and sensory block
- temperature of the feet: should be bilateral warm feet, indicating sympathetic block

If you find:

- **No block** after 30 ml of epidural bag mix, then the epidural is unlikely to be in the right place and a re-site should be offered
- **Inadequate block due to low volume and/or low frequency of doses:** check epidural pump and check with patient and midwife. Consider giving a clinician bolus of 10 ml if no dose in the last 30-60 min and encouraging patient to press PCEA when her contractions begin to feel painful.
- **Migration of catheter:** Previously working well and used regularly, but now not working adequately. Check epidural insertion site. Disconnect at filter and aspirate. If no CSF/blood and no dose within previous 30 min, consider a 10 ml manual bolus.
- **Sacral sparing:** If a patient is nearing delivery and she is complaining of pain where previously she had been comfortable, assess the sacral sensory block (S1 little toe and S2 popliteal crease). If there is no sacral sensory block, ensure the epidural catheter has not moved, sit the patient upright and administer a bolus of 10mls 0.25% Levobupivacaine with added 50 micrograms of fentanyl. If this fails, a resite could be offered, but it can be challenging to site an epidural in the late 1st stage or 2nd stage of labour.
- **Unilateral block:** this may be from too much epidural catheter in the epidural space or a variation in epidural space anatomy. Consider pulling the epidural catheter back 0.5-1 cm whilst ensuring that there is at least 3 cm still in the epidural space. Do this wearing a facemask and with surgically scrubbed hands, double layer sterile gloves and an extra clear dressing (e.g. Tegaderm) and white wide tape (e.g. Hypafix). Remove one layer of gloves when you have removed the old Hypafix and Tegaderm. Then administer a 10 ml clinician bolus or a manual bolus and position the patient laterally so that the "missed side" is down.
- **Missed segments:** The patient will have preserved sensation over 1-2 dermatomes. This is rare, but more common if the patient has altered anatomy, e.g. previous spinal surgery. Check whether there is any unusual block such as subdural. If not thought to

be subdural, but 1-2 missed segments only, try a manual bolus to increase the volume in the epidural space. If this does not work, a re-site should be offered with the explanation that this might happen again.

- **Subdural block:** The epidural catheter is under the dura rather than outside it, but is not in the subarachnoid space. A subdural block gives a high sensory block, which may include cervical dermatomes (ask about face, arm or hand numbness). There is no motor block or hypotension as there would be in an intrathecal catheter). It is a very variable and unreliable block and any blocks behaving unusually refer to seniors. A re-site will be required if subdural placement is confirmed with an explanation that this could happen again.

Manual boluses:

- Check IV access is patent before any manual boluses. Check BP.
- Disconnect epidural catheter and keep epidural tubing sterile by lifting it and ensuring that it doesn't touch anything or capping it with a yellow NRFit Hub Cap (kept in the epidural trolley)
- Manual boluses with a syringe are preferred as they result in further spread up and down the epidural space compared to clinician boluses from the epidural pump.
- Use a dilute mix of local anaesthetic, e.g.
    - 10 ml 0.1% levobupivacaine (10 mg = 2 ml of 0.5% levobupivacaine and 8 ml saline) or
    - 10 ml 0.125% levobupivacaine (0.25% levobupivacaine 5 ml and 0.9% saline 5 ml)

If adequate analgesia has not been achieved despite offer a resite and if despite your best efforts there is no improvement in analgesia call for senior help.

Epidural disconnections

Ask:

- Was it witnessed?
- Which location disconnected: patient side of epidural filter or epidural pump side)
- Any contamination of the area disconnected?
- Has the epidural been working well? If this was a poorly functioning epidural remove the catheter and offer a re-site.

If the epidural was working well, explain to the mother the small increased risk of infection versus the risk of a re-site and she what she wishes to do.

If the disconnection is:

- between the filter and the epidural giving set: change for a new filter, new giving set and new epidural bag
- between the clamp and the filter: the catheter could have been contaminated. In this case aseptically cut 10 cm of the catheter using a face mask, sterile scissors and sterile gloves. Replace for a new clamp and new filter then reconnect
- between the catheter and the clamp: check that the catheter is not sitting in any obvious contaminants. If it is, it will have to be removed. If not, then aseptically cut 10cm off the catheter using a face mask, sterile scissors and sterile gloves and replace with a new clamp and new filter, then reconnect

In all cases ensure the epidural catheter is removed as soon as possible after delivery.

Document all actions taken in the intrapartum notes and follow-up form and ensure handover.

At the post-natal ward follow up, ensure the mother knows what happened, the small risk of complication and ensure she is given written letter about infections and epidurals with red flags (kept in red cardboard folder in anaesthetic office near trays)

Epidurals and concurrent infections

Administering an epidural in a parturient who has a known or suspected infection is a contentious issue. "Although there is no evidence that placement of an epidural catheter in severely septic patients increases the risk of epidural abscess or haematoma formation, a substantial proportion of clinical opinion would seem to believe that the risks associated with using it in the context of severe sepsis is not justifiable."

D. Eissa, E. G. Carton, D. J. Buggy, Anaesthetic management of patients with severe sepsis, *BJA: British Journal of Anaesthesia*, Volume 105, Issue 6, December 2010, Pages 734–743, https://doi.org/10.1093/bja/aeq305

All decisions should be discussed with the consultant ensuring the following is done:

- All women who request epidural analgesia should have a thorough history, and where appropriate examination taken to exclude any concurrent infection or sepsis
- Vital signs must be noted (including temperature)
- Relevant blood tests should be requested or noted e.g. FBC, CRP, lactate if septic
- Any possible source of infection should be noted (PROM, Chorioamnionitis, UTI…)
- Any antibiotic treatment should be noted

Reading the current literature, the following would seem a sensible and reasonable approach, but discuss all cases of suspected or confirmed infection first with the anaesthetic consultant responsible for labour ward:

- If a woman is **systemically well without suspicion if infection**, but incidentally has a raised **white cell count up to 25 x 10^9/L** it would seem safe to offer epidural analgesia. A study showed the reference range in 500 labouring women was 5.3 - 25.3 x 10^9/L.

  Sivasankar R, Kumar RA, Baraz R, Collis RE. The white cell count in pregnancy and labour: a reference range. J Matern Fetal Neonatal Med. 2015 May;28(7):790-2. doi: 10.3109/14767058.2014.932765. Epub 2014 Jul 2. PMID: 24987875.

- If a woman is **systemically unwell** or has a **known concurrent infection**, Remifentanil analgesia should be offered first if analgesia is required. If she subsequently requires a surgical procedure, e.g. Caesarean, it would seem safe to proceed with spinal anaesthesia, **once** appropriate antibiotics have been administered (ideally an hour before) provided she does not have any sign of septic shock, coagulopathy or infection overlying the site of spinal anaesthesia. This decision should always be made on an individual risk/benefit basis and with senior input.

- Any women who receives an epidural who may be at subsequent increased risk of developing an epidural abscess should be discharged home with advice and an information leaflet with contact details of labour ward and:
  - signs and symptoms of epidural abscess, which should prompt her to seek immediate medical attention

Epidurals and thrombocytopenia or potential coagulopathy

Before siting an epidural or spinal, it is important that a potential coagulopathy is excluded. Reasons for coagulopathy include:

- Pre-eclampsia, in particular HELLP syndrome, where the platelet count can fall rapidly
- Disseminated intravascular coagulation (DIC), which can develop in obstetric patients, particularly following a placental abruption, PPH and an intrauterine death (IUD)
- Iatrogenic, such as prophylactic or therapeutic LMWH

General guidelines:

- Fit and well mothers with none of the above, and no concerns re: sepsis or PET, do not need a full blood count before siting an epidural
- There are no established guidelines on point of care coagulation testing, e.g. ROTEM, so rely on history, anticoagulants, platelet count and lab coagulation where required.
- A normal fibrinogen level at the end of pregnancy is 4 - 8 g/L. A level of ≤ 2 g/L is very low and predictive of major obstetric haemorrhage.
- Any mother with pre-eclampsia or HELLP should have a FBC within 6 hours of siting an epidural/spinal. The platelet count should be at least 100 x 10^9/L for an epidural and spinal. If lower, ensure coagulation is checked and then discuss with consultant, particularly noting the trend in platelet count. A rapidly falling count is more concerning than the actual platelet count and a repeat platelet count with result just before epidural insertion can be useful. An epidural is usually not considered with platelet counts < 100 x 10^9/L, but a spinal may be considered if the platelet count is stable and >75 x 10^9/L with normal coagulation.
- A further FBC may be required before removing the epidural catheter if the platelet count is dropping.
- A mother that has an IUD without overt bleeding or who has had an antepartum haemorrhage large enough to result in an IUD is at high risk of developing DIC. A FBC and coagulation will be needed just before siting an epidural/spinal.
- If a mother is on prophylactic LMWH then wait 12 hours before siting an epidural/spinal. If she is on a treatment dose then wait 24 hours before siting an epidural or spinal.
- If in any doubt discuss potential coagulation issues with the anaesthetic consultant.

Also, see AAGBI's 2013 Guideline:
http://onlinelibrary.wiley.com/doi/10.1111/anae.12359/abstract

Combined spinal epidural in labour (or intrathecal analgesia prior to siting a labour epidural)

At times there are patients who may be unable to sit and maintain the optimal position (OP) for epidural insertion due to a combination of labour pains and fatigue. This is more common later in labour. You may decide this before you commence the procedure or it may become evident after the patient is prepped and draped that to continue will expose the patient to increased risk of complications. These patients may benefit from low dose intrathecal analgesia (LDIA) to provide rapid analgesia to allow patient compliance for insertion of the epidural.

Risks:

There is an increased risk of maternal hypotension, maternal itch and fetal bradycardia. This is dose-related.

The first epidural test dose is delayed.

Preparation:

- Ensure that preparation, consent etc. is as for labour epidural. If the decision is made after draping and explaining an epidural, ensure that you discuss with the patient your change of intention and reasoning and discuss risk of hypotension, itch and later siting of epidural.
- **Unlike with a routine labour epidural, ensure isotonic IV fluid and giving set are attached** to the IV cannula and running.
- **Ensure BP cuff is on the patient**
- Ensure epidural trolley and epidural bag of 0.1% levobupivacaine and 2 micrograms/ml fentanyl is in the room.
- Ensure that there is a spinal 25G Whitacre needle ready (90 mm length if you plan to place the spinal before the epidural, 120 mm if you plan to do a needle through needle) or CSE kit.
- Ask the midwife to open the epidural bag and chosen needles into your sterile field.
- Draw up 3-5 ml of the epidural bag mix (3-5 mg levobupivacaine and 6-10 mcg fentanyl). Note: 10-15 microgram is advocated but it is quicker to use our bag mix than to draw this separately.

<u>If the spinal is done first:</u>

Using standard spinal technique inject **3 - 5 ml of the epidural bag mix** and inform the midwife. Ask for a BP check and that it is on a 5-minute cycle. Try to keep the patient's back sterile if possible. If there is any hypotension, ask the patient to lie left lateral, but try to keep the drapes in place and the back sterile so that the epidural can be inserted as soon as the patient is comfortable. If sterility is compromised, you will need to prep the skin and drape again.

or

Needle through needle CSE:

Use a CSE kit or if using a standard Tuohy to find the epidural space, then use a 120 mm spinal needle inserted through this until a pop is felt and CSF seen. Then the 2.5 – 5 ml dose of epidural bag mix is given through the spinal needle before removing the spinal needle. Keep the epidural needle in place to thread the epidural catheter. Ensure the midwife checks the patient's BP on a 5-minute cycle.

Shatil B, Smiley R. Neuraxial analgesia for labour [published correction appears in BJA Educ. 2020 Jul;20(7):250]. BJA Educ. 2020;20(3):96-102. doi:10.1016/j.bjae.2019.11.006

Troubleshooting intrathecal analgesia or CSEs in labour

- Maternal hypotension: treat with ephedrine or metaraminol and place the patient left lateral.
- Fetal distress, place the patient left lateral, check BP and treat any hypotension. If there is hyperstimulation, consider 250 mcg subcutaneous terbutaline.
- Itching: consider ondansetron.

After intrathecal analgesia or CSE in labour

- Check BP and ensure 5-minute BP checks for the following 15-minute, heart rate and that the patient has adequate physical support i.e. continuous presence of midwife in front of the patient.
- Assess effectiveness of analgesia. Once analgesia is effective, if you did the spinal as a sole procedure, you may now continue with siting the epidural. Check the BP sitting before siting the epidural in a sitting position.
- Care should be taken to avoid pushing your spinal block high enough to cause cardiovascular and respiratory compromise. Be aware of the volume of saline injected when finding the epidural space, as this contributes to the potential epidural volume expansion effect (i.e. compression of the dural sac) and therefore potential for a high spinal block.
- Once the epidural is secured and the patient is propped up in the bed, check the sensory height of the spinal block. Check for any motor block (should not be present with low dose intrathecal analgesia).
- Remember you have not ruled out an intrathecal catheter until you have witnessed a dose given down the epidural. The anaesthetist must be present for the test dose down the epidural.
    - If there is no spinal block: check epidural catheter with usual epidural test doses.
    - If analgesia is partial, give initial **reduced test dose of 5 ml through epidural**.
    - If analgesia is effective, allow block to wear off to upper limit of below T8 before giving a **reduced, 5 ml test dose through epidural**

- If 5 ml was the initial test dose given, give a further 5 ml after 5-10 minutes if required. Normally, after partially or fully effective intrathecal analgesia, **only 10-20 ml is required for effective epidural analgesia** (rather than the usual 20-30 ml).
- Connect the epidural pump on the PCEA programme at this point.

What should I do if I have given a low dose spinal and the patient needs a Cat 1 Caesarean?

There is a risk of a high spinal block and conversion to a GA, however if time permits, you should use a standard dose for the Category 1 LSCS spinal. As always care should be taken with positioning of the patient to minimise the chance of a high spinal. Once the patient is supine and a left lateral tilt has been applied, you should immediately check the level of the block and the BP.

How to manage a high block? See high spinal.

Post Dural Puncture Headache (PDPH)

The International Headache Society's definition of PDPH from 2018 is: "Headache occurring within 5 days of a lumbar puncture, caused by cerebrospinal fluid (CSF) leakage through the dural puncture. It is usually accompanied by neck stiffness and/or subjective hearing symptoms. It remits spontaneously within 2 weeks, or after sealing of the leak with autologous epidural lumbar patch". Postural is not in the definition though 95% are postural as 5% are not. The CSF leak causes compensatory cerebral vasodilation which is thought to cause the headache.

Despite the definition, sometimes PDPH headaches continue longer and occasionally are associated with chronic headache or backache. Rarely, PDPH can be associated with severe morbidity and even mortality caused by cerebral haemorrhage or cerebral venous thrombosis.

This normally occurs within 1-3 days of dural puncture.

If a patient complains of occipito-frontal headache after epidural/spinal, which is postural (relieved by lying and exacerbated by sitting/standing), this is typically a PDPH. Common associated features are neck pain, dizziness, nausea, mild photophobia, tinnitus or reduced hearing.

PDPH will occur 70% of time after a known dural puncture with a Tuohy needle but can occur after spinal (especially if multiple attempts were made) and after apparently uncomplicated epidural.

If you think a mother has a PDPH discuss with the consultant. She shouldn't be discharged until she has been seen or at least discussed with the consultant.

Be alert to differential diagnoses and potential serious causes of headache (see red flags below). Assess any headache patients and consider the differential diagnoses. If PDPH is likely, fill the **PDPH forms** obtained from PDPH folder on the desktop of anaesthetic office on labour ward (initial assessment form should include neuraxial block details, follow-up form row for each time the patient was reviewed).

Red Flags:

- Headache not relieved by simple analgesia
- Raised BP
- Signs of sepsis
- Associated with other neurological symptoms /signs, e.g. focal neurological signs, seizures
- Confusion or reduced GCS

Differential Diagnoses of PDPH

- tension headache
- migraine (usually has history and headache is similar to previous)
- preeclampsia and hypertensive diseases of pregnancy (check BP, urine dip, other symptoms, consider PET blood tests if BP high or proteinuria) can present with a headache
- haemorrhagic:
    - Subarachnoid haemorrhage (usually sudden severe): urgent CT brain
    - Subdural haematoma: not always trauma related: urgent CT brain
    - Intracerebral haemorrhage (may be PET, usually associated focal neurological signs): MRI brain
- ischaemic:
    - Cerebral venous thrombosis (can mimic other headaches, most often diffuse, progressive and severe, but can be unilateral and sudden (even thunderclap) or mild, may be migraine-like), over 50% have neurological deficits and 40% have seizures, some reduced conscious level: **Contrast CT venogram**, although Magnetic Resonance Venogram (MRV) is the gold standard
    - Ischaemic stroke: 10% of patients have headache, sudden focal neurological deficit: urgent CT brain
- other vascular, e.g.
    - arterial dissection (neurological deficit)
    - **posterior** reversible **encephalopathy** syndrome (predominantly affects occipital and posterior parietal lobes, several aetiologies, commonly hypertension, features of cerebral oedema)
    - reversible cerebral **vasoconstrictive** syndrome (unknown cause, sudden onset and severe, may resolve spontaneously, associated symptoms include agitation and confusion with focal neurological signs): MRI
    - pituitary infarction (Sheehan's syndrome): sudden headache, may have visual disturbance, acute adrenal insufficiency, hypotension: MRI
- space occupying lesion: often longer history of headache, worse in the morning with signs of raised ICP: urgent CT/MRI
- infective, e.g. meningitis (headache, neck stiffness, fever, also often vomiting, photophobia, confusion or reduced mental status, seizures): bloods including culture, antibiotics, CT before LP

Janvier AS, Russell R. Postpartum headache - diagnosis and treatment. BJA Educ. 2022;22(5):176-181. doi:10.1016/j.bjae.2021.12.004

Advice for patients with PDPH

1. Avoid prolonged bed rest, even though it may reduce the intensity of symptoms, as it may increase the risk of thromboembolic complications
2. Consider thromboprophylaxis for women whose mobility is reduced due to PDPH
3. Encourage fluid intake to maintain adequate hydration
4. Offer simple oral analgesia: Paracetamol, NSAIDs if not contraindicated and weak opioids such as Dihydrocodeine 30 mg QDS or Tramadol 50-100 mg QDS. Consider laxative with regular weak opioids.
5. Stronger opioids such as Oramorph may be offered but treatment should usually be limited to <72 h duration. Ensure laxatives and antiemetics are prescribed
6. Caffeine may be offered but limited to 24 h duration, with a maximum dose of 200 mg if breastfeeding or 900 mg if not breastfeeding. This may be as tablets or cups of tea or coffee. 4 cups of tea or 2 cups of coffee is approximately 200 mg.
7. Offer an epidural blood patch (EBP) when symptoms affect daily living and care of the baby. In 50-80% of patients, EBP gives partial or complete relief.
8. Before hospital discharge, women who have experienced dural puncture with an epidural needle or PDPH should be given information on symptoms that require further medical assessment and on whom they should contact
9. Arrangements should be made for appropriate follow-up after discharge from hospital for women who have experienced dural puncture with an epidural needle or PDPH.
10. When women experience dural puncture with an epidural needle or PDPH, the general practitioner (GP) and community midwife should be informed of treatment received and arrangements for further follow-up.

Russell R, Laxton C, Lucas DN, at al. 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

Russell R, Laxton C, Lucas DN, at al. 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

Epidural Blood Patch (EBP)

A patient with a postural headache after a known or suspected dural puncture OR a patient with no confirmed puncture but a postural headache persisting for 24 hours is best treated by an epidural blood patch. Usually not done in the first 24 hours as it is reasonable to trial conservative management. If done in the first 48 hours of PDPH, there is an increased failure rate, but this does not usually prevent it being done if the patient accepts the increased failure rate. EBP should usually be performed 48hrs post PDPH onset, unless contraindicated. All EBP should be carried out on the labour ward or in obstetric theatre and a consultant should be involved in the decision.

The patient should be given the PDPH leaflet prior to EBP being undertaken.

Contraindications: Patient refusal, Sepsis (pyrexia, raised white cell count or CRP, on antibiotics), coagulopathy, recent anticoagulation (check LMWH timing), other cause likely

Epidural blood patch:
1. needs two anaesthetists, both scrubbed
2. Identify and prepare venepuncture site.
3. Use Tuohy needle to identify epidural space in usual way, being aware of the possibility of a short distance from skin to space.
4. Obtain blood sample of 20ml using an aseptic technique.
5. Inject up to 20ml blood slowly through Tuohy needle or catheter.
6. Stop injecting if patient complains of pain in back.
7. Encourage patient to lie flat for 1 hour then mobilise normally.
8. Warn patient against lifting and straining for next 2 weeks.

The patient must be reviewed after 2 hours. If all is well, she may go home if appropriate but should be instructed to contact the duty anaesthetist if the headache returns or if she feels unwell. Give her the labour ward phone number and record in the notes that you have done so. Follow up telephone contact after 4 weeks or Obs clinic if the patient would like a debrief or discussion with anaesthetist.

Pre-epidural blood patch (EBP) procedure checklist

- Give patient written information to aid consent process (e.g. "Headache after an epidural or spinal injection?" from Labourpains.org)
- Check when the last dose of anticoagulant was given – if a patient is considering an EBP tomorrow, consider reviewing before the patient takes her next LMWH dose
- Check for evidence of maternal systemic infection.

- Check for the absence of 'red-flag' symptoms suggesting a different diagnosis e.g. change in the nature of headache, development of focal neurological signs, reduced conscious level and atypical headaches. Document patient vital signs.

- Consent: A written consent form is recommended.
  Discuss benefits:
  - 30% complete relief of symptoms following a single EBP.
  - 50-80% complete or partial relief. If there is partial or no relief, a second EBP may be considered (after consideration of other causes of headache)

  Discuss risks:
  - Repeat dural puncture: could worsen headache
  - Back pain is common during and for several days after EBP and can be significant
  - Rare complications include nerve damage, bleeding and infection

EBP procedure

- Ensure you check the documentation from the initial neuraxial intervention for level at which dural tap occurred and depth

- The epidural injection should be performed at the same space or one space lower than the level at which the original dural puncture occurred

- The procedure requires two clinicians. A consultant obstetric anaesthetist or experienced senior trainee should perform the epidural injection and a second clinician take blood (this will usually be an anaesthetist)

- The patient may be placed in the lateral or sitting position, considering the comfort of the patient in relation to her symptoms and the preference of the anaesthetist

- Cardiovascular monitoring and intravenous access may be considered to detect and treat bradycardia during the procedure

- A **full aseptic technique should be employed for both the epidural component and venesection**. An anaesthetic assistant is useful

- The epidural space should be located before venesection is performed

- After venesection blood should be injected immediately into the epidural space through the epidural needle. Volumes of **up to 20 mL** are recommended if tolerated by the patient

- There is insufficient evidence to recommend the routine collection of blood for culture. The decision on whether to do so should remain with the individual clinician, but will need follow-up

Post-EBP procedure management

Guidance on the management of obstetric patients immediately following an EBP is lacking. The following is suggested:

- Keep patients in the supine position for 1–2 hours
- Regular observations of maternal pulse, blood pressure and temperature may be made following the procedure, the frequency and duration depends on maternal health.
- Consider prescribing laxatives to avoid constipation and advising patients to avoid twisting, bending and straining.
- Women should be reviewed by an anaesthetist after 2 hours, or at the maximum, within four hours of the procedure. The effect on headache and presence of side effects should be documented. After the initial review, women may mobilise and, where appropriate, they may be discharged home. Those women who remain in hospital should be reviewed daily until discharge or until symptoms resolve.
- The patient should be given a letter (and copy for midwife and GP) which includes how and when to contact the hospital

Russell R, Laxton C, Lucas DN, at al. 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

Pre-op Assessment for Caesarean Birth (updated using NICE Guideline 192 which was last updated 30 Jan 2024)

Emergency caesarean birth patients may present at any time on labour ward or on ward 19. Elective caesarean birth patients may present for caesarean in the day assessment unit (within antenatal clinic), or on ward 19. Some may be reviewed and have some discussion face to face or by phone or in the anaesthetic consultant high risk clinic.

Urgency of Caesarean Section

Note that the urgency can change. This can have implications on the anaesthetic technique. Category 1 may necessitate a GA and may have verbal rather than a written consent form.

Category 1: Decision to delivery as soon as possible, but within 30 minutes
Immediate threat to the life of the woman or fetus (for example, fetal hypoxia or persistent fetal bradycardia, suspected uterine rupture, major placental abruption, cord prolapse)

Category 2: Decision to delivery as soon as possible, within 75 minutes
Maternal or fetal compromise which is not immediately life-threatening (e.g. severe pre-eclampsia, CTG suboptimal). Failure to progress in labour often also comes into this category

Category 3: Usually within 24 hours
No maternal or fetal compromise but needs early birth (e.g. failed induction of labour)

Category 4 (elective)
Birth timed to suit woman or healthcare provider

Medical and Anaesthetic History

The acronym AMPLE may be helpful in emergencies to remember key points in medical and recent history:

A allergies (medications, latex, skin cleaning solutions, foods)
M medications: particularly note recent doses of low molecular weight heparin, any recent antibiotics (to avoid double dosing in theatre), anti-hypertensives
P past medical history: any comorbidities and note weight and BMI. Especially note cardiorespiratory problems, epilepsy, diabetes. Any previous or family history of anaesthetic problems. If obesity, cardiorespiratory disease or recent cardiorespiratory symptoms or from a low-income country, ask about functional status, particularly dyspnoea.
L last meal and check whether patient has had omeprazole (if not, consider 40 mg Esomeprazole IV - mix with 5 ml saline and give over 3 minutes)

E events: current events. Particularly note and pre-eclampsia, sepsis or haemorrhage. What is the reason for C section? This may have implications on length of surgery particularly if surgeon plans trial of instrumental delivery and may move on to Caesarean.
In obesity: ask about STOP-BANG:
S snoring loud enough to be heard through a closed door
T tired/sleepy in daytime – often fall asleep in daytime?
O observed apnoea or pause in breathing during sleep or choking or gasping?
P pressure - high blood pressure?
B Body Mass Index more than 35 kg/m2?
A *Age older than 50 (unlikely)*
N Neck circumference large > 40 cm? estimate if no tape measure
G *gender male (no)*

A score of 3 or more (especially if score for Observed apnoeas or Neck circumference large) increases the risk of sleep apnoea. Discuss with consultant whether increased post-op monitoring is required.

Ask about smoking or alcohol in pregnancy. Among other risks, smoking increases the risk of placenta praevia, abruption, venous thromboembolism and post-op complications such as increased abdominal pain, delays wound healing and increases the risk of wound infection.

Examination:
Airway assessment: It is well recognized that there is a higher incidence of difficulty intubating in the obstetric population. (See difficult/failed tracheal Intubation). In severe pre-eclampsia, ask about voice change. Assess for:

- history of difficult intubation or C-spine fusion, scarring or burns
- loose teeth, caps, crowns, implants, bridges.
- tongue piercings: ask for them to be removed
- examination, for example
    - obesity especially BMI > 35
    - syndromic
    - receding mandible
    - Mallampati score 3 or 4
    - mouth opening > 5 cm (approx. 3 fingers)
    - protruding incisors
    - Mandibular protrusion
    - neck extension 90 degrees
    - thyromental distance (tip of thyroid cartilage (Adam's apple) to bony tip of chin) >6.5 cm (3 finger widths may be too small to measure this – in one study, 3 female patient fingers are only around 5.8cm)

Vital signs: heart rate, BP, temperature, +- SpO2, RR preoperatively

Weight: booking weight, recent weight and **BMI (based on recent weight)**

Booking weight is used for prescription of many drugs including postpartum LMWH (unless weight gain of >12 kg in pregnancy). Recent weight is used for Suxamethonium dosing (if this is used)
In obesity, as well as airway assessment, examine spine and estimate ease of veins for cannulation (any previous difficulty)

Auscultation: if respiratory symptoms, severe pre-eclampsia with concern about pulmonary oedema, concern about cardiac disease (auscultation may pick up valvular heart disease murmur in patients who have moved for a low-income country as rheumatic heart disease is still prevalent in sub-Saharan Africa and south east Asia.

In severe pre-eclampsia, look for peripheral oedema, check whether patella reflexes checked within last 4 hours recent patella reflex present, brisk or absent.

IV access: 16G (x2 if high risk of major haemorrhage)

Investigations: As standard, just two:

- FBC
- Group and save within last 3 days (with historic sample usually done at booking for pregnancy). Is electronic issue blood available? If not, cross-match

For pre-eclampsia: U&E, LFT, urine protein-creatinine ratio
For severe pre-eclampsia: also, coagulation
For obstetric cholestasis: LFT, coagulation
For sepsis: CRP, U&E, LFT, blood cultures, VBG including lactate
For antepartum haemorrhage: VBG may be helpful +- ROTEM
For diabetics: HbA1c, U&E, fasting blood sugar, blood ketones (raised if > 0.6 mmol/L, check VBG if >1.5 mmol/L as risk of DKA)
In early pregnancy: thalassaemia and viral screening
In high risk groups (Black African, Caribbean, Middle Eastern and South Asian heritage): sickle cell disease

Discuss anaesthesia
For most patients, regional anaesthesia is associated with the lowest risk. If elective Caesarean section, **give labourpains.org A4 stapled pages** on Anaesthetic for Caesarean section FAQ (produced by Obstetric Anaesthetists Association). If this is already in the patient notes, highlight it to the patient. If it's not, get one from the LSCS lever arch file on the top shelf in the Day Assessment Unit (DAU) or ask the midwife in charge in DAU.

Discuss spinal anaesthesia in most cases (benefits and risks). For contraindications and risks, see contraindications and risks of spinal and epidural anaesthesia

Consider combined spinal-epidural (CSE) if increased duration likely, e.g. if multiple previous Caesareans, if sterilization planned after Caesar, if previous other abdominal surgery, or BMI

>40. If CSE is being considered, explain that the benefits and risks. Explain that risks are increased (approximately double that of spinal anaesthesia) and it may involve more needles if epidural is sited first (unless needle through needle planned). For contraindications and risks, see contraindications and risks of regional block.

If a general anaesthetic (GA) is planned, can you justify it? Discuss risks and benefits and inform consultant if elective GA is being considered. See risks for discussion in GA section. It is worth discussing these risks in any patient in whom conversion to a GA is a thought to be higher risk from the start, e.g. placenta praevia.

Time for discussion of anaesthesia

The time for discussion depends on urgency.

For emergency Caesarean births: highlight the main points that spinal will numb the pain and the main risks (pain: can be treated, but may need GA, nausea/vomiting, headache, temporary or permanent numbness/weakness).

For elective Caesarean births: (Note, more time needs to be spent if anxious patient or never had Caesarean before). **Explain what a Caesarean is like** under spinal anaesthesia. Safety checks, IV access, spinal injection, laying down with left tilt, heavy legs, numb up to breast level, block tested, urine catheter inserted, tummy cleaned with antiseptic, screen put up, tugging and pulling expected, legs heavy for 4 hours, spinal morphine should last for up to 24 hours, but will need additional pain medicine too. Regular pain medicine and extra that the patient can ask the midwife to give her.

Medications to prescribe or discuss

Obtain consent for PR diclofenac if NSAIDs tolerated.

Give **antacid** prophylaxis:

- Elective: Omeprazole 20 mg 22:00 night before and 07:30 morning of surgery
  Add metoclopramide 10 mg 07:30 morning of surgery
- In labour: Omeprazole 20 mg BD
  - Esomeprazole 40 mg IV if urgent surgery within 1 hour
    - Give over 3 min (dilute in 5 ml saline).
    - This is preferred to Omeprazole as omeprazole IV is recommended to be given over 20 min as it has a higher risk of QT prolongation

If diabetic: target blood glucose is 4-7 mmol/L. Omit all oral agents on day of Caesarean as well as any short acting insulin. Continue basal insulin (see Diabetes Guideline on WISDOM, which is on COIN)

- Type 1 diabetes: Insulin sliding scale to start as soon as nil by mouth (or 6 am for morning Caesarean). Check ketones pre-op if insulin-dependent diabetic (should be <0.6 mmol/L)

- Type 2 diabetes or gestational: check 2 x blood sugars within 30 minutes before Caesarean and start insulin sliding scale if > 7 mmol/L . Check ketones pre-op if blood glucose > 11 mmol/L or unwell.

Fasting

Elective patients are recommended to fast from midnight (with the last meal not being high in fat). Patients are asked to buy a bottle of 500 ml still Lucozade sport (isotonic drink). They are asked to drink 250 ml at 7am and then sip the rest until they go to theatre. Diabetic patients are asked to have a glass of water at 7 am or to but the "zero sugar" version of Lucozade sport and drink 250 ml at 7am then sip either water or zero sugar Lucozade sport until they go to theatre.

Emergency patients: No food, milk or fizzy drinks if high risk of Caesarean section within 6 hours or is being given remifentanil or other opioid.

- Sips of isotonic drink (e.g. (Lucozade sport) can reduce ketosis. Sips of water if diabetic.
- Consider IV fluid if vomiting, septic etc.
- Note: Patients in labour not for Caesarean and who are "Low risk" can eat a light diet in established labour: NICE guideline 235 on Intrapartum care (updated 29/09/2023).

Obstetric history: this is useful for the anaesthetist
Gravidity (number of pregnancies of any gestation including known miscarriages)
Parity (number of deliveries of > 24 + 0 weeks. A twin pregnancy counts as 1 delivery episode)
After parity, record "+" for number of deliveries at less than 24 weeks

Examples:

- a patient on her second pregnancy with a previous single or twin birth would be G2 P1
- a patient who has had an early termination of pregnancy, a late miscarriage at 30 weeks and is now pregnant is G3 P1 +1

It is very helpful to note the year or date of previous deliveries, the anaesthesia/analgesia received, the outcome and any problems. For example:

- G3 P2
    - 2021 LSCS - spinal: boy, PDPH (conservative management) and PPH 1.2L (not transfused)
    - 2022 Vaginal delivery – remifentanil then epidural (no PPH)
- Now 39+3 (weeks' gestation) – no problems this pregnancy

Assess the wellbeing of the mother during pregnancy. Note booking blood pressure as this will act as a reference point for blood pressure management during caesarean section.

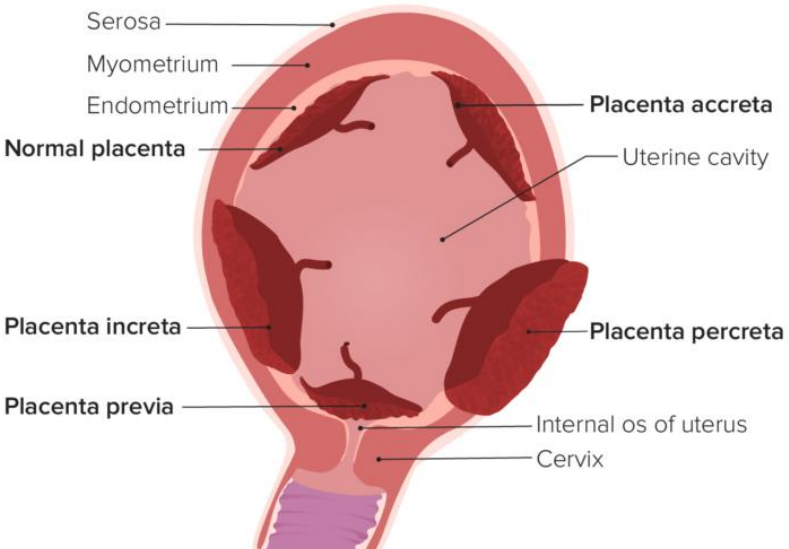
Placental location, praevia and accreta

Document placental position from most recent ultrasound (in patient notes "Investigations" section). The placenta can be:

1. **low-lying** if is <2 cm from the internal os. 90% of placentas that are low lying on 20-week scan will no longer have a low-lying placenta when they have their follow-up scan (usually a 32-week transvaginal scan) as the uterus grows. A patient with low-lying placenta at 32-week scan should have another trans vaginal scan arranged for 36 weeks to help plan mode of delivery. If there is a third trimester asymptomatic low-lying placenta, vaginal delivery may be possible depending on distance between placental edge and fetal head, clinical background and patient's preferences.
2. **praevia** if it completely covers the internal os (note that transvaginal scan is more accurate to diagnose this and is safe in placenta praevia). Note there is no minor or major in the classification any more. Estimated 1 in 200 pregnancies. On transvaginal scan, a short cervical length < 2.5 cm have a relative risk of 7.2 (95% CI 2.3–22.3) for massive haemorrhage during caesarean section for placenta praevia. A 2011 meta-analysis reported that the incidence of placenta praevia increases from 1% of deliveries with one previous caesarean to 2.8% with three or more caesarean deliveries.
   Klar M, Michels KB. Cesarean section and placental disorders in subsequent pregnancies–a meta-analysis. J Perinat Med 2014;42:571–83.

Women with an anterior low-lying placenta or placenta praevia with a history of previous Caesarean should be specifically screened for placenta accreta spectrum. Any position of low-lying placenta or placenta praevia increase the risk of massive obstetric haemorrhage. Regional anaesthesia is recommended unless contraindicated due to reduced blood loss compared with GA, but it may be necessary to convert to GA, so this should be discussed with the patient.

3. **accreta** is a spectrum disorder ranging from abnormally adherent to deeply invasive placental tissue. Incidence ranges from 1 in 300 and 1 in 2000 pregnancies. This risk increases with number of previous Caesarean birth and other intrauterine surgery including manual removal of the placenta. Accreta is a spectrum as it may be divided into:
   - the amount of placental tissue involved: total, partial or focal
   - the depth of placental invasion ('accreta' = placenta adheres superficially to myometrium without endometrium in between; 'increta' = placenta adheres deeply into myometrium down to serosa, 'percreta' = villi perforate entire uterine wall and may invade the surrounding pelvic organs, such as the bladder)



The risk of placenta accreta spectrum increases with the number of previous caesarean births or if a patient has a placenta praevia and both these risk factors combine to produce a higher risk. In patients with placenta praevia with:

- 1 previous Caesarean: 3% risk of placenta accreta
- 2 previous Caesareans: 11% risk of placenta accreta
- 3 previous Caesareans: 40% risk of placenta accreta
- 4 previous Caesareans: 61% risk of placenta accreta

Any patient thought to have possible accreta spectrum should be referred for imaging in a specialist unit with imaging expertise (either ultrasound or MRI are equally good). Patient with suspected placenta accreta should not be delivered at Singleton Hospital as they need access to a multidisciplinary team with expertise in complex pelvic surgery, including increased risk of urinary tract damage, surgery for invasive placentation, interventional radiology and intensive care. An elective Caesarean should be planned between 35+0 to 36+6 weeks and there should be a plan if emergency delivery is required.

Unanticipated placenta percreta diagnosis in Singleton:

- If a placenta percreta is first diagnosed in Singleton at the time of an elective repeat caesarean, where both mother and baby are stable, if it is immediately apparent that placenta percreta is present on opening the abdomen, the caesarean should be delayed until the appropriate staff and resources have been assembled and adequate blood products are available. This may involve closure of the maternal abdomen before uterine incision and urgent transfer to a specialist unit for delivery.
- If a placenta percreta is first diagnosed after the birth of the baby, the placenta should be left in situ and an emergency hysterectomy performed.

Jauniaux ERM, Alfirevic Z, Bhide AG, et al. on behalf of the Royal College of Obstetricians and Gynaecologists. Placenta Praevia and Placenta Accreta: Diagnosis and Management. Green-top Guideline No. 27a. BJOG 2018

Caesarean Birth with Spinal or Epidural Block

Contra-indications to regional anaesthesia

- **Patient refusal** after full discussion of risks/benefits
- **Allergy** to drugs being used – consider alternatives
- **Fixed cardiac output** state, e.g. moderate to severe valvular heart stenosis
- **Anticoagulated** (e.g. recent LMWH) or **coagulopathy** (INR target is ≤ 1.4 in obstetric cholestasis patients within 24 hours before a regional anaesthetic) – see reference below
    - Patients with intrauterine death (IUD) or abruption are at increased risk of coagulopathy
    - See epidurals and coagulopathy section
- **Severe thrombocytopenia**, though it is platelet function not necessarily platelet count that is important. Rapidly declining platelets are more of a concern than low stable platelet counts. Spinal is relatively contraindicated (and to be discussed with consultant) if:
    - In ITP: platelets < 75 x 10^9/L within 24 hours before spinal
    - In pre-eclampsia: platelets <100 x 10^9/L within previous 6 hours
    - See epidural and thrombocytopenia section
- Septic shock or **infection** overlying site of planned spinal insertion
    - (For epidurals in patients with suspected or confirmed infection, see epidurals and concurrent infection)
- **Raised intra-cranial pressure**, e.g. space occupying lesion, reduced conscious level (asymptomatic benign intracranial hypertension is ok though epidural top-ups are recommended to be done slower)
- **Some neurological conditions**, such as lumbo-peritoneal shunt. These may have medico-legal complications and are worth discussing with neurosurgery
- **Severe spinal abnormalities**, especially spina bifida occulta (may be swelling, dimple, birth mark or patch of hair over spine) or tethered spinal cord on MRI
    - Spinal is usually possible if:
        - spinal surgery or rods, but may not be able to flex spine much. An epidural may result in patchy block and higher failure rate.
        - scoliosis, though placement is likely to take longer with higher failure rate, particularly in more severe scoliosis

For anticoagulants and platelets, see Table 3 (page 970) in:
AAGBI, OAA, RA-UK. Regional anaesthesia and patients with abnormalities of coagulation. Anaesthesia 2013; 68: pages 966-972. http://onlinelibrary.wiley.com/doi/10.1111/anae.12359/abstract

Relative contraindications specifically where epidural/CSE is being considered

- There is more of a risk if patient has coagulation problems (due to bigger needle) or sepsis (due to indwelling epidural catheter)

- A patient with previous spinal surgery including insertion of metal-work is likely to have scarring in the epidural space, making epidurals more likely to fail or have poor spread or missed segments

Risks and possible complications of regional anaesthesia for Caesarean birth

Discuss the risks (see anaesthetic chart risk tick boxes and more detail below in case of patient queries), from https://www.labourpains.org/caesarean-birth/regional-anaesthetic-
Discuss main points and include risks important to the patient:

- **Shivering/shaking**
- **Itching**
- **Low BP**
  - 1 in 5 spinals have a significant drop in BP
  - 1 in 50 epidural top-ups (where no spinal was done)
- **Nausea, vomiting**
- **Failure:**
  - Spinal 1-2% - repeated attempt considered
  - Epidural: approx. 12% (1:8) poor or no block
- **May experience touch, tugging, discomfort or pain** (if pain, inform anaesthetist). This may need extra pain relief, e.g. Entonox ("gas and air"), IV analgesia, LA by surgeon or a GA (partner will have to leave in this case)
  - Pain in spinals:
    - 1 in 20 need **extra pain relief**. Options are
    - 1 in 50 need **GA**
  - Pain in epidural top-ups (no spinal done):
    - 1 in 7 need extra pain relief
    - 1 in 20 need GA

- **Headache** (1:200 spinals) which could be severe (1:500 spinals, 1:100 epidurals) and to contact Singleton and ask for labour ward anaesthetist if headache occurs in the few days after hospital discharge
- **Temporary numbness/weakness** (up to 6 months) 1:1000, **permanent numbness/weakness** 1:24,000 – if these occur, see: postnatal neurological deficits
- Serious risks very rare
  - e.g. **paralysis 1:100,000**
  - epidural haematoma 1:168,000
  - **spinal abscess** 1:50,000 or **meningitis** 1:100,000
  - Total spinal (small risk, not quantified by National Audit Project 3 (NAP 3)) but this would result in severe hypotension, bradycardia, respiratory arrest and loss of consciousness

There is no evidence of increased risk of chronic back ache from neuraxial blocks (though an epidural abscess would result in back pain for a time).

Procedure of regional anaesthesia for Caesarean birth

Obtain informed consent – consider contraindications and discuss risks.

See checks before anaesthesia in all cases.

Have a phenylephrine infusion connected to one of IV connector ports and stopped but ready to infuse (see phenylephrine preparation).

All spinals or CSEs for surgery should be performed in theatre.

Positioning the mother

- The lowest palpable lumbar interspace should be used as this is the safest. The spinal cord usually ends at L1/L2 but may extend to L2 or L3 and there can be tethering to the dura. Tuffier's line is the line joining the iliac crests and it identifies the L3/4 space. Ultrasound can be used to locate space if needed.

- Always ensure optimal positioning of the patient. Poor positioning is responsible for many failed regional blocks. Spinals can be inserted with the patient sitting or in lateral position. If performed in lateral position the spinal block may raise quicker.
    - The ideal sitting position has the women's knees above her hips, feet flat on a stool and heels close to the bed or operating table, with shoulders relaxed, pillow close to the abdomen, back gently curled outward. Avoid sitting the women on any dips in the bed.
    - The ideal lateral position has the women's head on a pillow with chin bought forward, back parallel and close to the end of the bed and legs bought up as far as they will go.

- In obese patients, sitting is often the easiest position, consider tilting the operating table toward the anaesthetist (right tilt). Ask the patient to feedback if the needle is to the right or the left.

Preparation for regional block

Full aseptic technique is required: let the anaesthetic assistant know your glove size. Wear theatre hat and mask, hand and forearm surgical scrub with chlorhexidine or iodine, dry with sterile towel, don sterile gown and sterile gloves.

- We do not recommend that first on-call anaesthetic trainees perform a "rapid spinal" with limited asepsis.

The skin should be prepared with 0.5% chlorhexidine (not 2%) and allowed to dry before starting the procedure. This need only be done once unless there is concern about the site being made unsterile by patient gown etc. ***Note: Chlorhexidine is neurotoxic and it is extremely important that it doesn't come in to contact with any of the needles to be used. Ensure the chlorhexidine has been disposed of before opening the spinal /epidural packs.***

Apply clear sterile drape.

See spinal needles and doses for Caesarean.

For epidural top-up doses and management, see Epidural top-up section.

A combined spinal-epidural may be done if surgery may be prolonged (either epidural component first or needle-through needle).

Once the block is done

- Place the patient supine with 15° tilt
- Commence phenylephrine at approximately 30 ml/hour (delay this if hypertensive). In pre-eclampsia, when phenylephrine started, start at lower rate. Phenylephrine is usually not required in epidural top-ups.
- Check BP and ensure it is cycling
- Ask the patient how she's feeling – are legs starting to feel tingly or heavy? Any dizziness or nausea may indicate hypotension
- See management of hypotension.

Testing the block

It is extremely important that the block is tested in its entire range (top to toe) particularly if an epidural has been used to detect any missed segments. It may be helpful to start at the thighs and work up, then work down.

Document the motor block:

- The patient is asked to lift one leg at a time straight and should not be able to lift her heels off the bed. If she can, wait and consider Trendelenburg position
- It is worth waiting for motor block before testing sensory block as sensory block will not be higher than L1 in a patient who can straight leg raise

Document sensory block:

- Light touch: A block to light touch at the level of T5 is recommended (e.g. test in midaxillary line)
  Plaat F, Stanford SER, Lucas DN et al. 2022 Prevention and management of intra-operative pain during caesarean section under neuraxial anaesthesia: a technical and interpersonal approach. Anaesthesia, 77: 588-597. https://doi.org/10.1111/anae.15717
- To cold: Ethyl chloride spray is usually used. We usually spray as low as S1 (little toe) and as high as required before cold sensation is felt. It can be tested in the mid-axillary line to preserve modesty. Test the higher and lower limit of the block.
- In anxious patient, it can help to reassure her if she pinches her own abdomen and it feels strange/"rubbery".
- The surgeon will also test with forceps once ready to begin, this should be done bilaterally at the level of T10

A block must demonstrate that it is considered adequate to proceed with surgery. A dense motor block, absent cold sensation up to T4 ("nipple level" when test in approximately mid-axillary line), no sharp sensation by applying a pinch to abdomen (usually done by surgeons). **Note: Pain during Caesarean section is the most common cause of complaint made against anaesthetists in obstetric anaesthesia. If you are not happy with the block, ask the surgeons to wait.**

If the block is low, place the patient in Trendelenburg position. If the block seems high, e.g. no cold sensation in the axilla (T2), then slight reverse Trendelenburg and test sensation in the arms (think of the anatomical position) and test motor block in the hands (motor grip is T1). See management of high regional block.

After cord clamping (usually delayed for 1 minute after birth), give oxytocin 5 units IV slowly, checking BP. Then give dexamethasone 6.6 mg IV unless diabetic (as antiemetic and to prolong analgesia) then ondansetron 4 mg IV. Keep an eye on blood loss. If >1.5 L blood loss: additional antibiotics should be considered (see 'Eolas Medical' App). Wean phenylephrine depending on BP. Unless contraindicated, give diclofenac before leaving theatre (after ensuring blood loss is < 1 L). In patients > 50 kg body weight: 100 mg suppository or 75 mg IV (e.g. after transfer to bed). Also consider giving IV paracetamol.

Spinal needles and doses

Also see spinal contraindications and risks if required.

The standard spinal injection we give for Caesarean birth is:
2.5mls 0.5% hyperbaric bupivacaine with 100mcg morphine and 20 mcg fentanyl

All spinal drugs should be preservative-free.
A filter needle should be used and 1 ml syringe is used to draw up the opioids.
The fentanyl is for intraoperative analgesia and morphine is for postoperative analgesia.

Consider a reduced volume of hyperbaric bupivacaine in a very short patient, e.g. 2.2 ml.

Use a sterile, small pencil point spinal needle: 25G Whitacre or 24G Sprotte.
Check for free aspiration of CSF at the beginning and end. If is not free at the beginning, remove syringe and adjust position.

Inject slowly, e.g. over 10 seconds.

Prevention and Management of Hypotension under Regional Anaesthesia for LSCS

Symptoms and signs:

Hypotension is tolerated poorly in the pregnant patient. Nausea is usually the first symptom of hypotension. Other symptoms are vomiting, light headedness. The patient may get pale, particularly their lips, hypotensive, tachycardic or bradycardic. If monitored, there may be fetal distress.

Spinal anaesthesia and hypotension

- CVS instability is more of a problem under spinal anaesthetic
- NIBP should be monitored closely during onset of regional block until the baby is delivered (e.g. every 2-3 minutes). It can then be reduced to every 5 minutes if the patient is stable
- **Avoid aorto-caval compression** (or at least minimise it) by placing the pregnant patient in a left lateral tilt position - 15^0 tilt is advised (though often the obstetricians don't tolerate this amount)
- **IV fluid:** Modest crystalloid pre-loading with 500 ml Hartmann's is recommended (unless pre-eclampsia or fluid restricted). If the patient has a history of vomiting or very poor oral intake, consider more fluid before regional block.
- **Phenylephrine** is the preferred vasopressor:
    - It is delivered by infusion (100 micrograms/ml), to be commenced at **30ml/hour** as soon as the spinal anaesthetic has been given. We recommend that the phenylephrine syringe is attached to a 'connect-a-line-1' infusion tubing and the 3-way extension set, primed, then the phenylephrine syringe is placed in the syringe pump. Once inserted, purge the set by pressing the bolus button until phenylephrine drips out of the end of the 3-way extension set. This step ensures that mechanical slack is 'taken-up' to avoid a 2-minute delay in the drug reaching the patient. Ensure the other two limbs of the 3-way extension set are flushed to eliminate air. Hartmann should be attached to one limb of the extension set
    - **Aim to keep systolic BP at > 90% of baseline systolic BP** and avoid drops to < 80% baseline BP
    - It often results in a reflex bradycardia.
    - If systolic BP < 90% of the baseline and heart rate low (e.g. <60/min):
        - small doses of ephedrine
        - consider anticholinergic drug (glycopyrrolate preferred, alternatively atropine)
    - If there is hypotension without bradycardia, metaraminol is another option
    - **Care must be taken when multiple vasopressors are used to avoid a marked vasopressor effect**. When a vasopressor is administered ensure adequate time is given to see its effect before another dose or another drug is administered
    - The phenylephrine must be **discontinued** by the end of the caesarean section and the octopus **connector should be flushed or removed** so that there is no drug left in the connector, which could be accidentally flushed and the patient be thought to be hypertensive

Caesarean Birth with Epidural Top-up

Epidural suitability for top up

Can the epidural be topped up?

1. Has the epidural block been **working effectively in labour?**
   The epidural should not have required more than one additional top up for inadequate block during labour
2. Is there a **symmetrical bilateral block to T10**, with no more than 1 segment discrepancy between both sides?
3. **No missed segments** are detected (the block is not patchy)?
4. Are **both feet warm** (that is, vasodilated, indicating sympathetic block)?

Yes

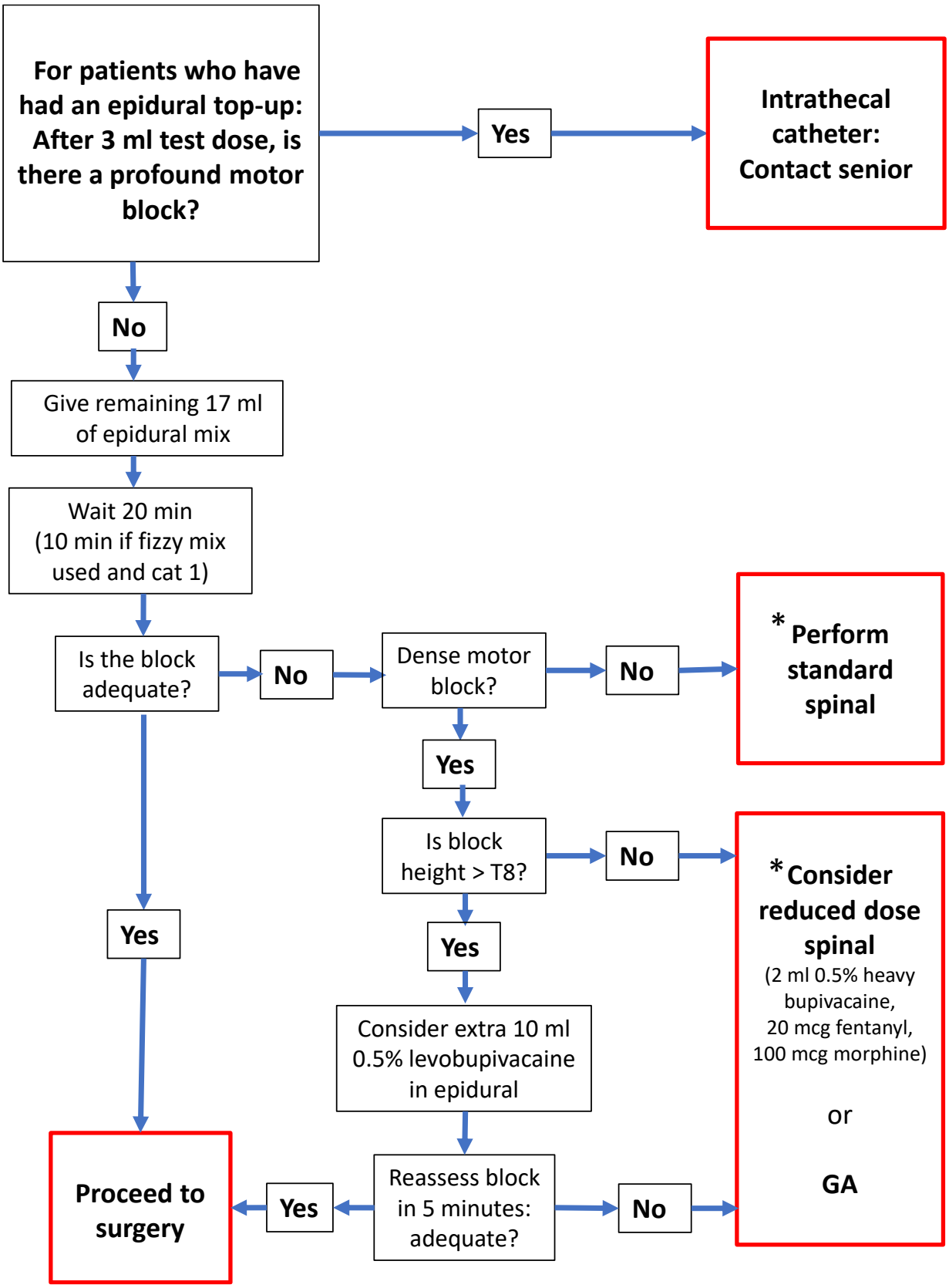
No

Top-up

- Check patient heart rate (pulse oximetry) and BP (cycling every 2-3 min)
- Get epidural top-up box and explain top-up to patient
- **Aspirate** epidural catheter to exclude blood in CSF
- Give **3 ml test dose** of epidural mix and wait 3-5 min (stay with patient)
- If no sign of profound motor block (also no new tachycardia if adrenaline used in the mix), give 17 ml of epidural mix

Remove epidural and insert spinal

Problems with the epidural whilst or after topping up



*** Spinal anaesthesia after recent epidural top-up is associated with increased rate of high or total spinal: be vigilant**

Epidural top-up box

This is kept in the anaesthetic room on labour ward. Ensure it's stocked up daily (and replenish after every use) with ampoules, syringes, filter needles and labels. There's contents list in the box. Fentanyl is kept in the CD cupboard.

Top-up mix

The top up mix **must be labelled and drawn up in a 20ml syringe,** you can use:

1. 17 ml 2% Lidocaine + 0.1 ml 1:1000 Adrenaline + 2 ml 8.4% Sodium bicarbonate + 100 micrograms of Fentanyl. This is also called the "fizzy mix". This is the most rapid though it takes slightly longer to draw up. See note
2. 10 ml 0.5% Levobupivacaine + 10 ml 2% Lidocaine + 100 mcg Fentanyl
3. 20 ml 0.5% Levobupivacaine + 100mcg Fentanyl

Volume

A total 20 ml volume of local anaesthetic is given (22 ml including fentanyl) even if the patient had a sensory block for labour of which the upper limit was T4-T10. See flowchart on previous page. A reduced volume may be considered when patient height is < 5 feet (1.52m) but discuss with senior.

Onset of epidural top-ups

Anaesthesia usually takes 10-30 mins after the top-up epidural mix has been given.

Conduct of anaesthesia – see flow chart on previous page

- Document block before top-up starts
- It is acceptable to commence topping up an epidural in the labour room and while "in transit" to save time **but you must ensure that obstetrician and theatre team are ready and then stay with the patient and monitor the patient throughout.** There is a risk otherwise of starting a top-up for theatre and another patient needs a more urgent Caesarean.
- Generally, with epidurals marked hypotension as seen with spinals is absent but ensure you have the emergency drugs to hand. A phenylephrine infusion doesn't normally need to be connected.
- After delivery: add 2.5mg diamorphine via epidural catheter (5mg diamorphine dilute to 5mls and give 2.5mls followed by 2.5ml flush of saline). The epidural can be removed at the end of the operation unless there is an indication to leave it in.
- Ensure bright green epidural/intra-thecal opioid sticker is completed.

Notes:

- in epidural top-up, **rate of pain is 1 in 7**
- rate of GA is 1 in 20

Desai N, Carvalho B. Conversion of labour epidural analgesia to surgical anaesthesia for emergency intrapartum Caesarean section. BJA Education, 20(1): 26e31 (2020). doi: 10.1016/j.bjae.2019.09.006

Hodgson, PS, Joseph M, Pollock JE et al. The Neurotoxicity of Drugs Given Intrathecally (Spinal). Anesthesia & Analgesia 88(4):p 797-809, April 1999. | DOI: 10.1213/00000539-199904000-00023

Note about fizzy mix and preservatives

The adrenaline and sodium bicarbonate contain preservatives (the adrenaline has sodium metabisulphite and the bicarbonate contains disodium edetate (EDTA) BP 0.01%). There has been some controversy about whether drugs with preservatives should be used in the epidural space in case of accidental intrathecal injection and neurotoxicity. There is paucity of data but a 1999 article specifically looking at preservatives commented, “Most antioxidants, preservatives, and excipients used in commercial formulations seem to have a low potential for neurotoxicity” (Hodgson et al below). Many units use them without problems.

Caesarean Birth with Intrathecal Catheter Top-up

- Ensure phenylephrine infusion is ready
- If intrathecal catheter has been working well, consider top-up. If not, remove and site spinal.
- Intrathecal top-up:
  - The volume depends on pre-existing block. 0.5 ml 0.5% heavy bupivacaine + 20 mcg fentanyl + 100 mcg morphine
  - Then add 1 ml 0.5% heavy to flush dead space
  - Then titrate further 0.5 ml as needed to ensure block to T4 (likely to need less than 2.5 ml as already some intrathecal local anaesthetic)

Management of Pain during Regional Block for Operative Delivery

It is important to differentiate between the tugging and pulling sensation that is felt during surgery (acceptable) and pain (unacceptable). Pain most frequently occurs during peritoneal swabbing/suturing. Pain is the most common reason for litigation against obstetric anaesthetists.

Timing of pain:

- If pain occurs prior to delivery of the baby, it is likely that a GA will be required.
- If pain occurs at uterine incision the baby would ideally be delivered before GA.
- If pain occurs after delivery, try the following, but a GA should still be offered:

Steps if pain felt during surgery:

1. Acknowledge the patient's distress and inform the operating theatre team
2. Ask the Obstetrician to stop as soon as it is safe to do so. Between uterine incision and delivery of the baby is not usually possible.
3. Reassure the patient (and partner) that you will manage the pain and that she can decide what she would like you to do
4. If an epidural is in situ, check the block and consider top-up with “fizzy mix”. Ensure pain is gone and recheck block before restarting surgery.
5. Offer Entonox and consider Alfentanil bolus (250-500 mcg boluses IV). Second line drugs are a Fentanyl boluses of 25-50 mcg IV or Ketamine 10 mg IV doses (0.2 ml of 50mg/ml). If ketamine is used, if 3 x 10 mg boluses have been given, we recommend strongly considering a GA and discussing with anaesthetic consultant. Watch for sedation and respiratory rate and have oxygen ready. Ensure that the patient is pain-free before restarting surgery. If opioids or ketamine has been given prior to cord clamping, ensure prompt communication with the neonatal team.
6. Call 2nd on anaesthetist especially if unfamiliar with ketamine
7. Do not treat pain with anxiolytics.
8. Ask the surgeon to try to minimise surgical stimuli, for example avoiding exteriorising the uterus (that is associated with increased postoperative pain and increased intraoperative PONV)
9. A General Anaesthetic must be offered if the patient remains in pain. For this, discuss with Obstetrician, but ramping the patient to get a better position helps. If the patient is in lithotomy as it was initially a trial of instrumental delivery, ask for the legs to be lowered in line with the trunk (if not already), take the “head end” off the bed, so that you are closer to the patient’s head. It may be necessary to put the patient’s legs on the bed, out of lithotomy poles and slide the patient up the bed.

10. Make a detailed record of events on anaesthetic chart including timing, what treatment was offered, patient's response. If GA is offered and declined, document this.
11. Ensure that patient is seen by a senior anaesthetist before leaving hospital.

Plaat F, Stanford SER, Lucas DN et al. 2022 Prevention and management of intra-operative pain during caesarean section under neuraxial anaesthesia: a technical and interpersonal approach. Anaesthesia, 77: 588-597. https://doi.org/10.1111/anae.15717

Management of a high regional block

This could occur with any regional block.

Signs/symptoms indicating a block is ascending too high include:

- Tingling fingers (though unilaterally this may be due to compression from the BP cuff), weak grip
- Chest heaviness, shortness of breath, inability to cough, progressive respiratory inadequacy, desaturation, apnoea (if C3 affected)
- Weak voice, talking in a whisper,
- Hypotension, bradycardia
- Deteriorating level of consciousness

This can be a life-threatening event if CVS stability is not achieved within 5 minutes, at which point the mother should have an immediate caesarean section.

Treatment

- ABC - Call for senior/consultant help
- Reassure/explain to patient - put bed head up unless severe hypotension (if severe hypotension, give vasopressor and IV fluid first
- If respiratory support is required, bag mask ventilate with cricoid pressure, followed by RSI and GA - with dose of anaesthetic depending on level of consciousness (consider ketamine) and normal dose of muscle relaxant
- IV fluids and vasopressors as required (IV adrenaline may be necessary)
- Treat Bradycardia < 60bpm with atropine
- Usually by the end of the LSCS the spinal has receded enough to allow the patient to be extubated but utilize HDU / ITU post-delivery if needed (this may take up to 4 hours to recede completely)
- Also see Quick Reference Handbook for Obstetrics (red file in anaesthetic room): section 2-7 final-obs-qrh.pdf (oaa-anaes.ac.uk)

Caesarean Birth with General Anaesthesia

Pre-assessment

If the indication is foetal compromise consider intra-uterine foetal resuscitation (IUFR)

1. Turn off Syntocinon infusion
2. Place woman in complete left lateral
3. Check BP Treat hypotension with vasopressors and IV fluid
4. Consider terbutaline 250mcg subcutaneously unless relaxing the uterus would increase bleeding (abruption, suspected uterine rupture or severe antepartum haemorrhage (APH))
5. Transfer to theatre in complete left lateral position and call 2nd on call

Rapid assessment of patient: AMPLE

- **A allergies**
- **M medications**: particularly note recent doses of low molecular weight heparin, any recent antibiotics
- **P past medical history**: any comorbidities especially cardiorespiratory, epilepsy, diabetes.
- **L last food** and check whether patient has had omeprazole (if not, consider 40 mg of IV Esomeprazole - mix with 5 ml saline and give over 3 minutes)
- **E events**: current events. Particularly note any **pre-eclampsia, sepsis** or **haemorrhage**. What is the reason for C section? This may have implications on length of surgery particularly if surgeon plans trial of instrumental delivery and may move on to Caesarean.

Examine patient:

- Airway
- Vital signs
- Recent or estimate patient weight
- IV access – FBC, G&S sent?

Explain:

- GA with cricoid pressure and prepping abdomen before going off to sleep. Explain she will be updated as soon as she wakes up.

In Theatre

- Transfer and place patient with left tilt (if not ready for preoxygenation, place full left lateral whilst assessing)
- Check patient ID band against verbal name, address, DOB (if written consent form, check hospital and NHS numbers)

- Reassess fetal heart (FH), confirm need for GA, have a failed intubation plan
- Give sodium citrate 30ml 0.3M
- Ensure good positioning, with head right at top of table, sniff the morning air, extended neck, consider HELP pillow particularly if high BMI
- Ensure IV access is working
- Nasal oxygen at 5 L/min whilst awake or consider Optiflow
- Pre-oxygenate with 10-15 L/min, with tight fitting mask until ETO2 is 0.9
- Suction ready under pillow
- Urine catheter and abdominal prep
- Ask for quiet in theatre for checklist and start Intubation checklist and Cat 1 WHO Checklist (or if not cat 1 GA, then full Time Out)
- Video-laryngoscope (VL) as 1st line is advised, usually with S3 or S4 Macintosh blades
- Communicate with Obstetricians when starting induction

Induction

- Consider addition of alfentanil 1 mg if PET - let neonatal team know (see PET adjustments)
- Check that the anaesthetic assistant is ready with cricoid pressure
- Propofol (titrate as needed) or Thiopentone 5mg/kg (caution: if extravasates). If haemodynamically compromised, consider ketamine 2 mg/kg.
- Suxamethonium 1.5mg/kg actual weight or Rocuronium 1.2 mg/kg ideal weight
- Increase nasal oxygen to 15 L/min when asleep if using nasal oxygen
- Await full muscle relaxation, **60 seconds** for good intubating conditions
- Consider manual ventilation with max 20 cmH20 pressure whilst waiting for muscle relaxation with cricoid pressure on
- Intubate with VL e.g. Glidescope Macintosh S3 or S4 blade
- Confirm correct placement of ETT: chest movement, breath sounds, sustained capnography trace (7 waves). It is important to let nobody distract you whilst you are inducing and intubating the patient.
- Sevoflurane on max
- Turn FiO2 down to enable N20 use to maintain SpO2 e.g. FiO2 0.5
- Keep high FGF
- Once ET Sevoflurane > 2 %, obstetrician can start
- Then turn Sevoflurane down to avoid excessive uterine relaxation as soon as depth adequate
- **Go to failed intubation drill if unsuccessful**
- Ensure antibiotics given

After delivery

- If baby is in good condition the cord will be clamped at 1 minute
- Oxytocinon 5 units slowly, e.g. over 1 minute. Slower if hypotension or tachycardia increases after giving 1 unit.
- Consider oxytocinon infusion and tranexamic acid (discuss with obstetrician)
- Remove tilt off table and ensure height is ok for obstetrician
- Give opiates: e.g. fentanyl 100mcg, morphine 10-15mg IV
- If uterus atonic, give uterotonics, do not reduce MAC of volatile less than 1

Before extubating:

- Ensure patient is stable
- WHO Sign Out whilst intubated – less distraction than when patient waking from GA
- Consider emptying stomach with large bore nasogastric or orogastric tube if recent non-clear fluid or food
- Ensure adequate analgesia given (paracetamol, NSAIDs, opiates and either TAP block, quadratus lumborum block or local anaesthetic infiltration)
- TOF: confirm reversibility and then give reversal. Neostigmine (with glycopyrrolate) takes 10 minutes for maximal effect. If Sugammadex is used, it often takes 1-2 min. Sugammadex points:
    - ensure patient is told about **reduction in effect of hormonal contraceptive** (need barrier, e.g. condoms for 7 days)
    - inform patient that **effects on breastfeeding are unknown**. In animal studies, it is excreted into breast milk. Oral absorption of cyclodextrins in general is low and no effect on the suckling child is anticipated following a single dose to the mother, however it is unknown (medicines.org.uk May 2024)
    - Confirm adequate reversal with nerve stimulator

Extubate

- Ensure suction to pharynx
- Consider bite block
- Head up or left lateral **and** awake
- Ensure head is near end of bed and bed is near machine

Recovery

- Anaesthetist to stay with patient until: airway control regained, able to communicate and haemodynamically stable
- Anaesthetist to be immediately available for at least 30 minutes
- No relatives until fully awake
- One to one care from recovery nurse or trained midwife (another professional should look after the baby)

Failed Tracheal Intubation

Best Practice Points

- Ensure familiar with DAS guidelines Obstetric DAS guidelines
- Always assess the patient's airway before induction of Anaesthesia
- Check all the intubation equipment daily and be familiar with its use
- Call for help early
- Position the patient correctly before induction (head near end of bed, ramped head up position with left tilt. Consider HELP pillow if obese)
- Remember oxygenation is more important than intubation
- Maternal welfare is paramount and takes priority over fetal considerations

Background

The incidence of failed tracheal intubation is 8 times higher in obstetrics (1:250 v 1:2000 general surgical population). Some of this is due to pharyngeal oedema and it has been shown that Mallampati scores worsen throughout pregnancy. Some is likely due to the RSI and the speed at which GAs are required in obstetrics.

Pre-operative Assessment

Clinical assessment of the airway and risk of difficult intubation can be performed in a matter of seconds. See airway assessment.

If there is any doubt about the ability to intubate a patient call for help and avoid General Anaesthesia where appropriate. However, some failed intubations cannot be predicted.

Equipment that should be immediately available

Guedel airways
Nasopharyngeal airways

Various size cuffed ETT 7.0 or smaller (recommended by OAA and DAS 2015)
Gum elastic bougie
2nd generation LMAs, e.g. i-gel
Glidescope (with hyperangulated low pro blade as backup)
Glidescope fibreoptic single use bronchoscope: "BFlex 2"
CICO kit
High flow nasal oxygen

This equipment is set out in draws on the airway trolley and corresponds to plan A, C and D in the DAS guidelines for failed intubation

Ensure you are familiar with the equipment available to you

Problems that may be encountered

Remember many difficult intubations are due to poor positioning or inadequate muscle relaxation.

- use the HELP pillow for optimal positioning
- use an adequate dose of Suxamethonium or rocuronium
- wait for it to work (at least 60 secs)

If unable to insert laryngoscope, the cause could be:

- suboptimal head and neck positioning: reposition
- breasts in the way: retract breasts, rotate blade to insert Glidescope or try short handle Mac 3 or Mac 4 laryngoscope of McCoy laryngoscope (on top intubation trolley)
- relaxant not working: wait
- cricoid hand in the way: adjust without releasing
- muscle rigidity (could be MH or can occur with Suxamethonium)

If the laryngoscope cannot be inserted subsequently proceed as failed tracheal intubation.

If the laryngoscope can be inserted, but intubation fails: max. 2 attempts (and 1 extra by senior): if fail, follow DAS e.g. supraglottic.

Modifications to GA with severe PET

- Avoid NSAIDs, ketamine and ergometrine
- Low threshold for arterial pressure monitoring (especially use if on IV antihypertensives or poorly controlled hypertension)
- If systolic BP >160 mmHg or diastolic > 110 mmHg on arrival in theatre, consider IV anti-hypertensive before GA:
    - labetalol 50 mg over 2 minutes. The neat labetalol solution is a 20 ml ampoule of 5 mg/ml, so give 10 ml of the 5 mg/ml solution over 2 minutes (contraindicated in asthma)
    - hydralazine 5 mg over 10-15 minutes. Hydralazine comes as 20 mg of powder in an ampoule. Take a 20 ml syringe of saline, inject 1 ml of this into the 20 mg hydralazine powder, then aspirate this to mix into a total volume of 20 ml to make a 1 mg/ml solution. Give 5 ml of the 1 mg/ml solution over 10-15 minutes (contraindicated in tachycardia and some cardiac disease)
    - $MgSO_4$ 2g over 5 minutes. Use the magnesium ampoules which have 500 mg/ml (50%) in a 10 ml ampoule. Using a 10 ml syringe, draw up 4 ml of 50% $MgSO_4$ solution and add 6 ml of saline. Give over 5 minutes. Note that this is in addition to previous Magnesium that the patient may be receiving, provided this hasn't been stopped due to areflexia
- Usually, IV antihypertensive infusions can be turned off when GA started if BP is ok, however continue MgSO4 infusion at 1g/hour (usually 10 ml/hour)
- Ensure fluid restriction 80 ml/hour. Hourly catheter output
- Consider smaller ETT if any voice change, e.g. 6.0 or 6.5 cuffed
- Obtund response to laryngoscopy:
    - Alfentanil 1 - 1.5mg, or Remifentanil e.g. 0.2mcg/kg/min (or 1 mcg/kg when on TCI) – ensure neonatal team aware
- Obtund response to extubation, e.g. with IV antihypertensive, e.g. labetalol 10-20 mg. NB: Magnesium may prolong NMB
- Ensure reflexes checked every 4 hours if NMB has worn off or if patient kept intubated and paralysed, send lab $MgSO_4$ level and aim for 1.8-4 mmol/L (5 mmol/L is associated with loss of reflexes, > 6 mmol/L with respiratory depression, respiratory arrest, weakness, arrhythmia and higher levels with cardiac arrest).

Extravasation of Thiopentone

If thiopentone is administered down an intravenous cannula that has dislodged the thiopentone has been administered subcutaneously. Subcutaneous thiopentone can cause significant harm.

Once recognized, another cannula will need to be secured and another dose of thiopentone or other induction agent administered.

The tissued cannula should remain in situ until you have time to aspirate any drug you can from it. It can then be removed.

Contact the on-call plastic surgeon in Morriston for advice.

The patient will need to be informed, a Datix completed and follow up arranged in the anaesthetic obstetric clinic.

Complications of GA

Very common problems (more than 1:10): nausea, vomiting, sore throat, shivering or itching.

Common complications (1:10 to 1:100): damage to lips or teeth,

- dental damage needing treatment in 1:4500

Uncommon complications (1:250): failed intubation

Uncommon complications (around 1:1000):

- accidental awareness during anaesthesia (1:670 in NAP 5, 1:212 in prospective multi-centre study in 2021).
  Odor, P.M., Bampoe, S., Lucas, et al. Incidence of accidental awareness during general anaesthesia in obstetrics: a multi-centre, prospective cohort study 2021. Anaesthesia, 76: 759-776. https://doi.org/10.1111/anae.15385
- Accidental awareness is when a patient may have memories of events in the operating theatre. The majority of patients who become accidentally aware do not feel pain.
- breathing difficulties after the anaesthetic
- permanent peripheral nerve injury

Rare (around 1:10,000) severe allergic reaction, most commonly to medicines.

Very rare complications (around 1:100,000): brain damage or death caused directly by anaesthesia is extremely rare

Post-operative Care for Caesarean Birth

WHO sign out must be done before leaving theatre.

Post-operative analgesia and thromboprophylaxis (if required) must be prescribed prior to leaving theatre. If a patient is unsuitable for low molecular weight heparin due to bleeding concern, consider TEDs and Flowtrons on labour ward (Flowtrons can be stopped when patient is mobile out of bed).

Analgesia post operatively is provided by in the following ways:

- Spinal Anaesthetic by opioids (fentanyl and morphine) in the spinal
- Epidural top-up by administration of diamorphine (2.5 mg) diluted with saline post-delivery of the baby, via epidural catheter (with 2 ml saline flush to flush the opioid in and take account of the dead space which is around 1 ml). Remember to remove the epidural catheter in theatre after surgery (unless you are concerned about coagulopathy. In this case, ensure team knows that epidural is still in and note it on MDT board with a star. Ensure that there is no LMWH prescribed.
- General anaesthesia will require either local anaesthetic infiltration of the wound by the obstetrician, or either a TAP block or Quadratus Lumborum block by anaesthetist, depending on your experience. Consider a PCA fentanyl or morphine postoperatively or early Oramorph. It is recommended to site a dedicated cannula for a PCA, but if the patient has very difficult veins, ensure there is a 2-way extension set with a one-way valve on the fluid line (to avoid the opioid backtracking up the fluid line).

If intra-thecal opioids have been administered:

- the patient must stay in LDU for 2 hours (or 12 hours if they are high risk of respiratory depression, e.g. OSA)
- a green intrathecal sticker must be put on the prescription chart (and same sticker but with epidural circled if they have had epidural diamorphine)

<u>Drug chart modification in theatre:</u>

- **Ensure patient allergies up to date**
- **Note patient booking weight**
- **Delete:**
  1. **any drugs that are duplicates on PRN side** e.g. paracetamol**,**
  2. **any drugs contraindicated with other opioids or in breastfeeding,** e.g. pethidine (due to other opioid prescribed) or codeine (if she may breastfeed).
  3. **omeprazole** (unless needed e.g. HDU patient, not expected to eat soon or on omeprazole regularly before admission)
- **Prescribe unless contraindicated:**

- Oxygen if GA or strong opioids prescribed by any route
- Stat doses of: Antibiotics (on front of drug chart)
- IV fluid including any oxytocin infusion. Consider prescribing until spinal has worn off. Ensure fluid balance chart is being used.

The following regular medication:

- Tinzaparin if required (see dose on next page)
- TED stockings (or Flowtrons if LMWH contraindicated for > 6 hours)
- Paracetamol 1g QDS (if over 50kgs)
- Ibuprofen 400mg TDS or QDS (reduce dose if below 50kgs) – after food (first dose 10 hours after PR diclofenac)
- **If NSAIDs contraindicated,** then either regular Dihydrocodeine 30 mg QDS or Tramadol 50-100 mg QDS with a regular laxative, e.g. Lactulose 15 ml BD

The following PRN medication:

- Oramorph 10 mg 1 hourly or 10-20 mg 2 hourly (note in max box "60 mg per day then call doctor")
- Naloxone 100 mcg PRN if RR <10 or sedated
- Tramadol (if not having it regularly) 50-100 mg QDS/PRN
- Ondansetron 4-8 mg IV/PO TDS (unless prolonged QT interval)
- Prochlorperazine 3-6 mg **BUCCAL BD** (or 12.5 mg IM TDS)

Notes:

Codeine: avoid if the patient may breastfeed as it can cause respiratory depression in babies due to variabilities in maternal liver metabolism by the cytochrome P450's CYP2D6 isoenzyme. This isoenzyme has considerable genetic polymorphism - some women are slow metabolisers whilst others are ultra-rapid metabolisers. If a woman is an ultra-fast metaboliser, she will metabolise codeine rapidly to much higher concentrations of morphine in breast milk than other women. In extreme cases, this can lead to severe neonatal depression and death.

Other opioids in breastfeeding women:

- Morphine has been recommended as the opioid of choice if strong analgesia is required in breastfeeding women though small amounts do pass to breastmilk. However, small amounts of all opioids pass to breastmilk though the amounts of morphine and its metabolite (morphine-6-glucuronide) are low and infants don't tend to show any signs. However, if the patient is having repeated doses, "the infant should be observed for signs of abnormal drowsiness and respiratory depression, especially if the woman is also showing signs of sedation". "**If sedation and drowsiness develop in the infant**, she should withhold breastfeeding and seek medical advice."

Mitchell J, Jones W, Winkley E et al. (2020). Guideline on anaesthesia and sedation in breastfeeding women 2020. Anaesthesia, 75: 1482-1493. https://doi.org/10.1111/anae.15179 (accessed 25/04/2024)

Thromboprophylaxis

Thromboprophylaxis should be prescribed S.C. normally 4 hours after the spinal or removal of the epidural catheter by anaesthetist if the VTE risk scoring for prophylaxis is triggered.

The dose will be prescribed depending on the mothers **booking** weight unless there has been significant weight gain (> 12 kgs)

	Tinzaparin	**Enoxaparin**
<50 kgs	3,500 units OD	20mg OD
50-90kgs	4,500 units OD	40mg OD
91-130kgs	3,500 units BD	60mg OD
131-170	4,500 units BD	40mg BD
>170 kg	75 units/kg/day	0.6mg/kg/day

There is a reminder purple laminate in the obstetric theatres on labour ward on the wall and in main theatre 1 in the Lever Arch file in the anaesthetic room.

If the spinal or epidural had multiple recent attempts or was a bloody tap, consider delaying LMWH for 12 hours after neuraxial. If patient has coagulopathy, leave epidural in, but note on MDT whiteboard, tell staff especially at handover and remove as soon as coagulation is normal (discuss with consultant if unsure).

Anaesthesia for Trial of Birth with Forceps in Theatre

(was called "Trial of Instrumental Delivery")

If the cervix is fully dilated and has either failed to deliver the baby without assistance, or the delivery has to be expedited, then an instrumental delivery with forceps or a Ventouse suction cup or a may be attempted.

Those going to theatre are "trials" as they have a higher risk of failure (the fetal head is usually mid rather than low in the pelvis). **The urgency of delivery must be categorised**, e.g. birth by a particular time. **You must be prepared to proceed to an IMMEDIATE Caesarean birth and therefore a block adequate for Caesarean is required prior to commencing the instrumental delivery** (use standard doses via spinal or epidural top-up as for Caesarean). **If the block is not sufficient, be ready to give an immediate GA.**

It is usual practice for the obstetricians to allow themselves 3 pulls with the forceps/ventouse, after which time if there has been no descent of fetus they should proceed to a Caesarean. Stay alert to the developing situation so that you are not taken by surprise by the need to do a sudden Caesarean.

There is also a risk of causing impacted fetal head by failing instrumental, so the team should be prepared for this, often with a vaginal push up and keeping the legs in lithotomy position.

Intravenous cefuroxime and metronidazole should be administered unless there is severe penicillin allergy.

Remember:

- WHO checklist
- Postoperative analgesia including neuraxial green sticker: if there is an episiotomy or perineal tear, prescribe regular paracetamol and ibuprofen unless contraindicated and PRN dihydrocodeine or tramadol with antiemetics
- Consider thromboprophylaxis.

<u>Birth with forceps or ventouse in the room</u>

Deliveries with ventouse or non-rotational forceps may be done in the labour room if the head is low in the pelvis and it is a "lift out". If there is an epidural in-situ, ensuring recent dose of epidural PCEA may be adequate. Consider giving 10mls of 0.25% levo-bupivacaine for extra analgesia.

If the mother is using remifentanil or Entonox, these can be continued for the delivery but supplementation with a Pudendal nerve block will be considered which helps numb the perineum.

Intra-operative Cell Salvage

Advocated for use in obstetrics in selected cases (endorsed by CEMACH, AAGBI, MBRACE and NICE)

Indications:

- Pre-existing anaemia < 105 g/L at term (note contraindicated in haemoglobinopathy)
- Bleeding:
    - Anticipated blood loss of more than 1 L, e.g. placenta accreta, large fibroids, ruptured ectopic pregnancy, previous uterine surgery or adhesions
    - Risk factors for bleeding, e.g. prolonged induced labour with oxytocin
    - Ongoing bleeding in massive PPH
- Problems or contraindication to transfusion of laboratory blood (allogenic transfusion) anticipated:
    - Rare blood group or multiple antibodies
    - Objection to receiving allogenic blood, e.g. Jehovah's witness, but consented to cell salvage

Benefits:

- Avoids the risks of donated blood (allogenic blood): infection, incompatibility, cost
- Salvaged blood: has improved oxygen carrying capacity (compared to packed red cells that have been stored)
- Enhance safety for patients who refuse donated blood
- Reduce healthcare reliance on donated blood

Risks:

- Intrinsic in the blood:
    - **Rhesus disease of the newborn** in future pregnancies if the patient is Rhesus negative and fetus is Rhesus positive, then transfusion of cell saved blood could contain fetal blood with its Rhesus antigen. This could cause Rhesus antibodies to form in the mother which could affect future Rhesus positive fetuses
    - **Haemolysis due to red cell fragility in Haemoglobinopathies**, e.g. sickle cell trait, sickle cell disease, thalassaemia
- From anticoagulant:
    - Thrombocytopenia if heparin used as anticoagulant and patient known to have heparin-induced thrombocytopenia
    - If excess administered accidentally, check APTT and give protamine
    - Citrate can cause hypocalcaemia, like any transfusion
- From leucocyte depletion filters (If used):

  - Hypotension from passing through leucocyte depletion filter (due to increased bradykinin)
- **Theoretically** from what's suctioned up apart from blood:
  - Amniotic fluid - embolism? no evidence
  - Infection: sepsis if suction from contaminated field, e.g. chorioamnionitis, bowel contents
  - Chemicals/toxins, e.g. clotting agents such as Surgicel
  - Malignancy (in patients with cancer)

Practicalities:

- Ensure discussion of risks and benefits (mention that many risks are theoretical)
- Discuss indication at the Team Brief prior to the WHO Sign In
- Ask ODP to set up in collect-only mode if there is an indication. If there is enough collected, it can be processed. This enables it to be more cost-effective. However, check with Jehovah Witnesses as some ask for the cell salvage circuit to be set up in continuity with them.
- To maximise blood collected all swabs should be washed gently in 2 litres of N/saline and this aspirated into the cell salvage machine. It is important not to wring out the swabs.
- Association of Anaesthetists' Working Party does not recommend routine use of separate suction for amniotic fluid (as it's washed and filtered out) or Leucocyte depletion filters.
  Klein AA, Bailey CR, Charlton AJ, et al. Association of Anaesthetists guidelines: cell salvage for peri-operative blood conservation 2018. Anaesthesia 2018; 73; 1141–50
  https://onlinelibrary.wiley.com/doi/full/10.1111/anae.14331

- A standard blood administration set with an in-line blood filter should be used.
- Connect the blood in theatre and add a sticker with the volume, time started and speed of transfusion on a pink blood transfusion chart.
- The re-infusion of salvaged blood should be completed within 4 hours of the completion of processing.
- Pressurising re-infusion bags presents a risk of air embolism and is not recommended.
- Check if the patient is **Rhesus negative.** If so and cell saver blood is transfused, take pink vacutainer from the mother to check Kleihauer. Then give anti-D within 72 hours of birth. Ensure the midwife looking after the mother is aware cell salvage blood has been re-infused.
- Note that reinfused blood does not contain platelets or clotting factors and ROTEM, blood gases and laboratory tests must be used to direct resuscitation
- Report any potential adverse events relating to the reinfusion of salvaged blood via SHOT website and Datix

Intra Uterine Death

You may be asked to provide labour analgesia for mothers who have had an intra uterine death (IUD) diagnosed and need to proceed to a vaginal delivery.

The usual practice once IUD had been diagnosed is to induce labour with prostaglandin pessaries. This can take several days.

Remember this is a very difficult time for the parents, so be sensitive to their situation.

The mother is potentially at risk of DIC, particularly if the cause of the IUD was a placental abruption. In this situation DIC can develop very rapidly. DIC can also develop if the fetus has died some time ago (usually 1-2 weeks).

The mother is also at risk of PPH secondary to an atonic uterus, retained products and sepsis.

It is useful to check FBC, coagulation on patients with IUD. If abruption is the cause, also check a ROTEM. If the IUD was > 1 week ago, check CRP and if suspicious of sepsis, check a VBG for a lactate and blood cultures.

Labour analgesia in IUD

Ensure the options are discussed, including oral analgesia, Entonox, TENS if the patient has a device, IM pethidine, a PCA (if at least 4 hours after IM pethidine) or an epidural.

A remifentanil PCA is preferable, ensuring same standard of care as usual including the continuous presence of a midwife. A morphine PCA is an alternative option.

If she wants an epidural:

- FBC and coagulation should be performed prior to siting an epidural and if prior to withdrawing the catheter, if it has been in situ for a significant time.
- If the IUD was due to a placental abruption, then due to the risk of developing DIC the risks and benefits of siting an epidural should be carefully weighed up, and discussed with the consultant.

Maternal Cardiac Arrest (for other emergencies, see Further Resources)

It is rare in pregnancy estimated to occur 1 in 30,000 deliveries.

Similarities between maternal and standard ALS

- Diagnosing cardiac arrest
- CPR 30:2
- Defibrillation and drugs

Differences between maternal ALS and standard ALS

- Causes of cardiac arrest: Remember 4 H s and 4 T s. The differential diagnosis includes amniotic fluid embolism, pulmonary embolism, eclampsia, drug toxicity (LA and Magnesium), cardiac causes, haemorrhage and sepsis.
    - If there is suspected LA toxicity, give 1.5 ml/kg intralipid bolus and see guideline Obs QRH 2024 – cardiac arrest may be refractory to treatment
    - If there is suspected Magnesium toxicity, give 10 ml 10% Calcium Chloride
- Ask switchboard for "maternal cardiac arrest team". This will automatically include obstetrician, anaesthetists for labour ward and 2nd on, neonatologist, medical registrar. If the patient is <22 weeks pregnant or postpartum, the neonatal team can be informed that they are not required.
- Avoid IVC compression by gravid uterus: In the supine position 90% of the vena cava is occluded at term and the resultant stroke volume may only be 30% of a non-pregnant lady. If fundal height of uterus is above umbilicus or known to be > 20/40, then ensure uterine displacement to the **left** and If patient is on theatre table, tilt left 15-30 degrees (with side supports). More than 30 degrees means that chest compressions are less effective.
- Perimortem delivery asap (within 5 minutes) in a patient who is > 20 weeks. This is for maternal benefit (improved oxygenation, ventilation and venous return). It should be done at the site of cardiac arrest. There is a perimortem delivery pack on the resuscitation trolleys. Bleeding will not usually be heavy but packing and pressure is needed if ROSC occurs.
- Intraosseous: humeral is preferred due to potential blood loss from intra-pelvic vessels. An EZ IO is kept in the bottom drawer of the resuscitation trolley in the anaesthetic room on labour ward (the other trolleys e.g. labour ward medication room, ward 19 and ward 20 don't have an EZ IO)

Tips:

- Ensure that closed loop communication is used
- If a cardiac arrest occurs in bed, ensure the bed is moved away from the wall and the head end is removed, to allow you to fit at the head end.
- Use ETCO2 early (Phillips monitor on a stand kept in store room beyond obstetric theatre or for transfer, the one on the transfer trolley near ECU)

Postpartum Haemorrhage

Causes are one or more of:

- Tone: uterine atony - this is the **most common**
- Tissue: retained placenta and/or retained products/clots
- Trauma: tear in perineum, vagina, cervix or uterus
- Thrombin: coagulopathy – this is the least common, but can occur after large volumes of IV resuscitation (limit to 2L crystalloid) or earlier in abruption or IUD

Major haemorrhage is > 1.5 L blood loss. Patients can bleed rapidly so it is helpful to rapidly assess and treat haemorrhage, using Obs Cymru to stop the bleeding. Measure blood loss (e.g. suction, weigh 'inco' pads or swabs). Patients can tolerate blood loss better than non-pregnant patients, but this means that blood loss can become large before the patient shows signs of compromise and then they can decompensate rapidly (hypotension is a late sign). Patients who are of low body weight, with pre-existing anaemia or pre-existing cardio-vascular-respiratory compromise tolerate blood loss poorly.

Estimated blood volume in a patient of normal BMI is 95 ml/kg (approx. 100 ml/kg for calculations). This is less in obese patients at term:

BMI	Blood volume ml/kg
18.5-24.9	95
25-29.9	85
30-39.9	75
≥ 40	70

Kennedy H, Haynes SL, Shelton CL. Maternal body weight and estimated circulating blood volume: a review and practical nonlinear approach. NJA 2022; 129 (issue 5): 716-725
https://doi.org/10.1016/j.bja.2022.08.011

Management

The priorities are resuscitation and stopping the bleeding (combination of finding the cause and treating it which may drugs and/or surgical intervention). Once resuscitation is underway, ensure rapid anaesthetic assessment and be prepared to take patient to theatre and anaesthetise if surgical intervention is required.

- Management should be a team approach, following the ABC approach.
- If major haemorrhage, ask for midwife in charge or a specific team member to call 3333 and state location of patient
- Blood tests:
    - VBG: An initial VBG will give a baseline Hb but should not be used to guide transfusion as Hb is a concentration.

  - ROTEM
  - FBC, clotting (includes fibrinogen), G&S
- Give tranexamic acid 1g IV slowly and repeat in 30 minutes if bleeding is ongoing
- Put out the major haemorrhage call in any patient who is decompensating, who have a blood loss >1.5 L or > 30% of estimated circulating volume or whom you are clinically concerned as it will alert the blood bank and get a porter to delivery suite rapidly

Uterotonics:

- IV Oxytocin 5 units IV given slowly
  - Or IM Syntometrine (5 units oxytocin and 500 micrograms ergometrine) - **avoid Syntometrine if hypertensive**
- Repeat IV Oxytocin 5 units slowly
- IV infusion of Oxytocin (40 units in 500 ml 0.9% saline at 125 ml/hour). If fluid restricted, 40 units in 40 ml total volume with 0.9% saline at 10 ml/hour.
- Ergometrine 500 mcg IM if syntometrine not given already (onset 7 minutes, duration 3 hours), unless contraindicated (hypertension, cardiac disease). Note there is no evidence to give a second dose of ergometrine if patient has already had syntometrine.
- IM Carboprost (Hemabate) 250 mcg IM repeated every 15 min maximum 8 doses - **avoid if asthmatic**
  - Or Misoprostol 1000 mcg (5 x 200 mcg tablets) PR / or 800 mcg sublingual

Haemorrhage control may include:

- Uterine massage
- Bimanual compression of uterus
- Intrauterine tamponade device (e.g., Bakri balloon®)
- Vaginal packing
- Uterine brace sutures (B-lynch suture)
- Hysterectomy

Tips:

- Ensure that the patient is **kept warm**, administer fluids from warming cabinet whilst waiting for an IV warming device to be set up. Consider a Bair Hugger. Aim for normothermia
- **Avoid excessive haemodilution** as this can cause coagulopathy and reduced oxygen carriage. No more than 2 L crystalloid for resuscitation before blood is given (give O negative if not yet crossmatched). Other blood products based on ROTEM (and check FBC for platelet count). If ROTEM is unavailable with ongoing heavy bleeding, discuss with consultant. Consider red cells: FFP at a 1:1 ratio (FFP takes 20 min to defrost).

- Monitor ionised **calcium** on VBG and maintain > 1 mmol/L. If low, give 10 ml 10% calcium chloride IV (or 30 ml of 10% calcium gluconate IV). Check VBG at least after every 4 units of blood transfused
- Monitor for acidosis, lactate and urine output as they can indicate hypovolaemia
- Consider **cell saver use** early in theatre (this can be started part way through a case, initially on collect-only mode for speed of set-up)
- Assess any patients who decline blood products early as their treatment options are more limited
- Low threshold for arterial line to allow repeated sampling and pressure monitoring if situation is not resolving

Pre-eclampsia (PET)

Definition

According to International Society for the Study of Hypertension in Pregnancy (ISSHP) 2018:

1. new onset hypertension (SBP ≥140 mmHg, DBP ≥90 mmHg, or both) ≥ 20/40
2. accompanied by **one or more of** the following features:
   - proteinuria 1+ (urine protein:creatinine ratio > 30 mg/mmol) though note that all pre-eclamptics don't have proteinuria
   - maternal organ dysfunction
   - AKI (Creat ≥ 90 micromol/L)
   - Liver involvement (elevated AST or ALT ≥70 IU/L or twice upper limit of normal range)
   - Haematological complications (platelet count <150 x 109/L) haemolysis, DIC)
   - Neurological complications (including eclamptic seizure, severe headaches, clonus, persistent visual scotomata, blindness, altered mental status or stroke)
   - Uteroplacental dysfunction (e.g. abnormal umbilical artery Doppler waveform analysis, restricted fetal growth or stillbirth)

Severity

In noting the severity, pre-eclampsia is a spectrum, which may change within an individual, so is best noted as "with or without severe features":

Severe features

- SBP ≥160 mmHg or DBP ≥110 mmHg
- Platelet count ≤100 x 109/L
- Renal insufficiency (doubling of the serum creatinine concentration in the absence of other renal disease)
- Impaired liver function (AST or ALT twice the upper limit of normal or more and severe persistent RUQ or epigastric pain not accounted for by alternative diagnoses)
- New onset headache, unresponsive to medication and not accounted for by alternative diagnoses
- Visual disturbance
- Pulmonary oedema
- HELLP (haemolysis, elevated liver enzymes and low platelets) syndrome is potentially life-threatening to both mother and baby, and represents a severe form of pre-eclampsia. Women may be critically unwell at presentation with placental abruption or DIC

Risk factors

There are a number of risk factors. The strongest are:

- Previous PET
- Chronic hypertension
- BMI > 30
- DM before pregnancy
- SLE or Antiphospholipid syndrome
- Assisted reproductive therapies

Prevention:

Healthy diet and aerobic exercise

Calcium if dietary intake is low (>1g/day) may reduce risk

Aspirin 75-150 mg from 12 weeks to 36 weeks or birth of the baby.

Treatment Summary

1. Manage hypertension and severe hypertension (see below):
    a. consider an epidural to reduce sympathetic stimulation in labour
    b. avoid exacerbating hypertension (avoid ergometrine and anaesthetic doses of ketamine, try to avoid a hypertensive surge at intubation)
2. Assess and monitor in case of expedited delivery (anaesthetic assessment in PET, blood tests in PET) because even if no severe features of PET, the PET could worsen. HDU care for any PET patient with severe features
3. Also, in severe PET:
    a. Prevent seizures in those at risk and treat any seizures (see below)
    b. Fluid restrict
    c. Avoid NSAIDs

Treatment

1. **Hypertension**

    Treat if sustained **Systolic BP (SBP) ≥140 mmHg, Diastolic BP (DBP) ≥90 mmHg**, then it is **recommended to lower to ≤135/85 mmHg** to reduce the risk of stroke (haemorrhagic > ischaemic). The patient is often treated as an outpatient with more frequent BP monitoring. She may be admitted if she has any severe features or other reason for admission.

    Treat with:

    - oral labetalol as initial therapy (avoid in asthma) – see doses below
    - alternatives: nifedipine (modified release preferred to immediate release) or methyldopa
    - other agents (second/third line): hydralazine or prazosin

Note: regular thiazide diuretics, ACE inhibitors or angiotensin II receptor blockers are not used in pregnancy as they have a risk of congenital abnormalities.

Severe Hypertension

If the patient has a **SBP ≥160 mmHg or DBP ≥110 mmHg**, treatment should be initiated urgently, with admission to labour ward for HDU care and consideration of IV treatment, aiming for a stepped controlled reduction of BP. Start with oral treatment in most cases. Hypertensive emergencies are usually initially treated with oral medication but monitored frequently and if the BP doesn't settle, IV antihypertensives may be required. An arterial line is not necessary initially unless an antihypertensive infusion is commenced. Hydralazine is a direct vasodilator and may cause adverse effects so crystalloid fluid IV is usually administered at the same time (up to 500 ml). Also see Pre-eclampsia Guideline on WISDOM (on COIN).

- PO Labetalol (AVOID in women with asthma)
  - 200 mg orally. Can repeat after 15–30 minutes (usual effect by 30 min)
  - Maintain with 200 mg orally TDS if good response
- PO Nifedipine (if asthmatic, Afro-Caribbean or if labetalol is ineffective)
  - 10 mg modified release orally (10 mg immediate release can be used instead and tends to work in 30 min) but avoid sublingual as it causes very rapid hypotension
  - Maintain with 10 mg modified release BD if good response
- IV Hydralazine (1 mg/ml) (if nifedipine or IV labetalol ineffective, but avoid if tachycardic >120/min. Also if initial heart rate ok, but then >120 on hydralazine, slow or stop infusion)
  - 20 mg powder in ampoule. Mix with 20 ml 0.9% saline to make 1 mg/ml.
  - Loading dose: 5-10 mg (5-10 ml) over 5-15 min (if given through syringe driver, give in 50 ml syringe, e.g. 5 ml at 20 ml/hour rate for 15 min). **Give IV crystalloid too (250 ml if patient has not had any IV fluid).** After 20 min, can repeat 5 mg Hydralazine over 15 min
  - Maintenance: SBUHB protocol suggests starting at 2 ml/hour. This can be titrated by 0.5 ml/hour every 15 min, max rate 18 ml/hour (not including rate of loading dose)
- IV Labetalol (5 mg/ml) (AVOID in women with asthma or who have bradycardia)
  - Give neat (not diluted)
  - Loading dose: 50 mg (10 mL) over 2 minutes. Can repeat every 5 minutes to a maximum of 4 doses (200 mg) if needed
  - Maintenance: Start at 4 ml/hour (20 mg/hour); double rate every 30 minutes until BP controlled. Max rate 32 ml/hour (160 mg/hour) not including rate of loading dose

BP should initially be monitored every 5 min after bolus doses until 15-30 min after dose, then every 15 min until BP has stabilised, then every 30 min as step down. If stable/normalised, it can be checked every 4 hours.

2. Assess and monitor in case of expedited delivery

Patients are on a spectrum and could become severe. Anaesthetic assessment is useful as is sending blood tests (within 6 hours of epidural/surgery or just before if platelet count is dropping rapidly). Ensure HDU care for any patient with severe features of PET.

Anaesthetic assessment in PET

Ensure that an anaesthetic history and anaesthetic chart is filled, that TED stockings are on unless contraindicated and that patient has received oral omeprazole 20 mg (or 40 mg IV esomeprazole over 3 minutes if the patient has not had oral omeprazole and is vomiting, drowsy or delivery is expected within 1 hour). Assess:

- Airway: vocal cord oedema? E.g. voice change (ask patient and birth partner), small ETT ready, e.g. 5.5 and 6.0 in case of GA
- Breathing: pulmonary oedema? E.g. ask about breathlessness, fast respiratory rate, desaturation, auscultate for decreased breath sounds or crackles. If any suspicion of pulmonary oedema, get senior support, investigate (e.g. ABG, chest x-ray), treat (e.g. oxygen, sitting upright, frusemide, GTN infusion)
- Circulation:
    - vital signs especially BP control to ≤135/85 mmHg
    - fluid balance, note extent of any oedema and fluid restriction (see below)
    - 2 x large bore IV access in severe PET
    - Blood tests in severe PET: FBC, blood film for haemolysis, Coag, G&S, U&E, LFT and that urine is sent for protein:creatinine ratio
- Disability: AVPU, irritability, headache?
- Exposure:
    - RUQ/epigastric pain (may be liver capsule, e.g. HELLP syndrome, liver capsule rupture).
    - Brisk reflexes? If clonus > 2 beats: $MgSO_4$ (see below)
    - Labour pain needing consideration of epidural?
        - Lumbar oedema may be present in PET making epidurals more challenging

Timing of delivery

If patients have severe features of PET and are ≥ 37/40, birth should be planned **within 24-48 hours as soon as the BP is controlled (at least <160/110).** During this time, do an anaesthetic assessment (see above).

If patients are premature, <37/40, consider planned early birth if:

- Inability to control maternal BP despite using 3 or more classes of antihypertensives in appropriate doses
- Progressive deterioration in renal function, liver function, platelet count or haemolysis
- Ongoing neurological features, such as severe intractable headache, repeated visual scotomata or eclampsia
- Maternal SpO2 < 90% on air

- Placental abruption
- Reversed end-diastolic flow in the umbilical artery Doppler velocimetry, a non-reassuring cardiotocograph or stillbirth

3. Further management of severe PET

3a Prevention of eclampsia/seizures

If the patient with severe PET has **persistent neurological symptoms or signs**, e.g. severe intractable headache, signs of cerebral irritability (e.g. feeling jittery), clonus > 2 beats, or visual disturbance, then Magnesium sulphate ($MgSO_4$) is given:

- **$MgSO_4$ 4g over 5-10 minutes loading dose**. This is usually given as a prefilled syringe of 4 g in 20 ml given at 240 ml/hour (this will give 20 ml over 5 min). If this is not available, it can be given manually: take 8 mL (4 g) of 50% (neat) MgSO4 diluted with 12 ml 0.9% saline in a 20 ml syringe and give over 5 minutes manually.
- Then check urine output. If urine output is normal, give a maintenance infusion of premixed $MgSO_4$ which is 5 g in 50 ml given as 10 ml/hour or 1g/hour. If oliguric, delay infusion until urine output is > 0.5ml/kg/hour as Mg is renally excreted
- Stop magnesium if:
  - Urine output is < 100 ml in 4 hours
  - Reflexes are absent (check 4 hourly)
  - Respiratory rate less than 12 breaths per min
  - Oxygen saturation less than 90 %
- The normal plasma level of Magnesium is 0.7-1.0 mmol/L. The therapeutic level of Magnesium is debated for pre-eclampsia, but is thought to be in the range of 1.8-4 mmol/L, although it is not usually monitored unless the patient is sedated on ICU. Instead, reflexes are checked every 4 hours (patellar or brachial if recent spinal anaesthetic). Reflexes are diminished or absent as an early sign of Magnesium toxicity, once serum levels are approximately 5 mmol/L. The patient may also be nauseous. If the reflexes are absent, $MgSO_4$ infusion is stopped until they return.
  - Higher plasma levels, 6-8 mmol/L cause weakness, respiratory depression, respiratory arrest, drowsiness, coma, arrhythmias and at 12 mmol/L, cardiac arrest can occur.
- The patient should have continuous SpO2 when on Mg, respiratory rate, pulse and urine output noted hourly and BP checked at a minimum of 4 hourly (BP intervals depending on degree of hypertension (see above))
  - If respiratory rate is reduced <12/min, Calcium Chloride should be given (10 ml 10% over 10 minutes).
- If the patient is on $MgSO_4$ predelivery, advise the patient to be nil by mouth for all except the isotonic fluids advised in the fluid restriction (or sips if delivery within 2 hours)

3b Fluid restriction

Fluid restrict all patients who develop PET with severe features to reduce the risk of pulmonary oedema (and also hyponatraemia) though it does increase the risk of renal impairment (which is usually temporary).

1 ml/kg/hour (max 80 ml/hour). This is essential IV medication, e.g. antihypertensive, $MgSO_4$ and then anything remaining give as isotonic oral fluid (unless unable to tolerate fluid orally).

Limit oxytocin infusion as this also causes fluid retention. If needed postoperatively, give concentrated in a 50 ml syringe pump as 40 units Oxytocin in 40 ml (add 36 ml 0.9% saline) and run at 10 ml/hour.

Monitor fluid balance closely. Catheterise and monitor urine output hourly. If urine output is <0.5 ml/kg/hour as an average over 4 hours, consider increasing oral fluid or giving small amounts of IV fluid slowly (e.g. 250 ml Hartmann's over 30 min)

3c Avoid NSAIDs

Post-delivery in severe PET (or if PET with other contraindications to NSAIDS) as NSAIDS increase the risk of renal impairment

Goddard J et al. Update on hypertensive disorders in pregnancy. BJA Education 2020, Volume 20, Issue 12, 411 – 416. https://www.bjaed.org/article/S2058-5349(20)30114-1/fulltext

Quick Reference Handbook for Obstetric Emergencies 2024 https://www.oaa-anaes.ac.uk/downloads/oaa-qrh/final-obs-qrh.pdf

Eclampsia

An eclamptic seizure is a seizure that occurs due to PET, in a patient >20/40 gestation or up to 6 weeks postpartum (though if postpartum, most present within 10 days). It can be in a patient not known to have PET.

The seizure will often self-terminate.
Call for help and ask for eclampsia treatment box

ABC approach and place patient in **Left lateral position**

- A/B: jaw thrust, oxygen 15L/min (is the mask misting)
    - Consider Hypoxia and Hypercarbia as causes
- C: Pulse and BP are difficult to check during a seizure. Auscultate heart. Attach 3-lead ECG and get large bore IV access. Send bloods for FBC, U&E, clotting, LFTs, blood glucose (BM), VBG
    - Hypotension? Hyponatremia? Hypo or hypoglycaemia?
- D: AVPU
    - Lateralising neurological signs? Check pupils?
    - Give Magnesium unless obvious other cause (4g $MgSO_4$ over 5 min IV or IO)
    - Blood glucose (BM) if not done already
- E:
    - check drug chart
    - Consider other differentials: check patient history: Epilepsy? Head trauma? Illicit drugs? May be Intracranial bleed, Cerebral vein thrombosis or Space-occupying lesion.
    - Urgent CT/ MRI head if diagnosis remain uncertain and consider contrast (discuss with consultant anaesthetist and then neuroradiologist)

As soon as seizure has resolved, assess the patient again with ABC approach and treat as for severe PET (HDU monitoring). Control hypertension, start a maintenance infusion of $MgSO_4$, do an anaesthetic assessment and blood tests and plan for delivery.

Further seizures whilst on a Magnesium infusion

- ABC approach
- Give a further 2g dose of Magnesium (over 5 minutes)
- Consider whether there could be an intracranial haemorrhage or another cause, e.g. hypoglycaemia from labour and not eating
- Call 2nd on and get advice from consultant anaesthetist

Further resources (all websites checked 25/04/2024)

Emergencies

- **List of location of emergency equipment:** Location page in red QRH files in anaesthetic room on labour ward
- **Anaesthetic emergencies:**
  - Association of Anaesthetists' Quick Reference Handbook (QRH) from (a second red file in anaesthetic room on labour ward – shelf above drug labels)
  - https://anaesthetists.org/Portals/0/PDFs/QRH/QRH_complete_April_2022.pdf?ver=2022-04-12-124225-493
- **Difficult intubation:**
  - Mushambi, MC, Kinsella SM, Popat M et al. (2015). Obstetric Anaesthetists' Association and Difficult Airway Society guidelines for the management of difficult and failed tracheal intubation in obstetrics†. Anaesthesia, 70: 1286-1306. https://doi.org/10.1111/anae.13260
- **Resuscitation:**
  - Resuscitation Council UK guide on cardiac arrest, peri-arrest and special circumstances: https://www.resus.org.uk/sites/default/files/2024-01/RCUK%20Adult%20QRH%20January%202024.pdf
- **Obstetric emergencies:**
  - Quick Reference Handbook for Obstetric Emergencies (red file in anaesthetic room on labour ward – shelf above drug labels) final-obs-qrh.pdf (oaa-anaes.ac.uk)
  - Most labour room emergencies: laminates on wall in rooms

Obstetric guideline A to Z for Swansea Bay:

- WISDOM https://wisdom.nhs.wales/health-board-guidelines/guidelines-by-health-board/swansea-bay/swansea-bay-maternity/
- There are also all Wales Obstetric Guidelines if you type WISDOM in the intranet search bar

Caesarean Birth Guidelines from NICE

- NICE Guideline 192: Caesarean birth (last updated 30/1/2024): Recommendations | Caesarean birth | Guidance | NICE

Intra and post-op analgesia for Caesarean

- Roofthooft E, Joshi GP, Rawal N. et al (2021). PROSPECT guideline for elective caesarean section: updated systematic review and procedure-specific postoperative pain management recommendations. Anaesthesia, 76: 665-680. https://doi.org/10.1111/anae.15339

Jehovah's Witnesses

- Checklist for patients 18 years and over who refuse blood transfusions: see COIN COIN downloadable checklist of blood products

Coagulation/thrombocytopenia

- AAGBI, OAA and Regional Anaesthesia UK. Regional anaesthesia and patients with abnormalities of coagulation. Anaesthesia 2013; 68: pages 966-72. http://onlinelibrary.wiley.com/doi/10.1111/anae.12359/abstract

Drugs in pregnancy

- BUMPS Best Use of Medicines in Pregnancy: https://www.medicinesinpregnancy.org/

Drugs in breastfeeding patients

- https://www.breastfeedingnetwork.org.uk/drugs-factsheets
- Mitchell J, Jones W, Winkley E et al. (2020). Guideline on anaesthesia and sedation in breastfeeding women 2020. Anaesthesia, 75: 1482-1493. https://doi.org/10.1111/anae.15179

Useful Apps for SBUHB:

- **Eolas Medical** – antibiotic guidelines for SBUHB since 2024 – see blue Celtic logo

- **Accurx Switch** – find a phone number for SBUHB – see yellow 'S' logo

Education:

- **OAA Events** Overview - Obstetric Anaesthetists' Association (oaa-anaes.ac.uk)
- **SWOAF –** South Wales Obstetric Anaesthetic Forum – meetings in Bridgend April/May and November. Look out for posters in the department in March and September for posters and presentations
- **PROMPT Course –** course run in Singleton for multi-professional management of obstetric emergencies. National videos of scenarios can be found here: PROMPT interactive videos | PROMPT Maternity Foundation

Maternity Services
Checklist for Clinical Guidelines being Submitted for Approval

Title of Guideline:	Obstetric Anaesthetic Trainee Guidelines 2024 – Singleton Hospital
Name(s) of Author:	Rebecca Jones, previously Susan Williams
Chair of Group or Committee approving submission:	Obstetric Anaesthetists
Brief outline giving reasons for document being submitted for ratification	Revised version
Details of persons included in consultation process:	Obstetric Anaesthetic Consultants
Name of Pharmacist (mandatory if drugs involved):	
Issue / Version No:	6
Please list any policies/guidelines this document will supercede:	Replaces version 3 Obstetric Anaesthetic Trainee Guidelines
Date approved by Group:	
Next Review / Guideline Expiry:	October 2026
Please indicate key words you wish to be linked to document	Anaesthetic, anaesthesia, anaesthetist, obstetric, trainee, epidural, remifentanil, PCEA, cell salvage, spinal, PDPH, PET, eclampsia, cardiac arrest, PPH
File Name: Used to locate where file is stores on hard drive	