Advanced Comprehensive Obstetric, Anaesthetic and Newborn Care

A Manual for Participants

Produced by

LSTM
LIVERPOOL SCHOOL OF TROPICAL MEDICINE

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Published by:
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Introduction

Welcome to the extended obstetric skills course. This course is intended primarily to address the issue of quality of care surrounding decision-making and execution of both caesarean section and assisted vaginal delivery, including anaesthetic and medical care in preparation for, during and after these events.

Globally, caesarean section is the most frequently performed major surgery. Approximately 23 million births occur by means of caesarean section annually, accounting for 19% of all deliveries. Rates of caesarean section and operative vaginal delivery vary greatly, both between and within countries, but rates are generally increasing. Between 1990 and 2014, Betrán et al (2016) determined that the global average caesarean section rate rose from 6.7% to 19.1% of deliveries, based on data from 121 countries. Rate rises have not been uniform. Overall the smallest rate rises have occurred in sub-Saharan Africa, whereas by contrast, countries in North Africa have seen large increases in rates. Boatin et al (2018) reported significant within country inequalities in caesarean rates, with overall median rates for those in the lowest wealth quintile reported at 3.7% as compared to those in the richest fifth at 18.4%. Rates are also substantially higher in urban than rural areas. This implies that reporting caesarean section rates at national level may be misleading and may disguise both under and over-usage in population subsets.

The WHO (2015) has stated that rates of caesarean section above 10% are not associated with improvements in maternal or neonatal mortality. This has been questioned by some authors (Molina et al 2015) who found that both maternal and neonatal mortality were inversely related to caesarean section delivery up to a caesarean rate of 19%. What is also apparent is that, even in settings where the rate of caesarean section is low, caesarean sections are not always performed for the right indications, or with the best decision to delivery interval. This results in some women being avoidably exposed to the immediate and longer-term risks associated with caesarean section. Those women in need of a caesarean for either maternal or fetal indications but who are unable to obtain one are also at risk of adverse outcomes for themselves and their babies.

One of the many avoidable causes of caesarean section is the lack of availability of assisted vaginal delivery. A study of assisted vaginal delivery in low and middle-income countries found very low rates of assisted vaginal delivery, especially in Health Centres (Bailey et al 2017). In many sub-Saharan African countries, rates of assisted vaginal delivery were less than 1% of all deliveries. If assisted vaginal deliveries cannot be performed when indicated, this often results in delays in delivery adding to morbidity and mortality, together with additional unnecessary caesarean sections. One reason why assisted vaginal deliveries are not performed as frequently as would be beneficial is a lack of provision of training, and therefore confidence, of doctors and midwives.

Caesarean section is major surgery and as such, carries significant surgical and anaesthetic risks both intra and post-operatively. Good training, and adherence to evidence-based guidelines can go a long way towards reducing these risks and to improving the quality of care provided.

There is an urgent need for training to ensure that both caesarean sections and assisted vaginal deliveries are performed for the right indications and in the best possible way to optimise outcomes and minimise adverse effects for mothers and their babies. Obstetric surgeons, anaesthetists and all

health providers engaged in operative delivery must work together in well-functioning teams with a full appreciation of each others' roles in delivering safe care.

This manual has been written to compliment the learning on the Extended Obstetric Skills course. It is not intended to be an obstetric or anaesthetic text-book, but rather a reminder of the contents of the sessions taught throughout the course, and a practical guide in the nature of a "quick look" book. The advice given is based upon the most recent available evidence. Where evidence is lacking, advice is based on many years of clinical experience of the authors.

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Module 1: Labour Ward Leadership and Management

1.1 Clinical leadership

Key learning points

- Effective clinical leadership is key to good outcomes on a well-run labour ward
- A leader should lead by example
- An effective clinical leader must have oversight of many issues but must be able to delegate and share tasks with colleagues

A well-run labour ward requires a strong multidisciplinary leadership team where staff of various cadres work together in harmony and mutual respect in accordance with agreed, evidence-based guidelines. Midwives, doctors and other cadres have different but complimentary roles and all team members are vital to good patient care. All staff should be appreciated and encouraged to take pride in their work.

Qualities of good clinical leadership

1. Exemplars: Clinical leaders should lead by example and demonstrate an excellent standard of clinical competence, evidence-based decision-making and respect for patients and colleagues alike. Leaders need to be flexible and able to take on different tasks as and when the need arises. No leader should consider that any task, however apparently menial, is beneath them.
2. Within the leadership team, clinical leaders must demonstrate ability to reach consensus-based decisions in a timely fashion. They must ensure that these decisions are communicated to all staff and consequent clinical changes are put in place.
3. Those in leadership must display an approachable manner and the ability to listen. They must be fair-minded and ready to see the various sides of any situation.
4. Personal qualities of a leader include patience and the ability to remain calm.
5. Innovation and implementation are key leadership skills. Leaders need to be pro-active, rather than waiting for sub-optimal outcomes to drive change.
6. Leaders must display trust in their team members together with an ability to share tasks. The roles of an effective leader are many and for a team to function smoothly in the best interests of the patients, delegation is essential.

Roles of a clinical leader

1. Patient safety and well-being should always be at the forefront of any leadership decisions, closely followed by staff welfare. This involves oversight of the production and updating of evidence-based guidelines together with ensuring such guidance is disseminated and enacted daily.
2. Adverse incidents must be investigated fairly and dispassionately, with timely and appropriate measures put in place to reduce future risk to patients. Leaders must embrace and promote a culture of learning from mistakes. Provision for staff debriefs following incidents should be ensured. Leaders should be aware of the distress felt by staff following adverse incidents and should support and enable reflection in a blame-free environment.
3. Leaders play a key role in ensuring active participation by all staff in on-the-job training and development. They must ensure that all staff are kept up to date and are thus enabled to practice safely.
4. Leaders should ensure that all staff members have an annual appraisal delivered by trained appraisers and leading to specific development and improvement targets. Staff should be supported in professional development and education.
5. Leaders play a key role in advocacy for adequate staffing levels, provision of equipment and disposables and a labour ward environment where respectful care is facilitated. They should ensure that there is an adequate and functional system for monitoring of stock and ordering replacements in a timely fashion.
6. Leaders must ensure that there are adequate processes in place to ensure infection control measures are appropriate for the protection of patients and staff from nosocomial infections.
7. Staff and patient forums must be enabled and the opinions of these forums should be respected and acted upon as appropriate.
8. Regular audit of both clinical outcomes and adherence to evidence-based guidelines should be ensured and followed by appropriate action and change in the interests of quality improvement.
9. Leaders should ensure that staff members are aware of their roles and responsibilities from the outset by providing comprehensive staff induction.

1.2 Handover and referral using SBAR

Key learning points

- Clear hand-over is vital to continuity of care
- SBAR is a useful system to ensure effective hand-over
- Remember to describe the problem, what has been done already and what actions are outstanding

When handing over care of patients at the time of shift change, during ward rounds or when making referrals it is very important the new health worker understands the main problem, what has been done already and what needs to be done next. Continuity of care should be ensured.

It is useful to have a system for the transfer of information so that all relevant information is conveyed in a succinct manner.

Many hospitals have employed the SBAR system to present patient information during referrals of at handovers.

What is SBAR?

S = Situation

This is like a newspaper headline. It describes in one brief sentence who you are, where you are and what the main and most urgent problem is. For example, "I am midwife D on the labour ward. I have a patient in shock with an on-going post-partum haemorrhage".

This immediately alerts the listener to the fact that there is a deteriorating problem requiring urgent attention.

B = Background

The background provides relevant background information with a brief pertinent history. In this case it might be

"This patient is now G3P3. She delivered the baby 40 minutes ago and the third stage was complete 30 minutes ago, after active management of the third stage with an oxytocin bolus. Since then she has not stopped bleeding".

A = Assessment

The assessment contains objective facts, for example the patient's vital signs. In this case; "The patient's BP is 80/55, pulse is 135/minute and respiratory rate 30/minute. Conscious level is alert. The uterus is soft and the fundus high. Vaginal bleeding is continuing."

R = Recommendation

This is what you think needs to be done, and also a summary of what has been done so far. For example, "I need you to come and assess this patient. The patient is receiving oxygen at 10l/minute and a rapid infusion of Normal Saline. I have catheterised and rubbed up a contraction and commenced an oxytocin infusion, but the uterus keeps relaxing. Another midwife is doing bimanual

compression as I speak but I think the patient will require balloon tamponade. Please come now. Would you like me to do anything else as you come?"

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1.3 The role of the anaesthetist in Comprehensive Obstetric care

Key learning points

- Anaesthetists have roles beyond the operating theatre
- Good teamwork involving co-operation between anaesthetists, theatre staff and surgeons increases patient safety

Both patients and other health professionals frequently underestimate the role of an anaesthetist within the hospital. The anaesthetist is often referred to as the 'gasman', or more precisely the person who provides perioperative anaesthetic care to the surgical patient.

The anaesthetist's scope of practice and skill set is far greater than just giving a general or spinal anaesthetic so that the surgeon can perform an operation. The role of the anaesthetist has expanded significantly over the last few decades to encompass:

- The preoperative assessment of all surgical patients, to establish a patient's suitability to undergo both an anaesthetic and surgery
- The resuscitation and stabilisation of all critically unwell patients throughout the hospital, including neonates and children
- The transport of all acutely ill and injured patients either within the hospital or to other specialist hospitals
- Pain relief in labour as well as providing obstetric anaesthesia
- Intensive care medicine
- Pain medicine – both acute and chronic pain

The anaesthetist is **not** the surgeon's assistant, contrary to widespread belief. Anaesthetists are highly skilled, independently practicing health professionals who play a vital role in ensuring the safety of all patients, ranging from those who undergo an elective surgery to the critically unwell or injured.

As part of their skill set anaesthetists tend to have exceptional situational awareness, often making them good team leaders during emergency situations, and thus a key member of any team.

Module 2: Making Decisions for Delivery

2.1 Making decisions

Key learning points

- Every patient encounter requires a decision, even if the decision is to take no additional action
- Decision making in labour is complex
- To make appropriate decisions take into account the woman's past medical, surgical and obstetric history and current observations, including the fetal heart rate and pattern
- Use the partograph
- To assess descent of the fetal head always palpate abdominally

Decision-making is an intrinsic component of every patient encounter, without exception. The fundamental question to ask is this:

> "Can this pregnancy safely continue, or do I need to recommend an intervention to end it now or at a set time?"

For the pregnancy to continue, sometimes other interventions need to be made, for example, commencing anti-hypertensive or other medication.

This chapter is concerned with making a decision to intervene to deliver a baby.

Making a decision to deliver a woman in the best way and at the best time requires a complex analysis of multiple factors. It is just as important, if not more so, than implementing that decision.

A decision to intervene before labour to perform an elective caesarean, or during labour to perform either an assisted vaginal delivery or a caesarean section is not a decision to be taken lightly. It will affect a woman's reproductive future and add risks to any further pregnancies. Equally, failure to perform a necessary intervention in a timely fashion has the potential to cause immediate damage to both the woman and her fetus. Weighing up and assessing the risks versus the benefits of the proposed intervention requires knowledge of all aspects of the patient's condition and an appreciation of the available relevant evidence.

Decisions to deliver may need to be made at the following points:

- During pregnancy
- Latent phase of labour
- First stage of labour
- Second stage of labour

Information required for decision-making

1 Past medical and surgical history

It is important to know if there are any medical conditions that may affect surgery or anaesthesia. For example, patients with valvular heart lesions such as mitral stenosis, or with sickle cell disease have added risks. This will influence a decision as to who should anaesthetise the patient, and how and where the procedure should be performed. As some decisions require rapid implementation, it is vital that significant medical history is clearly documented in the patient's record. Gold standard practice would include offering high-risk patients an advance anaesthetic assessment and formulating a plan to be enacted in the event of surgery becoming necessary.

Previous abdominal surgery may lead to adhesions and the surgeon should be prepared to deal with this potential complication. If possible, reading the previous operation records is strongly recommended.

2 Past obstetric history

An understanding of past obstetric history is a vital component of good decision-making. In particular, if a previous assisted vaginal delivery or caesarean has been performed then an appreciation of the indications and of any problems encountered is essential. Such information is not always available, especially if the patient delivered in a different facility, but previous records should be reviewed if at all possible. In the event of a previous caesarean section, particular note should be taken of any surgical difficulties encountered.

Even if the patient did not previously require intervention, understanding the progress of a previous labour will always help to inform decisions. Successive labours tend to become faster. For example, if a multiparous patient delivered previously following a 45-minute active second stage, whereas in the current labour she has failed to deliver after pushing for 90 minutes, something is wrong and full assessment is required.

3 Vital signs, observations, blood results and fetal heart rate and pattern

- Respiratory rate
- Pulse
- Blood Pressure
- Temperature
- Full blood count
- Baseline fetal heart rate, any changes
- Pattern of fetal heart rate, any decelerations
- Condition of liquor (if membranes are ruptured)
- Any bleeding?

All these observations should be taken into consideration before reaching a decision as to how and when to intervene. Appropriate interpretation of observations is essential.

For example, a patient may have a fever from a non-obstetric cause, such as a chest infection. This could lead to fetal tachycardia. Whilst it is important to treat the infection with antibiotics and give

antipyretics to reduce the fever, it is usually better to wait and see if the fetal tachycardia resolves once the maternal temperature is reduced, rather than rush to anaesthetise a patient with the potential for respiratory compromise.

Alternatively, if maternal fever with fetal tachycardia occurs in response to chorio-amnionitis consequent to a prolonged membrane rupture, then in addition to antibiotic and antipyretic therapy, urgent delivery is more likely to be necessary.

4 What is the fetal lie and presentation?

If the lie is not longitudinal and the membranes are ruptured, there is a risk of cord prolapse and caesarean delivery should be expedited.

Decisions as to mode of delivery with a non-vertex presentation will depend upon the state of the labour, considering departmental policy.

For example, a department may have a policy to undertake caesarean section in cases of breech presentation, but this may not be feasible if a multiparous woman presents with a breech presentation late in the second stage.

5 Is the woman in labour?

A diagnosis of active labour requires there to be:

- Regular painful contractions
- Progressive cervical dilation
- Descent of the presenting part

Accurate assessment is essential to avoid unnecessary caesarean interventions. If cervical dilation is inaccurately assessed this may lead to a woman who is in the latent phase being misdiagnosed as in active labour with failure to progress leading to the performance of an unnecessary caesarean. Equally, poor assessment may fail to detect true failure to progress, leading to a delay in a required intervention.

To assess progress in labour, full account must be taken of both the rate of cervical dilation and the descent of the presenting part.

6 Use of the partograph

Interpretation of the partograph is key to decision-making. The WHO partograph alert line is set such that deviation to the right of the line occurs if progress is less than one cm per hour after the onset of the active first stage at 4 cms dilation. If no progress occurs after 4 hours, the action line is reached.

Recently the previously accepted normal rate of progress of 1 cm per hour has been challenged. However, to date, an alternative tool to assess labour progress has not been validated. In most cases, if progress slows or becomes static to the extent that the action line is crossed there remains a risk that in the absence of intervention labour will become obstructed.

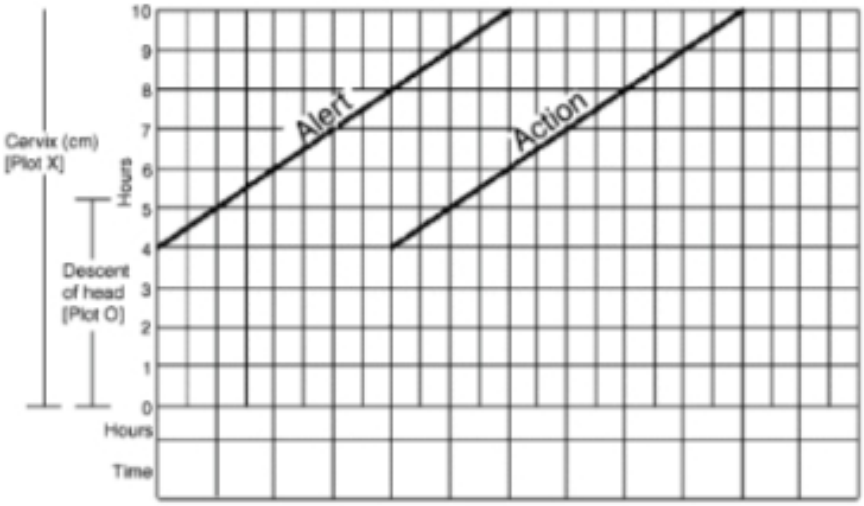

Figure 2.1.1: WHO partograph: Progress section (WHO 2008)

Recent evidence (Oladapo et al 2017) has found that progress in normal labour varies widely but this chart represents pooled values of median progress for nulliparous and multiparous women. This evidence has informed the new WHO recommendations for intrapartum care. (WHO 2018)

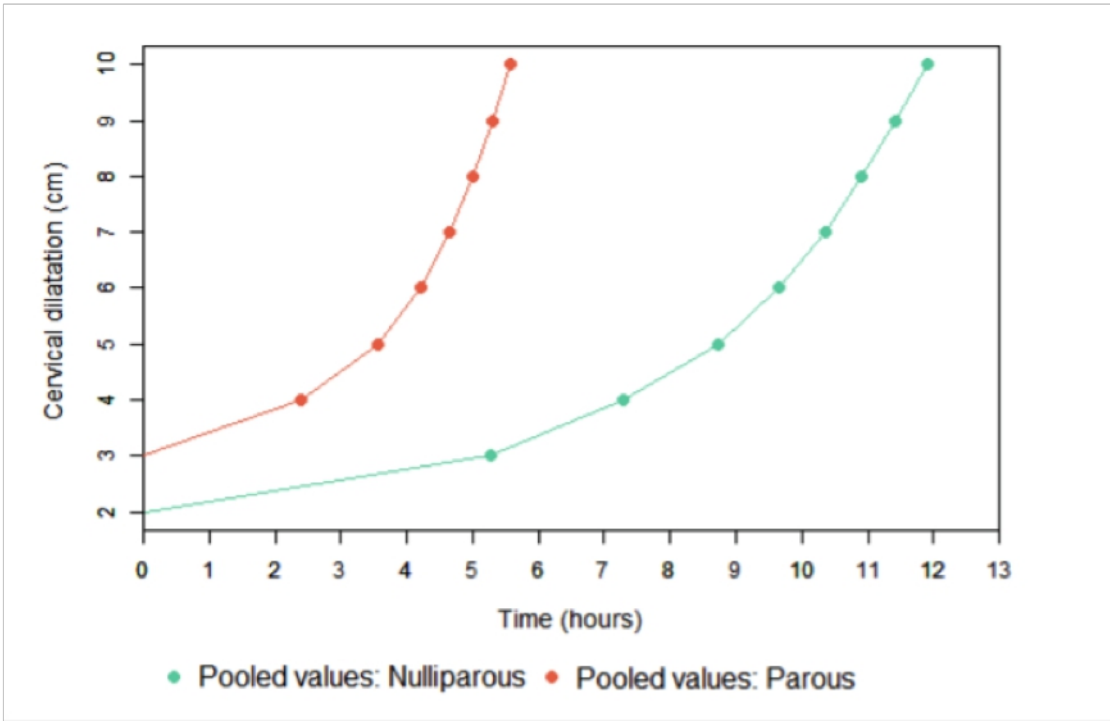

Figure 2.1.2: Cervical dilation patterns according to pooled median times to advance cm by cm (Oladapo et al 2017)

Once the action line has been reached or crossed then a decision as to appropriate action is necessary. Possible actions include:

- Artificial membrane rupture
- Oxytocin augmentation
- Delivery

Conditions for safe augmentation of labour

Primigravid

- Contractions <4 per 10 minutes
- Evidence of poor progress
- Ruptured membranes
- A reassuring fetal heart rate and pattern
- Stable maternal condition
- Adequate midwifery staffing to provide 1 to 1 care

Augmentation should NOT be chosen if the following apply:

- Multigravid labour
- Previous caesarean section
- Contractions >/= 4 in 10 minutes
- Any concern regarding fetal heart rate
- Inability to provide 1 to 1 care

In the event that the action line is crossed and augmentation is excluded, then delivery is indicated.

If the cervix is not yet fully dilated, deliver by caesarean section.

If the cervix is fully dilated, assess for descent of the presenting part.

Assessment should be both vaginal and abdominal. Vaginal assessment alone can be misleading. The fetal head changes shape in labour and becomes progressively more moulded. Although moulding and caput development are quite normal, they may give a misleading impression regarding descent of the fetal head. Descent should therefore be assessed by abdominal palpation, as judged by how many fifths of the fetal head remain palpable in the maternal abdomen. If abdominal palpation is inconclusive, use bimanual palpation, with one hand feeling the vertex vaginally and the other palpating abdominally. The fetal head will then be felt between the operator's two hands and an accurate assessment of descent can be made.

If the cervix is fully dilated and the fetal head is not more than 1/5 palpable in the maternal abdomen, an attempt at assisted vaginal delivery should be considered. If 2/5 or more of the fetal head remains palpable within the maternal abdomen, caesarean section is indicated.

If assisted vaginal delivery is indicated, assess the position of the fetal head. Assisted delivery is usually more straightforward when the fetal head is in the occipito-anterior position. Whilst occipito-transverse or occipito-posterior positions do not preclude an attempt at assisted vaginal delivery, it is a wise precaution to attempt the delivery in the operating theatre with staff on standby so that a caesarean can be performed without delay in the event of a failed attempt at vaginal delivery.

Note Fetal distress is not a reason to perform a caesarean section if the conditions necessary for assisted vaginal delivery are present. Assisted vaginal delivery is likely to be accomplished more quickly than caesarean section, and will leave the woman with less risks for future births if successful.

7 Urgency for delivery

Following a decision to intervene and deliver a mother the degree of urgency should be categorized.

Immediate delivery

- Cord prolapse with live baby
- Placental abruption with live baby
- Unresolved fetal bradycardia lasting more than 3 minutes
- Large non-resolving bleed from placenta praevia
- Strong suspicion of scar rupture with live baby

Delivery within 30 minutes

- Fetal distress other than bradycardia
- Non-resolving bleed with dead fetus
- Suspected scar rupture with dead fetus

Delivery within 60 minutes

- Failure to progress without fetal distress despite good contractions
- Inadequately treated HIV in labour
- Undiagnosed breech in labour and unsuitable for vaginal delivery
- Compound presentation
- Previous uterine scar x2 or more and in established labour

It is not always possible to achieve these standards regarding decision to delivery time, but the aim should be to deliver as near as possible to these timings.

In cases where immediate delivery is indicated but there has been a delay, always check for the presence of the fetal heartbeat in theatre before proceeding.

If fetal demise has occurred then the decision to deliver should be reviewed. A patient should not be subject to a caesarean section to deliver a dead fetus unless her own life is in imminent danger, for example due to a non-resolving bleed, or unless there is not feasible alternative means of delivery.

In cases of severe pre-eclampsia, take into account changes in blood tests. In particular, note alterations in the platelet count and coagulation profile. If there is a deterioration then delivery may need to be expedited before a further decline renders caesarean more complex.

Meconium liquor

Approximately 20% of term babies pass meconium prior to delivery. The presence of meconium in the liquor is not an indication for caesarean section in the absence of concern regarding the fetal heart rate and pattern. The fetal heart should be monitored closely where there is meconium present in the liquor, as fetal hypoxia may lead to fetal gasping in utero and the development of meconium aspiration. If the fetal heart rate and pattern remains reassuring then labour may proceed with caution.

The wishes of the woman

Please always remember that it is the woman who makes decisions, not health providers. It is the task of the health provider to make assessments, derive recommendations and communicate these to the woman in order that she is empowered to make a choice based upon clearly communicated information.

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2.2 Indications for Caesarean Section

Key learning points

- All interventions should have clear indications
- Consider obstetric, surgical and medical indications
- Elective caesarean is best performed after 39 completed weeks of gestation (with a few exceptions)
- Consider the underlying reasons for maternal request in line with respectful maternity care

All surgical procedures, caesarean section included, must have clear indications.

It is important that the right women are delivered by caesarean, for the right reasons and at the appropriate time to achieve good outcomes for both mothers and babies.

If the indications are apparent prior to labour, an elective (planned) caesarean should be performed prior to labour onset if possible. The best time to perform an elective caesarean is thought to be 39 weeks gestation. Prior to this there is an increased risk of the baby suffering from transient tachypnoea of the newborn. Fetal lungs may be slow to dry out following an elective caesarean, especially when the membranes have remained intact up until delivery. It is important that gestational age is estimated as accurately as possible early in the pregnancy to avoid iatrogenic prematurity caused by inadvertent early elective caesarean section.

It is safer to perform a planned caesarean at a set time when all help is available and when staff are not overtired. There is always a risk that patients who are booked for a planned caesarean may go into labour early, and this is why 39 weeks is suggested rather than waiting until 40 weeks. Even so, some labours will commence unexpectedly early and the planned caesarean will then have to be brought forward.

For some patients with particular risks, it is advisable to perform the caesarean earlier than 39 weeks in order to avoid the risk of labour onset in the night when experienced back-up may not be so readily available. For example, cases of known placenta praevia are best delivered at 38 weeks to maximize the chances of avoiding labour and a consequent bleed, despite the increased risk of transient tachypnoea of the newborn. In this situation, the relative risks to the mother as compared to the baby must be weighed up.

Indications for Pre-labour caesarean section

Surgical indications for pre-labour caesarean section

- Previous surgery associated with increased risk of uterine rupture including multiple previous caesarean sections, previous myomectomy with cavity opening
- Previous uterine rupture
- Large ovarian cyst or fibroid causing pelvic obstruction
- Previous anal sphincter damage if symptomatic or abnormal manometry
- Previous obstetric fistula

There has been debate as to when to consider a planned caesarean due to a past history of caesarean. Whilst some obstetricians would say “Once a caesarean, always a caesarean”, others would support a patient to undergo labour even after two previous caesarean sections. As the majority of patients who attempt labour after one prior caesarean (for non-recurrent reasons) give birth successfully, it is generally considered best to advise a patient to labour after one previous section, provided safe conditions and adequate monitoring can be provided, with strict observations of both the fetal heart, the maternal condition and progress in labour. For patients attempting a so-called “trial of scar”, slow progress should **not** be augmented with oxytocin. There is no reliable means of gauging the strength of a uterine scar and hence there is a real risk of uterine rupture if augmentation is undertaken for poor progress in such cases.

In situations where a previous uterine rupture has occurred, caesarean section prior to the onset of labour is absolutely indicated due to the high risk of recurrent rupture.

Rarely, patients may present with a large pelvic mass obstructing the descent of the head, rendering it is impossible for the head to negotiate the maternal pelvis. If this is detected by antenatal scan an elective caesarean should be arranged.

If a woman has sustained a previous anal sphincter injury from a third or fourth degree tear, which has caused anal incontinence, even of a temporary nature, she should be offered a caesarean, as any further labour risks a return or exacerbation of incontinence. Provided her anal function has reverted to normal immediately following repair she can chose to labour. Women who have not suffered any anal incontinence following sphincter repair have the same risks as all other women of sphincteric damage and subsequent loss of function. Such women should be counselled carefully as to the relative risks of caesarean versus risks of anal sphincter disruption (see Chapter 4.3).

Any woman with a history of previous obstetric fistula should be strongly advised to choose a planned caesarean.

Obstetric indications for pre-labour caesarean section

- Placenta praevia
- Known vasa praevia
- Eclampsia (following stabilisation)
- Placental abruption

If a placenta is completely or partially overlying the cervix there is no choice but to perform a caesarean, or risk catastrophic haemorrhage. The choice when the placenta reaches into the lower segment close to the cervix is more difficult. Generally, if the lower edge of the placenta is 2 cms or closer to internal cervical os (the top of the cervix) in the third trimester as measured by ultrasound, then a caesarean section is recommended. However, any case where the placenta is reaching into the lower segment associated with significant bleeding merits consideration for caesarean, as bleeding in labour may be heavy and expose both mother and fetus to risks greater than those of a planned caesarean.

Diagnosis of vasa praevia is very difficult without the benefit of colour flow doppler ultrasound. It should however be suspected in cases where a succenturiate lobe of placenta has been noted by ultrasound, or where the cord insertion into the placenta cannot be seen on scan, suggesting a

velamentous insertion. If bleeding occurs from a vasa praevia following membrane rupture in labour, it is likely that the fetus will quickly exsanguinate.

It is recommended that all patients suffering from eclampsia are delivered within 12 hours of the onset of eclampsia, as otherwise the situation is likely to deteriorate. If the patient is not already in established labour then caesarean section may well be the safest means of delivery, although each case must be carefully assessed taking the full clinical picture into consideration, because anaesthesia and surgery also pose additional risks for the eclamptic patient.

The decision as to deliver by caesarean section in cases of placental abruption must be made weighing up all the individual circumstances. In cases of major abruption where an intra-uterine fetal death has occurred it is best to aim for a vaginal delivery provided the patient can be stabilised and well monitored. Although more controversial, if a patient presents with a terminal bradycardia it is unlikely that the baby will be delivered alive by the time a caesarean can be arranged in many settings. However, it is always a very difficult decision not to expedite delivery if a fetal heartbeat is detected, however slow. In such cases always check again for the presence of the fetal heart when on the theatre table before commencing the operation and if it cannot be found it is best not to proceed, in order to avoid the future risks of a scarred uterus. If there is fetal compromise, a caesarean should be performed provided the patient has been stabilised. In cases of minor abruption where the fetal heart rate is reassuring it may be possible to continue with labour provided there is adequate supervision available and recourse to a rapid caesarean if necessary.

Medical indications for pre-labour caesarean section

- Rare conditions e.g. Marfan's disease with dilated aortic root
- According to the European guidelines, planned Caesarean section should be considered for the patient on oral anticoagulants (OAC) in pre-term labour, in women with severe heart failure, aortic root diameter >45 mm, and patients with acute or chronic aortic dissection (Ruys et al 2013). Otherwise vaginal delivery is the preferred means of delivery for patients with cardiac problems.
- Maternal cardiac arrest (peri-mortem)

Maternal request for caesarean section

- Tocophobia (fear of labour)
- Post-traumatic stress disorder
- Fear of instrumental vaginal delivery
- Fear of change to vagina or perineum
- Wish for delivery on a "lucky" day
- Influence of family
- Inappropriate use of ultrasound
- Concern over fetal wellbeing

Maternal request for caesarean must be considered carefully and each case assessed thoroughly. For women suffering from severe post-traumatic stress disorder requests for a caesarean should be treated with sympathy and understanding, whereas at the other end of the scale, those requesting a caesarean because they prefer to deliver on a particular auspicious day may best be persuaded that the risks are such that this is not a good plan despite their preferences. A suggested compromise for

such patients may be to offer induction of labour. All women making a request for a caesarean delivery deserve careful and sympathetic counselling prior to coming to an agreed plan.

Pre-labour fetal indications for caesarean section

Breech or transverse lie (consider External Cephalic Version first)

Intra-uterine fetal compromise (Intra-uterine growth restriction, and/or abnormal Doppler cord flow). The fetus is unlikely to cope with demands of labour due to poor reserve.

Avoidance of infection e.g. primary genital herpes in late pregnancy

Risk of interlocked twins (first breech, second cephalic)

In cases of persistent breech presentation at term, a vaginal birth may still be possible unless the fetus is judged to be large (>3.5 kg), in a footing position, has abnormalities such as hydrocephalus or the mother has had a prior caesarean section.

Where pre-labour compromise is suspected in cases of intra-uterine growth restriction and/or abnormal cord Doppler flow measurements (absent or reversed end-diastolic cord arterial flow) it is very likely that severe fetal distress would develop if labour contractions were superimposed, resulting in the need for an emergency caesarean. It is often better not to add to the level of stress such a fetus is already experiencing and this may be avoided by performing a planned caesarean.

Although rare, interlocked twins is an obstetric disaster. This situation can arise when a first twin is presenting by the breech and the second is cephalic. If the babies turn to face each other their chins can become locked as the breech baby delivers rendering safe completion of delivery impossible.

Intra-partum indications

- Fetal bradycardia or pathological fetal heart pattern/rate
- Cord prolapse
- Failure to progress
- Malpresentation e.g. Brow presentation
- Placental abruption
- Uterine rupture

Failure to progress and fetal distress are the most common indications for intra-partum caesarean section. (See relevant chapters). Only consider augmentation of labour with oxytocin if the following conditions apply (see chapters 2.3 and 2.4):

- Primigravida
- Reassuring fetal heart rate
- Stable maternal condition
- Membranes are ruptured
- Contracting less than 4 in 10 minutes
- A skilled birth attendant available to give 1 to 1 care

The multiparous uterus is more sensitive to oxytocin and failure to progress in a multiparous patient is almost never due to inadequate contractions. In such situations, contraction frequency may

diminish in response to cephalopelvic disproportion and attempting to over-ride with oxytocin would be dangerous and risk uterine rupture.

Reference

Ruys,T., Cornette,J. and Roos-Hesselink, J. (2013). Pregnancy and delivery in cardiac disease. J Cardiol, 61(2), pp. 107-121.

2.3 Understanding how to use the partograph

Key learning points

- Primigravid and multiparous women behave differently in labour
- Remember the 3 “Ps”, powers, passage and passenger
- If a multiparous woman is not progressing, something is wrong
- Only primigravid women should be augmented with oxytocin, provided all safety criteria are met
- If the ACTION line on the partograph is reached action must be taken
- The partograph should be used as a monitoring and decision-making tool

The consequences of neglected obstructed labour for both mother and baby are potentially very serious, with a high morbidity and mortality. Approximately 8% of maternal deaths occur in association with obstructed labour.

Consequences include uterine rupture, sepsis, haemorrhage, obstetric fistula formation, fetal hypoxia and death.

To diagnose abnormal progress in labour, it must first be established whether or not the patient is actually in the active phase of labour.

Labour is defined as progressive cervical change (effacement and dilation) with descent of the presenting part in the presence of regular painful uterine contractions.

Labour starts with the latent phase, where the cervix starts to soften, efface and dilate. As the presenting part descends, the cervix also descends and is pushed anteriorly. During the latent phase the patient may experience contractions but they are usually mild in intensity and irregular.

A patient should be considered to be in active labour when the cervix reaches 4 cms dilation and regular painful contractions are present. The partograph should be started at this point.

The partograph was devised in 1971 in Harare, Zimbabwe, by Professor Philpott (Philpott and Castle 1972) as a tool to monitor progress in labour and diagnose failure to progress in a timely fashion, in order to enable the transfer of patients to a comprehensive facility for a caesarean section to be performed. The introduction and use of the partograph resulted in a reduction in maternal mortality.

The partograph is an essential tool to aid decision-making, but it is also a comprehensive record of maternal and fetal observations throughout labour, and a means of monitoring both contractions and progress in labour.

Time is monitored on the horizontal axis. You will notice two diagonal lines drawn on the partograph across the cervical dilation and descent of the head section of the chart. These lines are the ALERT line and the ACTION line. They are drawn to represent progress in labour at a rate of 1 cm per hour, which is considered to be normal. The ACTION line is parallel to and four hours later than the ALERT line. If the mother’s progress deviates to the right of the ALERT line then the labour is no longer considered to be progressing normally. If it crosses the ACTION line then some action must be taken.

If progress is in between the ALERT and ACTION line, consider supportive measures such as encouraging upright posture and mobilisation, providing nourishment and drinks and the presence of a companion of the woman's choice, if these has not already been done.

Crossing the ACTION line does not necessarily mean a caesarean section should be performed immediately, it may be possible to take action by rupturing the membranes or starting an oxytocin infusion provided the criteria for doing so safely are met.

The cervix must be at least 4 cms dilated in order to start using the partograph, as this is the point at which the ACTION line intersects with the left hand side of the chart. It may well be however that the patient is admitted with a greater cervical dilation, in more advanced labour. If this is the case then the first cervical dilation entry is made where the ALERT line is intersected, and not at the left-hand edge of the chart (seeFigure 2.3.1).

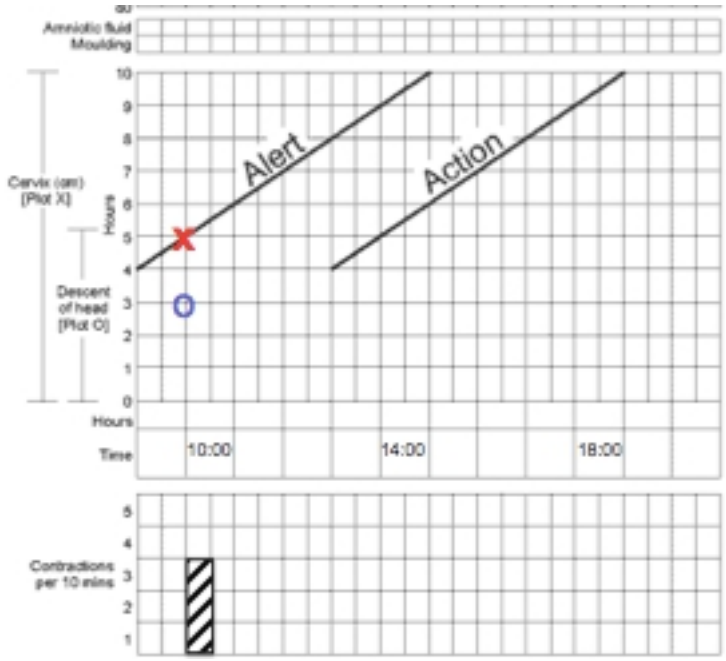

Figure 2.3.1: Partograph showing first vaginal examination at 5 cms

This is very important to remember, as if the dilation was not recorded on the ALERT line this would result in an undue prolongation of the time taken to reach the ACTION line in cases of prolonged labour. The chart to the left of this starting point is then ignored.

Record all other observations taken at the same time in line with the cervical dilation. Subsequent entries must be made in line with the appropriate time.

The time of the first assessment is recorded underneath the point that the first cervical dilation is recorded.

The frequency and duration of uterine contractions is recorded half hourly. By convention, contractions up to 20 seconds in duration are filled in with stippling, contractions of 21 to 40 seconds duration are filled in using slanting lines and contractions longer than 40 seconds are filled in as solid blocks. The frequency of contractions is documented by a bar chart from the bottom up

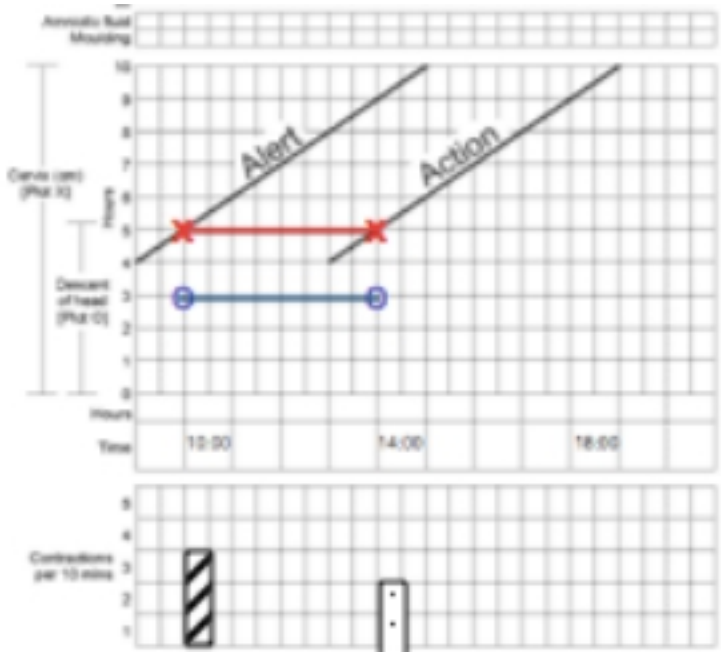

Figure 2.3.2: Partograph showing subsequent observations

Amniotic fluid is recorded as follows:

Membranes intact:	I
Clear liquor:	C
Meconium stained liquor:	M
Blood stained liquor:	B

Moulding of the fetal head is recorded as follows:

No moulding:	0
Sutures approximated but not overlapping:	+
Sutures overlapping but reducible:	++
Sutures overlapping and not reducible:	+++

Fetal heart rate is recorded half hourly.

Maternal observations are recorded along with any drugs given, including oxytocin.

Obstructed labour

There are three factors to consider when assessing the reasons for poor progress in labour, the Powers, the Passage and the Passenger.

The Powers

The “Powers” are the contractions. Generally speaking, when a primigravid mother fails to make adequate progress, it is important to consider the duration and frequency of the contractions. It may be that simple measures, such as ensuring adequate hydration, an empty bladder, an upright posture with good mobility and a supportive environment with clear communications and explanations to relieve anxiety may improve the contractions, but if not then further measures such as amniotomy and the use of intravenous oxytocin to augment labour should be considered. Aim for

a contraction frequency of 3 to 4 contractions in ten minutes. A contraction frequency of 2 in 10 minutes or less is unlikely to achieve progress, and a frequency of 5 or more in 10 minutes (hyperstimulation) is very likely to cause fetal distress, and should be avoided. If contraction frequency does reach 5 in 10 minutes in a mother receiving an oxytocin infusion, then the oxytocin should be turned off, at least temporarily, to avoid the risk of fetal compromise caused by hyperstimulation.

In order to use oxytocin safely the following criteria must be met:

- The patient must not be left without a midwife
- Nulliparous patients only
- No fetal distress prior to commencing oxytocin
- Membranes must be ruptured
- The fetal heart must be auscultated every **15 minutes** following a contraction for 60 seconds
- There should be no more than 4 contractions in 10 minutes

The effect of oxytocin will vary greatly from person to person. It is very important to count the contraction frequency rather than focus on than the drip rate as it is the frequency of the contractions that matters. The drip rate may be a distraction when the contractions and the fetal heart rate are the important things to monitor. If you hear a decrease in the fetal heart rate following a contraction (a delayed deceleration) this may a sign of fetal distress. If such decelerations are heard on a regular basis over a 30-minute period, then the fetus may be deemed to be oxytocin intolerant and consideration should be given to performing an emergency caesarean section. This is particularly true if the fetal heart base rate has risen beyond 160/minute.

If poor progress in labour has been identified then the next vaginal examination should take place after two hours, rather than the more usual four hours, in order to avoid prolonged obstructed labour.

It is very important to consider that the multiparous uterus behaves very differently from the nulliparous uterus. If a multiparous patient is not making progress in labour then it is almost always due to factors other than poor contractions. The multiparous patient should not receive oxytocin augmentation.

The Passage

The “Passage” is the maternal pelvis through which the fetus must pass. The bony pelvis is a complex structure and there are many variations of pelvic size and shape. The pelvis may be distorted by maternal disease such as Ricketts, or by a previous pelvic fracture, so awareness of the maternal past history is important.

Women of very short stature are likely to have a small pelvis rendering them susceptible to obstructed labour.

A clinical impression of pelvic size may be obtained when performing a vaginal examination, but unless the pelvic dimensions are extremely small this may mislead and is not recommended by WHO (2018). The real proof of whether or not a pelvis is adequate is whether progress and descent occur in the presence of adequate contractions.

The Passenger

The "Passenger", or fetus, may vary greatly in size. The pelvis that can comfortably accommodate a 2.5 kg infant may fail to allow for the passage of a 4.5 kg infant for example.

The degree of flexion of the fetal neck is also very important, as is the position of the fetal head. A well-flexed head in the occipito-anterior position presents a very different diameter to the pelvis compared with a deflexed head in the occipito-posterior position.

Certain fetal abnormalities, such as, for example, a cystic hygroma, may also affect progress (by preventing neck flexion) and cause obstruction.

Beware the multiparous patient who is failing to make progress. The reason almost always relates to the fetus, which may either be much larger than any previous babies, or be in a difficult position. There may be brow presentation. In such cases augmentation with oxytocin would not only be ineffective, but dangerous, and may lead to a uterine rupture.

Trial of Scar

A patient who has had one previous caesarean section for a non-recurrent reason, such as, for example, a breech presentation with her first baby, may be encouraged to labour. In order to minimise the risk of scar rupture, any sign of failure to progress must be dealt with promptly. Oxytocin should never be used to augment labour in cases of trial of scar. The fetal heart should be auscultated at least every 15 minutes throughout the first stage. Scar tenderness is a very common finding and does not necessarily indicate that the scar is starting to rupture. If scar rupture does occur there will be severe fetal heart rate abnormalities, so the condition of the fetus is often the best measure of scar integrity.

Failure to progress in the second stage of labour

If the patient has not delivered after one hour of active pushing then an assessment is required. The descent of the head must be checked both vaginally and abdominally. It is easy to be deceived as to the descent of the fetal head if only a vaginal examination is performed. This is because moulding and caput may have developed, making it seem as though the head has descended, when it has not. Abdominal or bi-manual palpation will determine the true descent of the head. If the fetal head is more than 1/5 palpable in the abdomen then a caesarean section should be performed. If the head is 1/5 or less palpable per abdomen, an operative vaginal delivery may be considered.

Sometimes abdominal descent is difficult to determine by abdominal palpation alone, especially if the patient is tense or obese. In such cases it is often easier to assess descent by means of a bi-manual palpation. This is done by palpating the fetal head above the pubic symphysis with one hand whilst simultaneously examining vaginally. The fetal head can then be palpated between the operator's two hands and descent is assessed. Ask the patient to push during an examination to assess whether any descent occurs during pushing.

References

Philpott, R. and Castle, W. (1972). Cervicographs in the management of labour in primigravidae. 1. The Alert line for detecting abnormal labour. The Journal of Obstetrics and Gynaecology of the British Commonwealth, 79, pp.592-598.

Philpott, R. and Castle, W. (1972). Cervicographs in the management of labour in primigravidae. 2. The Action line and treatment of abnormal labour. The Journal of Obstetrics and Gynaecology of the British Commonwealth, 79, pp.599-602.

WHO. (2018). WHO recommendations: intrapartum care for a positive childbirth experience. Geneva. World Health Organization. Available at: http://apps.who.int/iris/bitstream/handle/10665/260178/9789241550215-eng.pdf?sequence=1

2.4 Monitoring for signs of fetal distress (compromise) in labour

Key learning points

- Fetal reserve affects fetal ability to compensate for labour-related stress
- Appreciation of normal, suspicious and pathological fetal heart patterns is key to safe management of labour, timely performance of operative delivery and avoidance of unnecessary caesareans
- Sentinel events cause sudden fetal compromise requiring rapid action

Introduction

Fetal distress is a commonly used but poorly defined term. It is used to describe concern about fetal condition where fetal hypoxia is suspected, but it is not a diagnosis in itself.

It is important neither to under nor over-diagnose fetal hypoxia. Under diagnosis can lead to intrauterine fetal death, birth asphyxia and sequelae, whereas over diagnosis leads to unnecessary interventions with consequent maternal morbidity and sometimes mortality.

Fetal heart monitoring in labour by intermittent auscultation

Note **Always check the maternal pulse** alongside the fetal heart to ensure that you are auscultating the fetus and not the mother via the maternal abdomen. Normally the fetal heart rate is faster than the maternal heart rate, except in cases of fetal bradycardia.

The fetal heart should be auscultated for **a full minute immediately following a contraction**. WHO guidelines stipulate auscultation every 30 minutes in the first stage and every 5 minutes or after every contraction in the second stage. However, this guideline relates to women with no additional risk factors. Where **risk** factors are identified or if oxytocin is in use, then auscultation every 15 minutes in the first stage is preferable**.**

If fetal heart rate abnormalities are suspected do not stop listening but continue to listen without stopping until a decision has been reached or normality has returned.

There are three key factors to consider when making management decisions regarding fetal distress:

- Fetal reserve
- The likely cause of fetal distress
- The potential response to resuscitation

Antenatal factors affecting fetal ability to withstand periods of hypoxia in labour (fetal reserve):

- Presumed fetal growth restriction
- Pre-eclampsia
- Intrapartum bleeding
- Infection, e.g. chorioamnionitis
- Post maturity or prematurity
- Antepartum haemorrhage

If fetal growth is impaired fetal glycogen stores will be depleted. Such a fetus will have reduced ability to cope with hypoxia. An infected fetus will have an increased metabolic requirement, enhancing the risk of relative hypoxia. Sometimes even contractions of normal frequency and duration are too much for a fetus with diminished reserve to cope with.

Likely causes of fetal distress in labour

Note In cases of diminished fetal reserve, fetal distress related to any of these causes will develop more rapidly

- Hyperstimulation (>5 contractions in 10 minutes)
- Cord compression
- Failure to progress
- Maternal positioning
- Maternal dehydration
- Sentinel (sudden) events

The fetus needs a gap between contractions in order to maintain oxygen levels. Very little transplacental oxygen transfer takes place during contractions and the fetus replenishes its oxygen levels between contractions. If the gap between contractions is too short, there will be insufficient time to replenish oxygen levels and progressive fetal hypoxia will develop unless contraction frequency is reduced.

In most cases the umbilical cord is protected from compression by Wharton's jelly. However with fetal growth restriction the cord is thinner and more likely to become compressed. In the normally grown fetus compression is much less likely except in cases of severe entanglement.

Prolonged labour is associated with fetal exhaustion, distress and death.

Correct maternal positioning is of great importance. Women should never lie flat on their backs (supine) because the gravid uterus will compress the vena cava and aorta (aortocaval compression). This reduces cardiac return and hence output, leading to maternal hypotension and a reduced blood supply to the uterus and hence fetal distress. If lying down, the mother should either lie on her side or be tilted between 15-30° to relieve the pressure of the uterus on the vena cava.

Sentinel (sudden) events

- Vasa praevia
- Cord prolapse
- Abruption
- Uterine rupture

Sudden events lead to severe fetal distress of sudden onset.

Vasa Praevia occurs when blood vessels containing fetal blood run through the membranes and when membrane rupture occurs one of these vessels is torn leading to loss of fetal blood and severe fetal distress.

Cord prolapse is diagnosed on vaginal examination or when loops of cord are seen at the introitus. The presenting part of the fetus must be elevated to prevent further compression and immediate delivery is indicated if the fetus remains alive.

Placental abruption results in severe continuous pain and the uterus may feel hard. Bleeding may be revealed or trapped behind the fetus. Again, if the fetus is alive, immediate delivery is indicated once the mother is stabilized.

Uterine rupture may present with fetal distress. The contractions may cease and there may be continuous pain. Fetal parts may be felt higher in the abdomen (not if rupture occurs in the later second stage). Rapid resuscitation of the mother and surgery is indicated.

Intrauterine resuscitation

- Position the mother in the left lateral position (except in cord prolapse when she should be in the knee/elbow all 4s position).
- If an oxytocin infusion is in progress, stop it immediately you suspect fetal distress from any cause.
- If the uterus is hyper-stimulated and terbutaline is available, give 250 micrograms subcutaneously.
- Oxygen is not recommended for intrauterine fetal resuscitation but should be used if indicated for maternal benefit.
- Intravenous fluids should be used in cases of maternal hypotension or dehydration but only saline or ringer's lactate, never dextrose.
- Maternal pyrexia is an independent risk factor for poor neonatal outcome. Aim to reduce maternal pyrexia from any cause by administration of paracetamol and tepid sponging.

Understanding fetal distress

The fetal heart responds in a complex fashion and many features need to be considered. In practice, although beat-to-beat variability is of significance, it is impossible to hear this feature during intermittent auscultation and it will only be apparent on a cardiotocograph.

The fetal heart pattern is classified as either normal, suspicious or pathological.

If all four features are reassuring then the fetal heart pattern is **normal.**

If there is one non-reassuring feature the pattern is **suspicious.**

If there are 2 or more non-reassuring features or one or more abnormal features the pattern is **pathological.**

Table 2.4.1: Definitions of fetal heart rates and patterns (NICE 2014)

Feature	Baseline	Variability	Decelerations	Accelerations
Reassuring	110-160	>5/minute	None or early	Present
Non-reassuring	100-109 161-180*	<5/minute for 40-90 minutes	Variable decelerations with >50% contractions over 90 minutes Or Single prolonged deceleration for up to 3 minutes	The absence of accelerations is of uncertain significance with an otherwise normal pattern
Abnormal	<100 or >180	<5 for >90 minutes	Late decelerations with >50% contractions for >30 minutes OR Single prolonged deceleration for >3 minutes	

* In the absence of infection, a moderate fetal tachycardia (160-170/minute) or moderate bradycardia (100-109/minute) are probably not associated with adverse outcomes unless there are other non-reassuring features.

Early decelerations occur during the contraction with their peak coinciding with the peak of the contraction (mirror image). They are usually caused by pressure on the fetal head and are not a sign of fetal distress.

Late decelerations have their onset mid to late contraction with the nadir >20 seconds after the peak of the contraction. A late deceleration will end after the contraction ends. If persistent may be

a sign of fetal hypoxia especially if combined with other abnormal features such as fetal tachycardia. To interpret decelerations correctly the fetal heart base rate must first be established.

Variable decelerations may be due to cord compression. They vary in timing, depth and duration.

Note Meconium **liquor** in the absence of fetal distress is not an indication for caesarean section if occurring after 37 weeks gestation.

Meconium aspiration can happen if fetal hypoxia develops in utero, so prompt action is required if fetal distress is present with meconium liquor, but if no fetal distress is present then meconium in the liquor is not a problem.

Note Premature (<37 weeks) babies may pass meconium due to gut hypoxia. The passage of meconium prior to 37 weeks is not normal.

Action to be taken with suspected fetal compromise

1. Fetal bradycardia FH <100/minute for >3 minutes

- Call for help (anyone available but including seniors and theatre staff)
- Prepare for immediate delivery either by caesarean if still in first stage or if in second stage with head >1/5 palpable per abdomen. If head 1/5 palpable or less and no other contraindications, deliver by vacuum.
- Rapid maternal assessment by ABC
- Position mother in left lateral position
- Immediately turn of oxytocin if an infusion is in progress
- Continue to monitor the fetal heart throughout
- If oxygen readily available and maternal respiratory rate is >25/minute give fast flow oxygen
- Rapid IV access and give IV fluids (1 litre) if mother hypotensive (not with severe pre-eclampsia or heart failure)

A true terminal bradycardia of <100/minute will result in progressive fetal brain damage after 10 minutes and fetal death after 20 minutes in most cases so there is not time to lose in delivering the baby. However, the mother should not be placed at risk in so doing. Always ensure maternal safety first.

When can a terminal bradycardia happen?

Terminal bradycardia usually arises as a result of a sentinel event, for example a severe placental abruption. However, it may arise in the second stage of labour if the cord becomes totally occluded, especially if the cord is around the fetal neck. Note however that a nuchal cord is **NOT** in itself a reason for a caesarean section as many babies will deliver vaginally in the presence of a nuchal cord with no signs of fetal distress. Total cord occlusion is rare.

In other cases, terminal bradycardia may arise after a prolonged period of partial hypoxia, manifest by persistent late decelerations, which is why delivery is indicated if late decelerations persist for >30 minutes on a regular basis.

2. Fetal tachycardia

It is important to differentiate fetal tachycardia from fetal heart accelerations, which are a sign of normal fetal good health. Accelerations are irregular and do not persist or follow any regular pattern, whereas a fetal tachycardia occurs as a result of a sustained baseline rise.

Always be alert for signs of maternal infection with fetal tachycardia. Signs of infection include pyrexia, tachycardia, tachypnoea and drainage of offensive liquor. Always treat with antipyretics (paracetamol) and antibiotics if signs of maternal sepsis in labour.

A sustained fetal tachycardia of >180/minute from any cause is pathological and requires immediate delivery following maternal stabilisation.

Fetal tachycardia with a baseline of >160/minute plus regular late decelerations also requires immediate delivery.

Moderate fetal tachycardia 160-179/minute requires attention but may respond to resuscitative measures (depending upon the cause). If found in the presence of a sentinel event, immediate delivery is indicated. If no obvious sentinel event, the fetal heart rate may respond to intrauterine resuscitation.

Actions with fetal tachycardia

- Call for help (anyone available but includes seniors).
- Ensure mother is in left lateral position.
- Rapid ABC assessment.
- Turn off any oxytocin infusion.
- If maternal tachypnoea is present and oxygen is easily available give oxygen.
- Establish IV access and give rapid IV fluids (not in severe pre-eclampsia or heart failure).
- Perform a rapid examination to assess stage of labour and descent of presenting part.
- If pathological tachycardia, deliver immediately by most appropriate means following maternal stabilisation.
- If Moderate tachycardia unresponsive to resuscitative measures deliver by most appropriate means. Aim to deliver within one hour of onset of moderate tachycardia or sooner if moderate tachycardia progresses to pathological.

3. Sustained late decelerations (>30 minutes duration)

As above:

- Call for help
- Left lateral position
- ABC of mother
- Resuscitative measures
- Turn off oxytocin

If no response deliver within 30 minutes.

Note When interpreting the fetal heart pattern always take the full clinical picture into account, including antenatal risk factors that may affect fetal reserve, any signs of maternal infection, the gestational age, the presence or absence of meconium in the liquor the presence of a sentinel event, the stage of labour and the maternal condition in labour.

Note **Fetal hypoxia may develop more rapidly in the active second stage so increased vigilance is always necessary in the second stage of labour.**

Reference

NICE. (2014, updated 2017). Intrapartum Care for healthy women and babies (CG190) Available at: https://www.nice.org.uk/guidance/cg190/chapter/Recommendations - monitoring-during-labour

https://www.figo.org/news/available-view-figo-intrapartum-fetal-monitoring-guidelines

2.5 Informed consent

Key learning points

- Informed consent involves a voluntary choice made by the patient herself
- For informed choice to be made the procedure must be explained using words the patient is able to understand
- The patient must understand the reason why the procedure is recommended
- Even in an emergency consent must be obtained
- Risks should be quantified to enable fully informed choice

Consent is the permission given to a health worker by a patient permitting them to perform an investigation or procedure. For consent to be informed, health workers have an obligation to provide information in a manner that the patient can understand.

It is important to remember that women in labour are in pain, tired and often frightened. In these circumstances the health worker must take particular care to give clear explanations, with patience and courtesy and check that they have been understood.

For elective procedures, consent should preferably be obtained in advance and the patient given adequate time to consider her options and ask any subsequent questions.

In an emergency, there is much less time, but informed consent should still be obtained.

In order to be **valid**, consent must be:

Voluntary

The decision to either consent or not to consent must be made by the patient herself and must not be influenced by pressure from medical staff, friends or family.

Informed

The patient must be given all the information as to what the treatment involves including the benefits and risks, whether there are reasonable alternative treatments and what is likely to happen if the proposed treatment does not happen.

Made with capacity

The patient must be capable of giving consent, which means she must understand the information given to her and be able to use it to make an informed choice.

What information is required?

- The reason why you believe the procedure is necessary
- The purpose of the procedure must be explained. For caesarean section, for example, the purpose is the safe delivery of the baby
- The nature of the procedure
- The benefits of doing the procedure or investigation
- Any risks
- Any possible alternatives (this includes doing nothing) and likely outcomes
- Any additional procedures which may become necessary or advisable, e.g. ovarian cystectomy if a cyst is found

Reason for caesarean section

- Why you are recommending this procedure?
- If the reason is poor progress, consider showing the partograph to the patient to help her understand
- Consider drawing a diagram, for example, to show why a baby cannot be delivered past a placenta praevia
- Chose words the woman will understand
- Encourage the woman to ask questions
- Seek feedback to ensure you have been understood

The nature of the caesarean procedure

- Skin incision: location, direction and length
- Uterine incision: location, direction, length
- Any possible variations
- Sutures: type, whether dissolving or removable
- Nature of anaesthesia
- Care of the baby after delivery

Risks

Helping patients to understand risk

Explaining the concept of risk is sometimes difficult, but just saying that there is a risk of something happening, without any quantification of that risk, does not allow a patient to make an informed choice. If, for example, a procedure carried a 1 in 10 risk of death, a patient may choose against it, whereas if they knew the risk was 1 in 10,000 their choice would probably be different. Not all patients understand ratios and percentages so an alternative is to liken risk to a situation they may be more familiar with. For example, you could explain for a 2% risk “If every woman in your street had a caesarean, 2 of them could expect that complication would occur”.

Table 2.5.1: Risk equivalents in lay terms (RCOG 2009)

	Risk level	Equivalent
Very common	1/1 to 1/10	Someone in your family
Common	1/10 to 1/100	Someone in your street
Uncommon	1/100 to 1/1,000	Someone in your village
Rare	1/1,000 to 1/10,000	Someone in a small town
Very rare	Less than 1/10,000	Someone in a large town

Risks vary according to individual circumstances and this can make quantification more difficult. For example, the risk of major haemorrhage will be greater in a case of caesarean for placenta praevia than one done due to suspected fetal distress. Some risks depend upon genetic factors. For example, populations where thrombophilic genes are more common will have a greater risk of venous thrombo-embolism following surgery. It remains helpful to give the patient some information as to overall risks nevertheless.

Table 2.5.2: Risk of complications associated with caesarean section (RCOG 2009)

Complication	Risk level	Risk frequency
Persistent wound or abdominal discomfort	9/100	Common
Increased risk of caesarean when attempting future delivery	1/4	Very common
Readmission to hospital	5/100	Common
Haemorrhage	5/1,000	Uncommon
Infection	6/100	Common
Hysterectomy	7/1,000	Uncommon
Venous thrombo-embolism	4/1,000	Uncommon
Bladder injury	1/1,000	Uncommon
Fetal laceration	2/100	Common
Death	1/12,000	Very uncommon
Future placenta praevia/accreta	8/1,000	Uncommon

Note The above risks are based upon a UK population. Risks in other countries may be different.

Obtaining consent in an emergency situation

Obtaining consent in an emergency must be done quickly but the patient must still be given sufficient information on which to base an informed choice.

Documentation of consent

It is good practice to record consent, even if the patient is not able to sign a consent form. Write that verbal consent has been obtained and if possible ask another member of staff who was present when the procedure was explained and consent obtained to counter sign the record of consent.

Who can give consent

This will vary depending upon national regulations. In UK, only the patient themselves can give consent. If they are unable to do this because they lack competence (for example, if they are unconscious) then a doctor must make a decision on their behalf to act in the patient's best interests. A relative is not allowed to give consent on behalf of an adult patient. This is because sometimes relatives do not have the patient's best interests at heart and may not make the best decision for the patient.

In some settings, women do not feel able to consent to procedures without the agreement of other family members. As much as possible, their wishes must be respected, but a human rights approach dictates that the woman herself should have the ability to make the final choice in cases of disagreement.

Reference

RCOG. (2009). Consent Advice no 7 Caesarean section. Available at: https://www.rcog.org.uk/globalassets/documents/guidelines/consent-advice/ca7-15072010.pdf

Module 3: Peri-Operative Care

3.1 Respectful care on the labour ward

Key learning points

- Respectful care is a human right, not a favour
- Disrespect and abuse is never acceptable
- Women will avoid services and facilities where disrespect is the norm

Much has been written concerning the typologies of disrespectful care and abuse of maternity patients, but the provision of respectful care requires more than merely the absence of disrespect and abuse. It requires promotion and provision of a rights-based, equitable approach to care that protects the dignity, privacy and confidentiality of the patient, involves them in decision-making about their treatment options, seeks informed consent for all examinations and procedures, ensures access to support from a person or persons of their choice and ensures provision of care that is kind, competent, safe and timely.

Bowser and Hill (2010) categorised disrespectful and abusive care into seven types:

1. Physical abuse
2. Non-consented care
3. Non-confidential care
4. Discrimination
5. Abandonment of care
6. Detention in facilities.

This was further elaborated by Bohren et al (2015) who included physical, sexual and verbal abuse, stigma and discrimination, failure to meet professional standards of care, poor rapport between women and providers and health system conditions and restraints.

A systematic review of disrespect and abuse of women during childbirth in Nigeria (Ishola et al 2017) provides evidence of disrespect and abuse according to the Bowser and Hill categories. From this review it is clear that disrespect and abuse occurs commonly throughout the country. Evidence from a variety of studies suggested that as many as 36% of women reported physical abuse during labour and 54% gave witness to unconsented care. Lack of privacy and overhearing doctors and midwives discussing private matters with other patients was common, due to lack of physical infrastructure to provide for adequate privacy. Patients reported being bullied and insulted. Authors also reported discrimination on the basis of ethnicity, social class, age and HIV seropositive status. There were also reports of abandonment and neglect together with denial of companionship during labour. Finally, 22% of women reported detention in facilities for failure to pay their bills.

Reasons for lack of respectful care may be found both at individual, community, facility and staff levels, all of which may be modified in some measure by national policies and laws. Lack of respectful care leads to deleterious consequences. In particular, women may avoid facility delivery in an attempt to escape from disrespect and abuse. This leads to an increase in mortality and morbidity.

The White Ribbon Alliance has published a charter for respectful maternity care (2011), incorporating the following principles:

1. Women have the right to be free from harm and ill treatment.
2. Women have a right to information, informed consent and refusal and respect for their choices and preferences, including companionship during maternity care.
3. Women have a right to privacy and confidentiality.
4. Women have a right to be treated with dignity and respect.
5. Women have a right to be treated with equality and with freedom from discrimination and provided with care that is equitable.
6. Women have a right to healthcare and to the highest attainable level of health.
7. Women have a right to liberty, autonomy, self-determination and freedom from coercion.

Respectful care extends to the provision of care in theatre during caesarean sections and other surgical procedures. Women should be afforded dignity whether awake or asleep whilst undergoing procedures, and communicated with at all times. Every effort should be made to ensure that the woman's body is exposed for the minimum possible time.

In a qualitative evidence synthesis, Shakibazadeh et al (2017) reported that women across many countries valued health workers who spoke to them in a warm and measured manner and refrained from raising their voices.

Women expressed a need for privacy, especially during examinations and procedures by limiting the number of staff present and by being shielded from visitors and other women.

Women wanted to feel welcomed to the labour ward by kindly, warm-mannered health providers and treated as individuals. Respect for culture, values and beliefs was highly regarded.

The provision of information regarding labour practices and obtaining permission for potentially embarrassing procedures was important. Family interaction was highly valued. This involved the provision of adequate infrastructure and space so that a woman may have a companion of her choice present whilst ensuring the privacy of her fellow labourers was not compromised.

The labour ward environment should be clean and comfortable with access to all necessary technologies to meet standards of safe care.

Services should be available to all, regardless of age, ethnicity, sexuality, religion or other sub-groups and all women should be treated with equal respect.

Effective communication was regarded as a key factor in respectful care. Women wished to be given praise and encouragement during labour and treated with empathy and understanding. Women needed to be involved in decision-making and their choices respected. The ability to mobilise and chose positions for birth was important.

Carers must be competent and motivated to provide a high level of care. Unnecessary interventions and procedures should be avoided.

Women valued continuity of care and being cared for by a familiar midwife.

In order to achieve respectful care, interventions are required at all three health care levels; individual provider, facility and health system.

At individual level, much depends upon the attitude of the provider and their recognition that provision of respectful care is a human right, not a privilege.

At facility level, measures must be put in place to enable skilled birth attendants to provide efficient, effective and continuous care, maximising resources and providing a conducive physical environment. Training of providers should include a key element of respectful care.

At health system level, standards and benchmarks should be incorporated into guidance. There should be respectful care-related indicators to measure policy enactment. Respectful care policies need to be adequately financed.

Respectful care is not something to be considered in isolation but rather to be woven into the fabric of all care provision for both mothers and newborn babies.

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Bohren, M., Vogel, J., Hunter, E., Lutsiv, O., Makh,S., Souza J. et al. (2015). The mistreatment of women during childbirth in health facilities globally, a mixed methods systematic review. PLoS Med, 12(6): e1001847.

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Ishola, F., Owolabi, O. and Filippi, V. (2017). Disrespect and abuse of women during childbirth in Nigeria: A systematic review. PLoS One 12(3): e0174084.

Shakibazadeh, E., Namadian, M., Bohren, M. et al. (2018). Respectful care during childbirth in health facilities globally: a qualitative evidence synthesis. BJOG, 125, pp.932-942.

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3.2 Surgical pre-operative assessment

Key learning points

- An appreciation of past history is essential for the provision of safe surgery
- Assessment is a key factor in preparation for surgery

Prior to undertaking any surgery, it is essential that both anaesthetists and surgeons assess the patient. Both should be aware of previous medical, surgical and anaesthetic history and any current added risk factors.

1. Previous surgery
2. Previous caesarean sections
3. Medical and psychiatric history
4. Medications and allergies
5. Viral status
6. Complications during current pregnancy
7. Past obstetric history
8. Social circumstances
9. Blood test results, including haemoglobin
10. Inter-current illness
11. Body Mass Index

1. Previous surgery

If the patient has had previous abdominal surgery there may be an increased risk of adhesions. This may add extra time to the surgery and increase the risk of blood loss.

2. Previous caesarean section(s)

If there is a history of previous caesarean check the previous records if at all possible. Note if any difficulties were experienced, and look in particular for any documentation regarding adhesions and scar thickness. Note any history of excessive blood loss. If any previous difficulties were noted, ask for senior help to be available this time around.

3. Medical and Psychiatric history

Both anaesthetists and surgeons should be aware of all aspects of a patient's past medical and psychiatric history and factors altering their risk profile. For example, knowledge of any past thrombo-embolic events would help to determine the extent of thrombo-prophylactic treatment offered to the patient. Equally any history of bleeding tendency should prompt careful planning of surgery, including ensuring availability of clotting factors. Knowledge of psychiatric history is vital to the provision of adequate support and reassurance for the patient undergoing surgery that they may find very stressful.

4. Medications and allergies

Awareness of any current medications is essential to avoid any potential drug interactions. Always check for any history of allergy, including to latex. This is a particular problem in health workers who are patients, as repeated use of latex containing gloves may have induced a reaction that can become much more severe if latex containing products are used within the body cavity. Also pay particular attention to any reported antibiotic allergies. Sometimes patients believe themselves to be allergic to medications when they have had a different type of reaction. For example, vomiting following ingestion of medication does not signify allergy. Reactions such as urticarial rashes or wheezing and chest tightness may well represent an allergy and drugs associated with these reactions should be avoided. Hospitals should have policies outlining alternatives to commonly used antibiotics such as the penicillins for use in cases of suspected allergy.

5. Viral status

Knowledge of a patient's viral status with regard to HIV and Hepatitis B is essential in planning for strategies to reduce mother to child transmission to the lowest possible level and also to put in place measures to protect both patients and staff. It is generally considered to be good practice to utilize universal precautions when conducting all surgery, since any patient may be at a point following infection before they have seroconverted. They may have tested negative but still have a high viral load. In general, however, if the viral status is known, staff may wish to undertake precautions such as double gloving, wearing eye protection or using blunt surgical needles if available. Staff should be vaccinated against hepatitis B, but in some cases there is a persistent failure to seroconvert and develop immunity. Staff need to be extra vigilant to avoid needle stick injury.

All maternal cases of active chicken pox near term require isolation from other patients and also enhanced neonatal surveillance as neonatal varicella can lead to encephalitis. If available, treatment of the neonate with VZIG is recommended if the mother develops a rash within seven days either before or after birth. Staff who have not had chicken pox themselves should avoid contact with such patients.

6. Complications during current pregnancy

Awareness of conditions such as pre-eclampsia are key to planning safe surgery. A patient with high blood pressure should not be exposed to ketamine, for example. In cases where poor fetal growth has been detected or suspected, paediatric assistance should be on standby to provide neonatal resuscitation. Good communication with the paediatric team is important in cases of prolonged membrane rupture in order to provide prophylaxis against neonatal infection if indicated.

7. Past obstetric history

It is important to obtain a full past obstetric history. Patients who have previously experienced a stillbirth or neonatal death should be treated with particular compassion and empathy. Past history may also help to determine current management. A patient with a past history of surgical haemorrhage should have blood cross-matched in readiness as they are at increased risk of a repeat haemorrhage.

8. Social circumstances

Patients may have difficult social circumstances and in certain cases may even require protection from family members in cases where they have been victims of domestic violence. Some patients may have been widowed or abandoned during pregnancy and sharing this information in the patient's records is important to avoid asking the patient potentially distressing questions as to the whereabouts of their husband. It is essential that patients are never discriminated against because of their social circumstances.

9. Blood results

All patients undergoing surgery should have a recent haemoglobin estimation. Anaemic patients are at greater risk of obstetric haemorrhage and of decompensation at an earlier stage in the process of haemorrhage, should it occur. Any other recent test results should be prominently displayed in the records. In cases of severe pre-eclampsia, platelet counts, and renal and liver function tests should be undertaken if available.

10. Inter-current illness

All active current illnesses should be documented. Although in many cases surgery cannot be deferred, understanding of the presence of a chest infection may help to determine the choice of an anaesthetic method. All cardiac disease should be well documented as patients are at risk of decompensation, especially at the time of significant changes in haemodynamic status in the immediate aftermath of delivery.

11. Body Mass Index (BMI)

Body Mass index in either the significantly under or overweigh ranges can greatly add to risk. Drug doses may need to be adjusted taking BMI into account. In cases of severe obesity, it may not be possible to place a patient on a theatre table, and a bed may need to be used instead. Extra help may be needed from assistants to provide retraction for surgical exposure and patients require added thrombo-prophylactic measures.

A full awareness of all relevant medical, surgical, psychiatric and obstetric history is essential in order to provide safe care and prevent avoidable complications that may otherwise arise.

3.3 Anaesthetic pre-operative assessment

Key learning points

- Thorough pre-operative assessment is key to safe anaesthesia, both regional and general
- Assessment is necessary as unexpected developments may occur leading to rapid changes in anaesthetic management

Why is anaesthetic assessment important?

Prior to surgery, all patients must be assessed by the anaesthetist. Whilst this may be challenging in a busy obstetric environment, where there may be very little time between cases, but it can be done swiftly, without delaying the patient's surgery.

The purpose of the anaesthetic assessment is:

- To anticipate problems and allow adequate preparation
- To guide planning of the anaesthetic
- To explain to the patient your anaesthetic plan and gain consent

What do you assess?

1. Confirm patient identity – it is important to check that it is the correct patient for the correct operation!
2. Indication for and urgency of caesarean.
3. Anaesthetic history – has the patient had an anaesthetic previously and if so were there any problems e.g. postoperative nausea and vomiting?
4. Family history of problems with anaesthesia. If the patient hasn't previously had a general anaesthetic has anyone in the family e.g. parents, siblings, grandparents experienced any problems with anaesthesia?
    a) **Suxamethonium apnoea** – failure to metabolise suxamethonium can result in prolonged paralysis and the patient requiring ventilation for many hours post-op. If there is a family history of 'not breathing' or 'not waking up' for many hours, consider an alternative neuromuscular blocking drug.
    b) **Malignant Hyperpyrexia** – this is very rare. It an inherited life-threatening complication of anaesthesia, triggered by inhalational anaesthesia and suxamethonium. If there is a history of death under anaesthesia, explore whether it was due to this. If the condition develops, the mortality is 80% if it is not treated with dantrolene. Avoid anaesthetic vapours and suxamethonium and use a breathing circuit that has not had any vapour in it.
5. Medical history – does the patient have any other medical problems that are not directly related to the pregnancy but could have an impact on the patient during anaesthesia e.g.

Type 1 diabetes, asthma, sickle cell anaemia, cardiac abnormalities (arrhythmias or structural defects)?

6. Surgical history – what operations have they had in the past (including previous caesarean sections) and were there any problems associated with these surgeries?
7. Obstetric history - how many times has the patient been pregnant?
    a) How many pregnancies reached viability (including live and still births)?
    b) Were there any antenatal problems e.g. gestational diabetes, iron deficiency anaemia, pre-eclampsia?
    c) What is the position of the placenta if known? (this may affect you as the anaesthetist if the patient has a placenta praevia or accrete, as the patient will have a high risk of haemorrhage).
8. Allergies – including both drug and type of reaction, e.g. rash, anaphylaxis. Don't forget to check for latex allergy.
9. Drug history – type and doses of drugs, what drugs have been taken prior to the anaesthetic?
10. Smoking history – how many cigarettes does the patient smoke per day and for how many years? If an ex-smoker how long ago did they give up?
11. Alcohol consumption – what type of alcohol do they drink and how much per week?
12. Last meal – starvation criteria > 6 hours for food and > 2 hours for clear fluids (though all obstetric patients should be considered high risk for aspiration even if they have not eaten for > 6 hours).
13. Additional questions to ask – do they take a non-steroidal anti-inflammatory? (this category of drugs is contra-indicated in pregnancy, but ask anyway).
    a) Does the patient suffer from acid reflux? How often? Does it get worse when they lie down?
14. Airway assessment

Airway assessment

Obstetric patients have a higher risk of failed intubation than non-pregnant patients. They are also at higher risk of aspiration pneumonitis. They will become hypoxic rapidly, putting the mother and the baby at risk.

Performing an airway assessment is essential to anticipate difficult intubation and plan accordingly.

Check if the patient has any loose teeth, caps, crowns or dentures.

The following simple tests can help identify patients at higher risk of failed intubation:

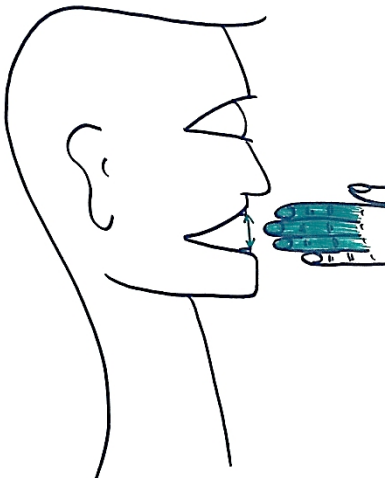
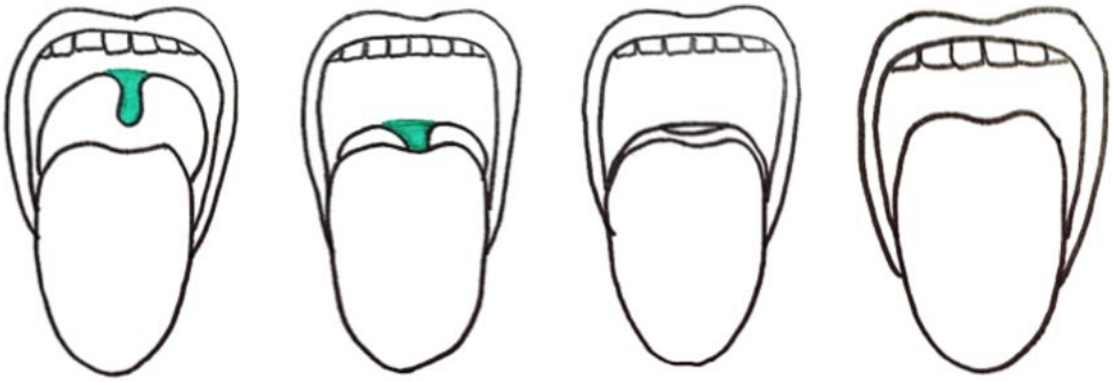


Figure 3.3.1: Checking mouth opening

Mouth opening

Ask the patient to open their mouth as wide as they can. Measure the mouth opening the patient's fingers. It should be ≥ 3 fingers (5cm). If it is less than this, laryngoscopy is likely to be difficult.

Mallampati



Mallampati 1 Mallampati 2 Mallampati 3 Mallampati 4

Figure 3.3.2: Mallampati scores

Ask the patient to sit up and open their mouth as wide as they can and stick out their tongue. If none of the uvula is visible (Mallampati 3 – soft palate only or Mallampati 4 – hard palate only), this predicts a difficult intubation.

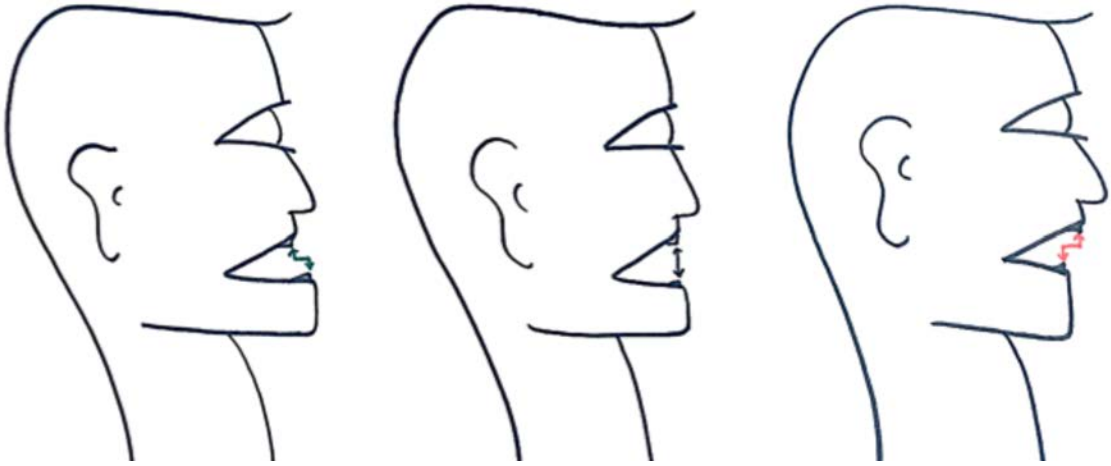


Figure 3.3.3: Assessing jaw slide

Ask the patient to try to bite their top lip. If the patient is unable to bring the bottom teeth in front of the upper teeth (Jaw slide C), this predicts a difficult intubation.

Neck movement

Ask the patient to tilt their head back to look up at the sky. If they cannot tilt more than 90 degrees, this indicates a difficult intubation.

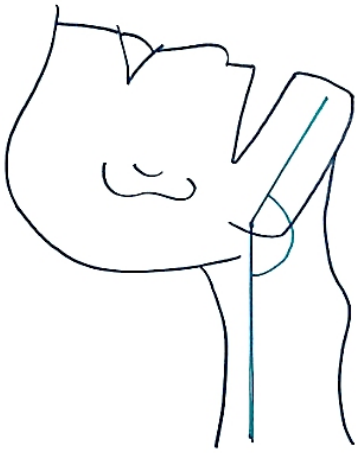


Figure 3.3.4: Measuring neck movement

Thyromental distance

Figure 3.3.5: Measuring thyromental distance

Ask the patient to close their mouth and tilt their head right back and measure the distance between the tip of their chin and the thyroid cartilage prominence in their neck. If the distance is less than 6cm in an average sized adult, this predicts more difficult intubation.

Patient's current condition

Is the patient stable for anaesthesia?

Check HR, BP, RR, level of consciousness. If the patient is unwell, assess using the ABCDE approach and manage any problems.

Auscultate the patient's chest (for signs of infection or fluid overload) and heart (for murmurs).

Review any Laboratory results (Haemoglobin, clotting, Platelets, Urea and Electrolytes)

Stabilise the patient **BEFORE** anaesthesia. Giving an anaesthetic to an unstable patient can be fatal. The best resuscitation for the baby is to resuscitate the mother.

Ensure that the patient is adequately resuscitated in case of shock, as a GA or a spinal will exacerbate shock and can precipitate cardiac arrest.

Ensure that the BP is controlled in cases of pre-eclampsia. Failure to control the BP can result in a cerebral haemorrhage.

Additional information to document: ASA grade

Table 3.3.1: ASA grades

ASA grade	Description
1	A normal healthy patient, (that is, without any clinically important comorbidity and without a clinically significant past/present medical history)
2	A patient with mild systemic disease
3	A patient with severe systemic disease
4	A patient with severe systemic disease that is a constant threat to life
5	A moribund patient who is not expected to survive without the operation
6	A declared brain-dead patient whose organs are being removed for donor purposes

Investigations

The type of investigations required will vary from patient to patient. However, as an anaesthetist you **must** check the patient's bloods and ECG (if one has been performed), and document the results on the anaesthetic chart.

Bloods

- **Haemoglobin:** this will be important if the patient starts bleeding. You may need to give a blood transfusion earlier if the patients haemoglobin is low prior to going to theatre.
- **Platelets:** To establish if a spinal anaesthetic can be given safely.
- **Electrolytes:** If this blood sample has been requested e.g. for a pre-eclamptic patient.
- **Clotting:** If available in your hospital, and it has been requested e.g. for a patient with sepsis.
- Check blood has been taken for a group and save.

ECG

- If the patient has sepsis prior to going to theatre or has a known arrhythmia then an ECG should be preformed

Choice of Anaesthesia

Most caesarean sections can and should be done under spinal anaesthesia. There are few contra-indications to spinal anaesthesia, in which case a general anaesthetic should be performed.

Contra-indications to spinal anaesthesia include:

- Hypovolaemic shock
- Severe sepsis
- Disordered clotting or platelets < 70
- Raised intracranial pressure
- Maternal refusal

Pre-eclampsia is **not** a contra-indication to spinal unless the patient has some of the features above.

- Check platelets in Pre-eclampsia
- Avoid ketamine and NSAIDs in severe Pre-eclampsia
- Avoid ergometrine in cases of severe Pre-eclampsia
- Avoid paracetamol if severe liver derangement
- In case of multiple pregnancy, avoid giving oxytocic drugs until **all** babies have been delivered.

Discuss the anaesthetic plan with the patient, explain what they should expect and gain consent.

Consent requires the patient to understand the risks and benefits of the procedure.

Don't use medical jargon when talking to patients, and if there is time explain to the patient what will happen when they come to theatre e.g. a cannula will be inserted, and monitoring will be put on, their back will be cleaned.

You must discuss the risks and benefits of the anaesthetic that you are planning to give with the patient, and then document this discussion on the anaesthetic chart. This is equivalent to the surgeons obtaining written consent from the patient prior to performing a caesarean section.

See chapter 3.4 for further information on the types of anaesthetic and their associated risks and benefits

Note See anaesthetic chart documentation of how to document pre-operative assessment.

Spinal risks

- Failure – can give GA instead
- BP drop – associated nausea + vomiting – common and treatable
- Headache (< 1: 200) – not common and treatable
- Nerve damage (< 1:12,000) – very rare and sometimes temporary, sometimes permanent
- Need for catheter
- Post op pain

Spinal benefits

- Can stay awake to meet baby
- Better for baby – does not have GA
- Safer
- Better post-op analgesia

GA risks

- Dental damage
- Sore throat
- Post op pain
- Nausea and vomiting
- Baby may be sleepy when born

GA benefits

- It may be the safest option (if spinal contraindicated)

3.4 Anaesthesia: Methods, complications and management

Key learning points

- IF there are NO contraindications, use spinal anaesthesia for caesarean section where possible
- GA with RSI should be performed where spinal anaesthesia is contraindicated or not possible
- Do NOT perform caesarean under Ketamine without intubation unless there is no option for safe spinal or GA with intubation or safe transfer to another facility
- All patients undergoing caesarean require monitoring and IV access, before induction of anaesthesia
- Check emergency equipment and drugs before induction of anaesthesia
- Patients with high spinal block may be conscious but paralysed – treat them as if they are aware
- In case of difficult intubation – follow guidelines and ensure OXYGENATION – Failure to intubate is not fatal but failure to OXYGENATE will cause death

Reminder: Stabilise the patient BEFORE anaesthesia.

- Giving an anaesthetic to an unstable patient can be fatal.
- Inadequate resuscitation in case of shock – anaesthesia can precipitate cardiac arrest.
- Failure to control the BP in severe pre-eclampsia can result in a cerebral haemorrhage.

Choice of Anaesthetic

All anaesthesia carries risk. It is the role of the anaesthetist to choose to safest and most appropriate method of anaesthesia for the patient. The anaesthetist must deliver safe anaesthesia and anticipate and manage any complications.

Discussion of choice of anaesthetic may involve the obstetrician and the patient, but the anaesthetist has the ultimate responsibility to ensure that the safest anaesthetic possible is provided.

- Most caesarean section cases can be done under spinal anaesthesia. Unless there is a contra-indication to spinal anaesthesia, it is the safest method.
- Patients for whom spinal anaesthesia is not suitable should receive general anaesthesia**.** The risks of failed intubation and awareness are greater in obstetrics than in other surgical specialties.
- In remote areas where spinal and intubation equipment is not available, Ketamine is sometimes used for caesarean section. This carries a higher risk of aspiration, hypoxia and emergence delirium than spinal or general anaesthesia with intubation. Routine use of benzodiazepines increases the risks of hypoxia and should be avoided.
- In facilities where labour epidural is available, a patient with a working labour epidural may undergo caesarean section under epidural top-up with high dose local anaesthesia.

Table 3.4.2 summaries the methods of anaesthesia which may be used for caesarean section.

General principles

Pre-op Preparation

Discuss the anaesthetic plan with the patient, explain what they should expect and gain consent.

Consent requires that the patient understands the risks and benefits of the procedure and agrees to it.

Pregnant patients are at increased risk of aspiration. The risk can be reduced by pre-op administration of antacid (ranitidine or proton pump inhibitor) and pro-kinetic medication. Table 3.4.1 shows a suggested regime.

Table 3.4.1: Antacid prophylaxis for caesarean section

Drug	Elective	Emergency
Ranitidine	150mg PO 12hr pre-op and 2hr pre-op	50mg IV immediately pre-op
Metoclopramide	10mg PO 2hr pre-op	10mg IV immediately pre-op

Prior to starting anaesthesia, ensure the following

- All of the equipment and drugs have been checked and are available – Remember to have GA drugs, emergency drugs and airway equipment available for **all** anaesthesia, including spinal. (See Table 3.4.3)
- Adequate monitoring is **on the patient** – SpO2, BP, ECG if available, and in case of GA, End Tidal CO2 (ETCO2) if available.
- IV access is working and fluid attached.
- Perform the Sign In part of the WHO Checklist prior to giving any drugs or anaesthetic.

Intra-op

- Continue to monitor the patient, checking SpO2, HR and BP.
- Talk to the patient if they are awake, ask how they are feeling, they can alert you to problems with breathing and circulation.
- Communicate with the surgeon so you are aware of any complications and you can respond early.

Post-op

- Ensure the patient is recovered in a monitored recovery area.
- Clearly document the anaesthetic and any complications.
- Ensure appropriate analgesia has been prescribed.
- Visit the patient the next day to check for any complications.

Table 3.4.2: Anaesthetic methods in obstetrics

Method	When to Use	Contraindications	Advantages	Risks
Spinal Anaesthetic	All stable patients undergoing caesarean section who have no condraindications.	Hypovolaemic shock Severe sepsis Disordered clotting Platelets < 70 Raised intracranial pressure Patient refusal	Can stay awake to meet baby Better for baby – does not have GA Safer than GA Better post-op analgesia	Hypotension (patient may feel nausea) Nerve damage (1/45,500 permanent) Post-dural puncture headache (1/500) High spinal Urinary retention Failure of spinal -> GA required
General Anaesthetic with intubation	Patients undergoing caesarean section with contra-indications to spinal. If spinal has failed or is taking too long and immediate delivery of baby is required	Known allergy to anaesthetic agents used	May be faster than spinal in some cases. Duration – if case is prolonged due to complications, GA may be necessary.	Hypotension on induction Hypertensive response to laryngoscopy Failed intubation (1/250 for RSI) Dental damage (1/45,000) Sore throat (2/5) Post op pain Nausea and vomiting (1/6) Awareness (1/8,000) Emergence delerium Baby receives GA -> floppy, sleepy
Ketamine Sedation/GA without intubation	Can be used in emergency situation **only** where there is **no** facility for spinal/intubation and no option for **transfer**.	This technique is to be **avoided** where spinal anaesthesia and intubation are available. **Avoid** the use of benzodiazepines as this increases the risk of hypoxia and aspiration.		Aspiration Hypoxia Hypertension, tachycardia Awareness Post-op pain Emergence delirium Baby receives GA -> floppy, sleepy

Table 3.4.3: Equipment required for anaesthesia

For all anaesthesia:	
Monitoring	SpO2, BP, HR, RR, (ETCO2 if GA)
Airway equipment	Suction, Oxygen, Self inflating bag, face mask, oral airway, ETT, syringe, laryngoscope, bougie/stylet, LMA.
Anaesthetic machine	
GA drugs	Thiopental/propofol/ketamine + suxamethonium/rocuronium/atracurium
Emergency drugs	Atropine, ephedrine, phenylephrine/metaraminol/adrenaline
Other drugs	Antibiotics, oxytocics, analgesia, antiemetics
IV access	Large bore cannula, IV fluid + giving set
Wedge/tilt	Left lateral tilt using bed or wedge to prevent aorto-caval compression
For spinal anaesthesia:	
Monitoring	As above and*:* level of consciousness, level of block (pinprick with blunt needle/cold)
Spinal equipment	Sterile gloves, spinal needles, sterile syringe, antiseptic solution + gauze
Spinal drugs	Bupivacaine (ideal)/lidocaine (only if bupivacaine unavailable), fentanyl/diamorphine/preservative-free morphine

Table 3.4.4: Drugs to use with caution

Drug	**When to avoid**
NSAIDs (diclofenac, ibuprofen)	Severe PET/HELLP. Renal failure. Usually safe in asthma but check with patient if they have had a reaction before
Paracetamol	Severe liver derangement (e.g. in HELLP)
Ergometrine	Severe PET – worsens hypertension
Carboprost (Haemabate):	Asthma – causes bronchospasm

Spinal Anaesthesia

Most caesarean sections can and should be done under spinal anaesthesia. There are few contra-indications to spinal anaesthesia (see Table 3.4.2), in which case a general anaesthetic should be performed. Pre-eclampsia is *not* a contra-indication to spinal *unless* the patient has clotting or platelet derangement, is fitting or has signs of raised intracranial pressure. Remember to check platelets in patients with pre-eclampsia.

Spinal anaesthesia causes sympathetic blockade below the level of the block. This causes vasodilatation and therefore will lower the blood pressure. The hypotension can be severe in an under-resuscitated hypovolaemic patient. Consider whether the patient has been adequately resuscitated. Do not perform a spinal in a hypotensive patient.

Performing spinal anaesthetic

- Prepare equipment.
- Spinal anaesthesia may be performed in the sitting or lateral position. The midline is easier to identify in the sitting position. In difficult cases, conditions may be improved by sitting the patient perpendicular on the operating table with their knees flexed and feet resting on a stool. Putting a slight tilt on the table towards the anaesthetist can also aid opening of the interspinous spaces.
- The landmarks are the iliac crests, which correlate to L4. At the lumbar level, the space may be accessed by inserting the spinal needle perpendicular to the skin. The spinal cord terminates at L1/L2 in adults. Avoid going higher than L3 as the risk of causing spinal cord injury is increased.
- Full asepsis should be used, to reduce the risk of introducing infection, which may then cause meningitis. Use sterile gloves, clean the back with an antiseptic such as iodine or 0.5% chlorhexidine. Allow the antiseptic to dry before starting the procedure. Do not touch skin that has not been cleaned or non-sterile objects with the sterile gloves.
- Local anaesthetic to the skin (1% lidocaine, administered with a 25G subcutaneous needle) makes the procedure more comfortable for the patient.
- Smaller, non-cutting spinal needles reduce the risk of post-dural puncture headache. Smaller needles may require an introducer (e.g. a green needle) to facilitate insertion. You will feel a ‘pop’ when you go through the ligamentum flavum and another subtle ‘pop’ as you enter the dura. Free flowing CSF shows that the needle is in the correct place. Hold the spinal needle securely while attaching the syringe containing the spinal anaesthetic. Inject slowly.
- Opioid analgesic can be administered with the local anaesthetic in the spinal injection. This provides improved post-op analgesia, but carries an increased risk of itching, nausea and respiratory depression. See Table 3.4.5 for safe doses of spinal anaesthetic drugs.
- When the spinal has been administered, lie the patient on their back with a wedge under the right side or with the table tilted to the left. This is very important to prevent aorto-caval compression causing hypotension.

Table 3.4.5: Spinal anaesthesia drugs

	Spinal dose	Duration
Local Anaesthetics		
Bupivacaine 0.5% (plain or hyperbaric)	2.5 ml	2 hours
Lidocaine 2%	3-4 ml	30 – 45 min
Lidocaine 5%	1.0 – 1.5 ml	45 – 60 min
Opioid Analgesics		
Fentanyl	10-25 micrograms (0.2 – 0.5ml of 50 mic/ml)	1-4 hours
Diamorphine	0.3mg (0.3ml of 5mg/5ml)	12 hours
Preservative free morphine	0.1mg (0.1ml of 10mg/10ml)	24 hours

- An IV fluid bolus 250-500ml can be given at the same time as the spinal to prevent hypotension. It is not necessary to complete the bolus prior to the spinal (pre-load), it may be given as a co-load.
- Monitor the patient, checking BP every 1-2 minutes until the baby is delivered, and every 5 minutes until they have been stable in the post op recovery area for 15 minutes. Treat hypotension with IV crystalloid and a vasopressor such as ephedrine (3mg boluses), or metaraminol (0.5mg boluses), or phenylephrine (0.5mg boluses).
- Check the block:
    - Adequate motor block for caesarean will mean that the patient is unable to lift their legs. They should be able to move their arms at all times and if they are unable to squeeze your hands, this is a sign that the block is becoming too high.
    - Sensory block should be to T4 for a caesarean – at the level of the nipples.
- If the block is inadequate after 15 minutes, consider: Repeating the spinal (if there is a partial block, use a reduced dose, if there is NO block, give the same dose). A GA may be considered as there is a risk of high block and dural puncture headache when a second dose is given in the context of a partial block.
- When the block is adequate, inform the surgeon that they may begin.

Post op care

- The patient will be unable to move their legs for up to 3 hours, so will need to be transferred carefully.
- They will need to have a urinary catheter in place until they are walking
- The patient does NOT need to lie flat after spinal anaesthesia, they should be encouraged to mobilize as soon as they are able, as this will prevent deep vein thrombosis. Lying flat is only indicated if the patient develops a post-dural puncture headache.
- When the spinal medication has worn off, the patient will begin to experience pain if adequate analgesia is not provided. Therefore, it is important to prescribe post-operative analgesia.

General Anaesthesia

General anaesthesia should be performed in patients who have a contraindication to spinal anaesthesia, or when spinal anaesthesia has failed. Patients who are severely unwell should be stabilized prior to anaesthesia and should be anaesthetised with a GA if they require caesarean.

Table 3.4.6: General anaesthetic drugs, doses and contraindications

Drug	Dose	Contraindications	Notes
Induction agents			
Ketamine	1.5 - 2mg/kg IV	Pre-eclampsia – can worsen hypertension	Causes tachycardia, maintains cardiovascular stability better than other induction agents. Drug of choice in shocked patients Increases secretions. Avoid in
Thiopental	3-5mg IV		Causes hypotension, use with caution in shocked patients
Propofol	3 mg IV		Causes hypotension, use with caution in shocked patients
Neuromuscular blockades			
Suxamethonium	2mg/kg IV	Hyperkalaemia, Spinal cord injury, crush injury, severe burns, known malignant hyperpyrexia	Rapid onset (45 sec) and offset (<10min). Causes muscle pains.
Rocuronium	1.2mg/kg IV		Slower onset than suxamethonium (1min), longer acting.
Vecuronium	0.15 mg/kg IV		Doesn't require a fridge for storage Onset 2min, duration 45-60min

Consider the drug of choice for GA. Ketamine should be used in patients who are hypotensive (e.g. due to blood loss or sepsis), as it provides a more cardiovascular stable induction than thiopental or propofol.

In patients who have severe pre-eclampsia however, ketamine should be avoided as it can increase blood pressure, increasing the risk of cerebral haemorrhage.

Performing Rapid Sequence Induction GA for caesarean section

- Prepare the equipment.
- Ensure the surgical team are scrubbed and ready to commence and the WHO safe surgical checklist "Sign In" and "Time Out" have been performed.
- Anticipate difficult intubation and make an airway plan.
- Position the patient with a wedge/left tilt to prevent aorto-caval compression.
- Position the patient in the best position for intubation prior to starting the anaesthetic.
    - Head at the top of the table where you can reach.
    - Use a pillow/blanket if necessary to ensure that the tragus (front of the ear) is higher than the manubrium (top of the sternum).
- Place suction under the pillow.
- The surgical team should clean and drape the patient during pre-oxygenation, but must not commence the operation until the airway is secure.
- Pre-oxygenate the patient with 100% oxygen for 3 minutes, ask them to take deep slow breaths.
- Give the pre-calculated dose of induction agent.
- Ask assistant to apply cricoid pressure to prevent regurgitation of stomach contents (firm pressure over the cricoid ring in the front of the neck) as the patient is going to sleep and to maintain the pressure until the ETT is secured.
- Give the pre-calculated dose of muscle relaxant.
- Perform laryngoscopy when the muscle relaxant has had sufficient time to work ~1 minute, or after the fasiculations have stopped when using Suxamethonium.
- Once the ETT is secured, tell the surgeon that they may start.
- Start inhalational agent or give further boluses of intravenous anaesthetic.
- Ensure some pre-emptive analgesia is given prior to waking the patient – e.g. PR diclofenac, IV or PR paracetamol, IV or IM morphine (see section on analgesia).
- Consider pre-emptive anti-emetic (e.g Cyclizine 50mg IM, Ondansetron 4mg IV, Dexamethasone 8mg IV) to prevent post-operative nausea and vomiting.
- At the end of the procedure, ensure that if further muscle relaxant has been given, it has worn off or has been reversed (non-depolarising neuromuscular blocking drugs – any muscle relaxant except Suxamethonium can be reversed with neostigmine 2.5mg and either Atropine or Glycopyrronium 500micrograms to prevent bradycardia from the neostigmine).
- Wake the patient in the left lateral position.
- Pre-oxygenate prior to extubation.
- Ensure the patient remains in a monitored recovery area until they are fully awake and stable.

Ketamine Sedation/GA without intubation

This technique is less safe for the mother and baby than either spinal or conventional general anaesthesia. It should be avoided where possible. If there are no facilities for spinal or intubation, it

is in the patient's best interests to refer them to a facility that can offer safe anaesthesia where possible.

The risks of this technique include:

- Aspiration as the airway is not secured
- Hypoxia due to aspiration or respiratory depression. The risk is increased with benzodiazepines and therefore routine use of diazepam should be avoided.
- Ketamine will exacerbate hypertension in severe pre-eclampsia, increasing the risk of cerebral haemorrhage.
- Awareness
- Emergence delirium

Performing Ketamine GA without intubation

- Prepare the equipment.
- Ensure the surgical team are scrubbed and ready to commence and the Sign In and Time Out have been performed.
- Position the patient with a wedge/left tilt to prevent aorto-caval compression.
- Position the patient in the best position for intubation prior to starting the anaesthetic.
    - Head at the top of the table where you can reach.
    - Use a pillow/blanket if necessary to ensure that the tragus (front of the ear) is higher than the manubrium (top of the sternum).
- Place suction under the pillow.
- The surgical team should clean and drape the patient during pre-oxygenation, but must not commence the operation until the anaesthetist has confirmed that the patient is anaesthetised.
- Pre-oxygenate the patient with 100% oxygen for 3 minutes, ask them to take deep slow breaths.
- Give the pre-calculated dose of Ketamine (1.5 -2mg/kg).
- The duration of action of the Ketamine is 10-20min, so they will need smaller boluses throughout the operation to maintain anaesthesia.
- Ensure that the airway is patent and that they are breathing throughout.
- Be prepared to use a jaw thrust and oropharyngeal airway and to ventilate the patient using a face mask.
- Provide pre-emptive analgesia.
- Recover the patient in left lateral position, in a calm, monitored environment until they are fully awake and stable.
- Emergence delirium is best treated with a calm environment and reassurance. If the patient is very agitated despite this, low doses of Diazepam can be given (2mg IV). Diazepam can accumulate and risks respiratory depression on the ward post-operatively so patients should be monitored.

Epidural top-up for Caesarean

This technique is employed when a mother has an epidural in situ for labour and requires an emergency caesarean section. It is therefore only applicable in hospitals where epidurals in labour are commonly used and is beyond the scope of this course.

Anaesthesia: Management of Complications

Intra-operative complications of anaesthesia include

- Hypotension
- High spinal
- Failed intubation

Post-operative complications of anaesthesia include

- Post dural puncture headache
- Neurological injury
- Spinal haematoma/abscess
- Awareness
- Emergence delerium

Hypotension

Hypotension is a common side effect of anaesthesia, and is more common with spinal anaesthesia and in patients presenting for caesarean section. Awake patients may complain of nausea or light-headedness.

Management:

- Ensure left tilt to relieve aorto-caval compression
- IV fluid bolus
- Vasopressor drugs (boluses can be given every 1-5min)
- Consider other causes (bleeding, anaphylaxis, sepsis)

Table 3.4.7: Vasopressor drugs to treat hypotension secondary to anaesthesia

Drug	Dose	Effects
Ephedrine	3-6mg boluses IV	↑BP, ↑HR
Metaraminol	0.5mg boluses IV	↑↑BP, ↓HR
Phenylephrine	0.1mg boluses IV	↑↑BP, ↓HR
Adrenaline	5 – 20 microgrammes IV	↑↑BP, ↑HR

High Spinal

High spinal*:* Spread of LA block affecting the spinal nerves above T4

Total spinal*:* Intracranial spread of local anaesthetic resulting in loss of consciousness

Table 3.4.8: Signs if high spinal spread of local anaesthetic

Root level	Systems affected	Effects
T1-T4	Cardiac sympathetic fibres blocked	Bradycardia Severe hypotension as bradycardia compounds hypotension from vasodilatation
C6-C8	Hands & arms	Paraesthesia (tingling) and weakness Accessory muscles of respiration affected
C3-5	Diaphragm & shoulders	Diaphragmatic innervation, therefore respiratory compromise Shoulder weakness is a warning sign of impending diaphragmatic compromise
Intracranial spread		Slurred speech Sedation Loss of consciousness

Symptoms

The patient may complain of bilateral tingling or weakness in their hands or arms, difficulty breathing, nausea or feeling lightheaded. These are common side effects of spinal anaesthesia and it important to assess the patient using an ABCDE approach.

Signs

- Hypotension – higher block causes increased sympathetic blockade, causing worsening hypotension.
- May have increased HR but may develop bradycardia if the cardiac accelerator fibres (T1-T4) are involved.
- Shallow breathing, as increasing levels of intercostal muscles are blocked. If the block reaches C3-C5, there will be respiratory arrest due blockade of the phrenic nerve supplying the diaphragm.
- **Falling SpO2 and failure to speak indicate that immediate intubation is required.**
- Progressive arm weakness as the block rises, starting with hand weakness and moving proximally.
- **Shoulder weakness is a sign of impending diaphragm compromise – prepare to intubate.**
- The patient may be agitated or drowsy and may subsequently lose consciousness – 'total spinal'.

Management of High/Total Spinal

ABCDE approach

Call for help! Communicate with the team that you have a problem.

Place the patient in head up position if hyperbaric bupivacaine was used, to prevent cranial further spread.

A Check that the airway is patent. Administer O2 via face mask.

Indications for intubation:

- Airway obstruction
- Falling SpO2
- Unable to speak/slurred speech
- Inadequate respiratory effort/Respiratory arrest
- Loss of consciousness

B Assess breathing – RR and depth of breathing, SpO2. Auscultate to check for other causes of hypoxia (e.g. pulmonary oedema, anaphylaxis causing wheeze).

If the patient is not breathing, support ventilation.

Give oxygen to maintain SpO2 > 94%

C Assess HR, BP and Capillary refill time. Look for other causes of hypotension (e.g. blood loss, sepsis, anaphylaxis).

Treat hypotension with fluid bolus and vasopressor (e.g. Ephedrine 3-9mg).

Treat bradycardia with Atropine 500-600micrograms.

Ensure that the patient is tilted to the left to relieve aortocaval compression.

If there is no pulse palpable and no signs of life, commence CPR.

D Assess block level with cold, light touch or pinprick. Monitor repeatedly as it may be rising.

The patient may be paralysed and lose the ability to breathe but can still be **aware** even though they appear unconscious. If you need to intubate the patient, ensure to give an **anaesthetic** – use ketamine for induction to preserve cardiovascular stability.

Assume the patient is awake until they have been anaesthetised and talk to them, explaining what is happening.

E Look for signs of rash, bleeding, sepsis (check temperature), so that you don't miss any other causes of the clinical picture.

The spinal may last up to 2 hours, therefore the patient may require ventilation for a prolonged period and should be kept anaesthetised until they are spontaneously ventilating.

Failed Intubation

The incidence of failed intubation is 10 times higher in obstetric patients than in the general population. The reasons for this include:

- Changes in the anatomy due to pregnancy: increased soft tissue in the oropharynx, increased breast tissue.
- Increased stress of the situation – emergency caesarean section is a time-critical procedure, and the stress can impair performance.
- Timing – many caesarean sections take place in the night, when staff are more tired and perform less well.

In addition, pregnant women are at increased risk of hypoxia during induction of anaesthesia, for anatomical and physiological reasons.

- Reduced Functional Residual Capacity due to the gravid uterus displacing the diaphragm, meaning that there is less reserve of oxygen in the lungs during apnoea.
- Increased oxygen consumption in pregnancy.
- Increased risk of aspiration due to reduced lower oesophageal sphincter tone and increased pressure on the stomach from the gravid uterus.

In case of failure to intubate the patient, it is vital that **oxygenation** is maintained – the patient will not die from failed intubation, but will die from failure to oxygenate.

Safe management of the failed intubation scenario requires communication and teamwork with the whole team in the operating room.

The Difficult Airway Society have produced guidelines on management of failed intubation in obstetrics. **Error! Reference source not found.** summaries the algorithm and Figure 3.4.2 - Figure 3.4.4 , Table 3.4.9 and Table 3.4.10 provide more detailed explanation.

Planning and preparation

- Optimise patient position 'Sniffing position' – ensure the tragus is higher than the manubrium, use pillows if necessary.
- Have all equipment ready, including difficult intubation equipment (bougie, stylet, supraglottic airway device, scalpel).
- Make an airway plan for failed intubation and share it with the team, for example:

  A – direct laryngoscopy (if fails, use bougie/sytlet, external manipulation of larynx, reposition the head, maximum 3 attempts).

  B – maintain oxygenation – face mask + oral airway, 2-person bag-mask ventilation.

  C – maintain oxygenation – Supraglottic airway device.

  D – maintain oxygenation – cricothyroidotomy.
- Consider whether it will be possible to wake the patient up in case of failed intubation or whether the caesarean must take place immediately.

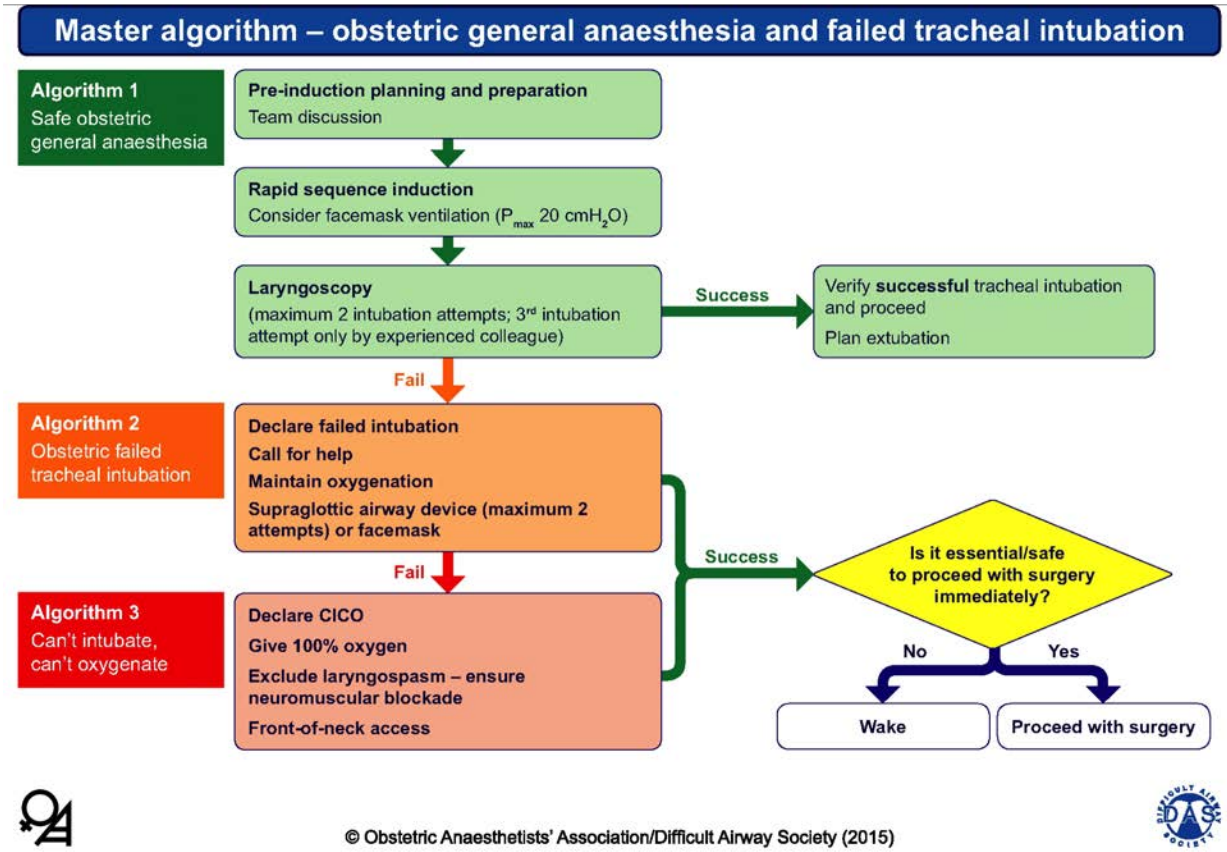


Figure 3.4.1: Algorithm for failed tracheal intubation (Mushambi et al 2015)

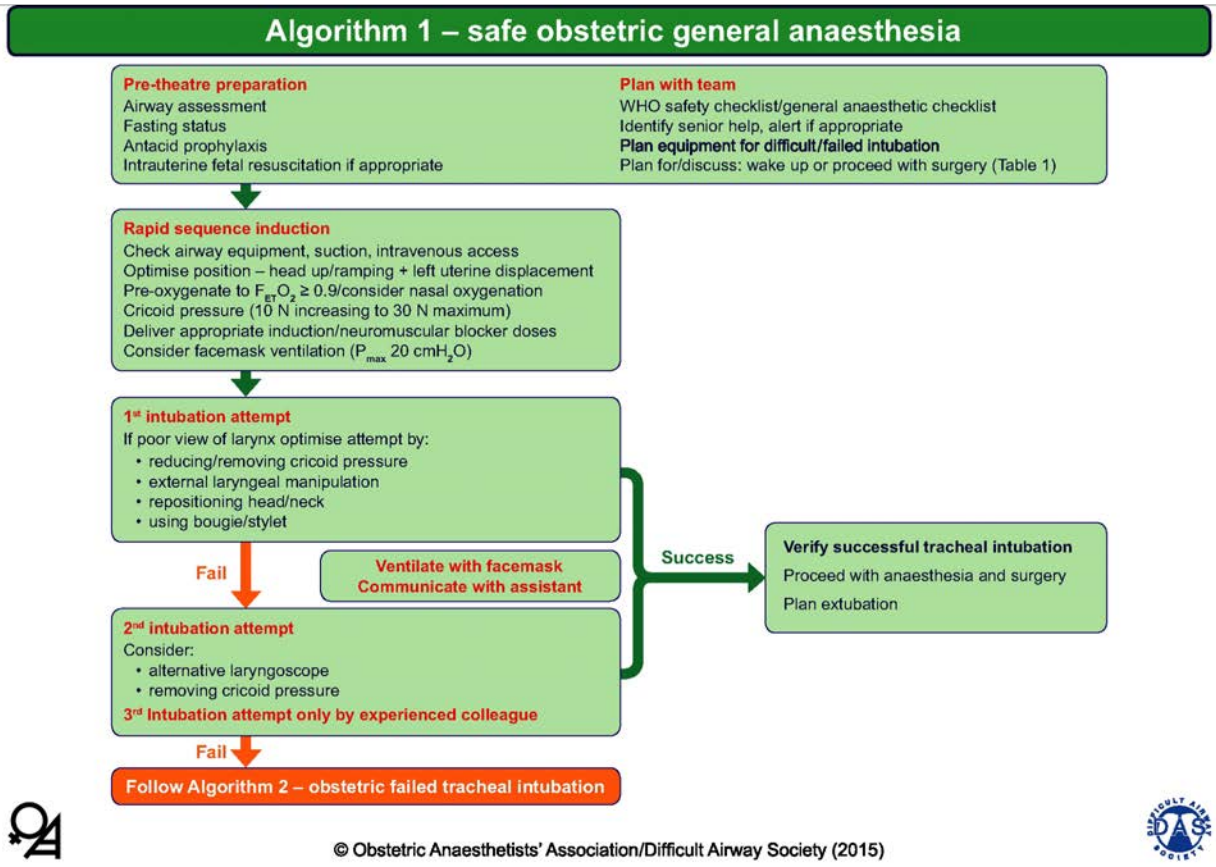


Figure 3.4.2: Algorithm for safe obstetric general anaesthesia (Mushambi et al 2015)

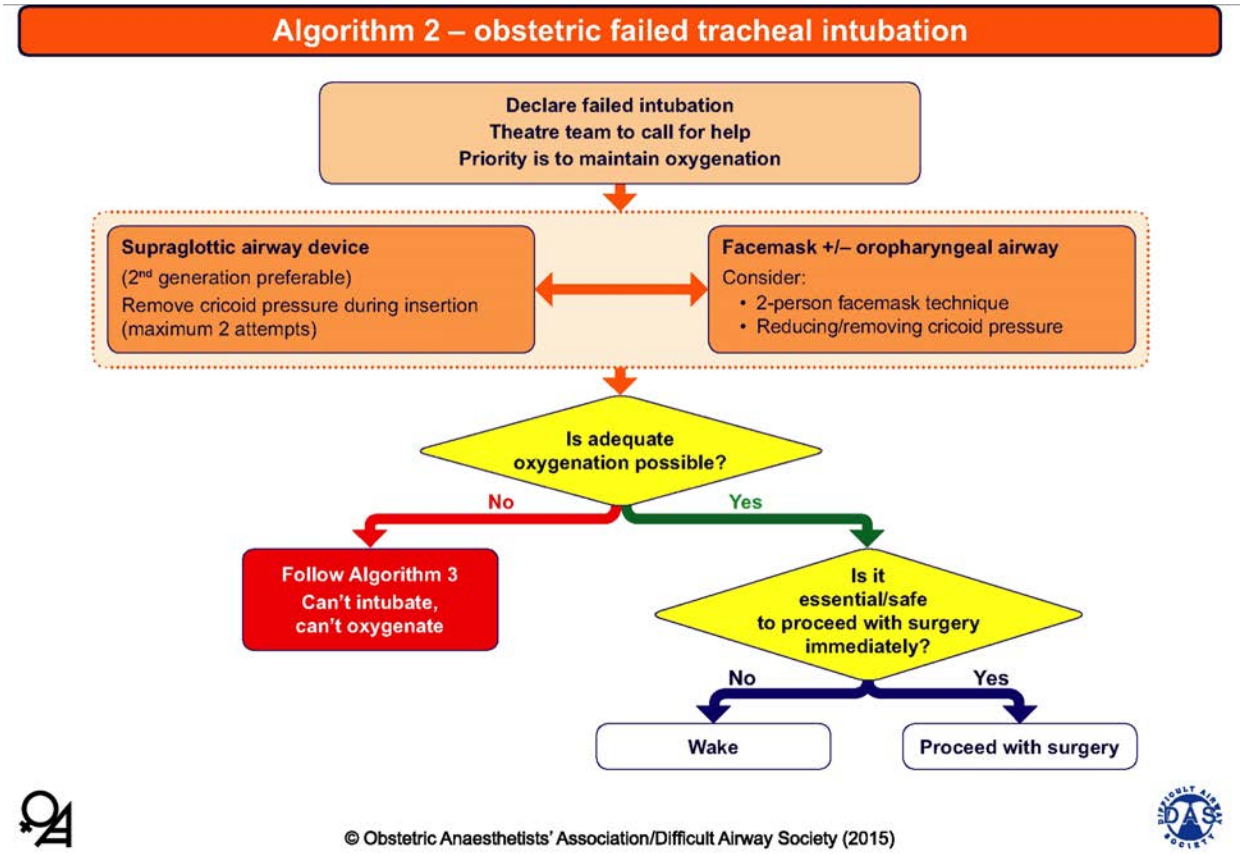


Figure 3.4.3: Algorithm for obstetric failed tracheal intubation (Mushambi et al 2015)

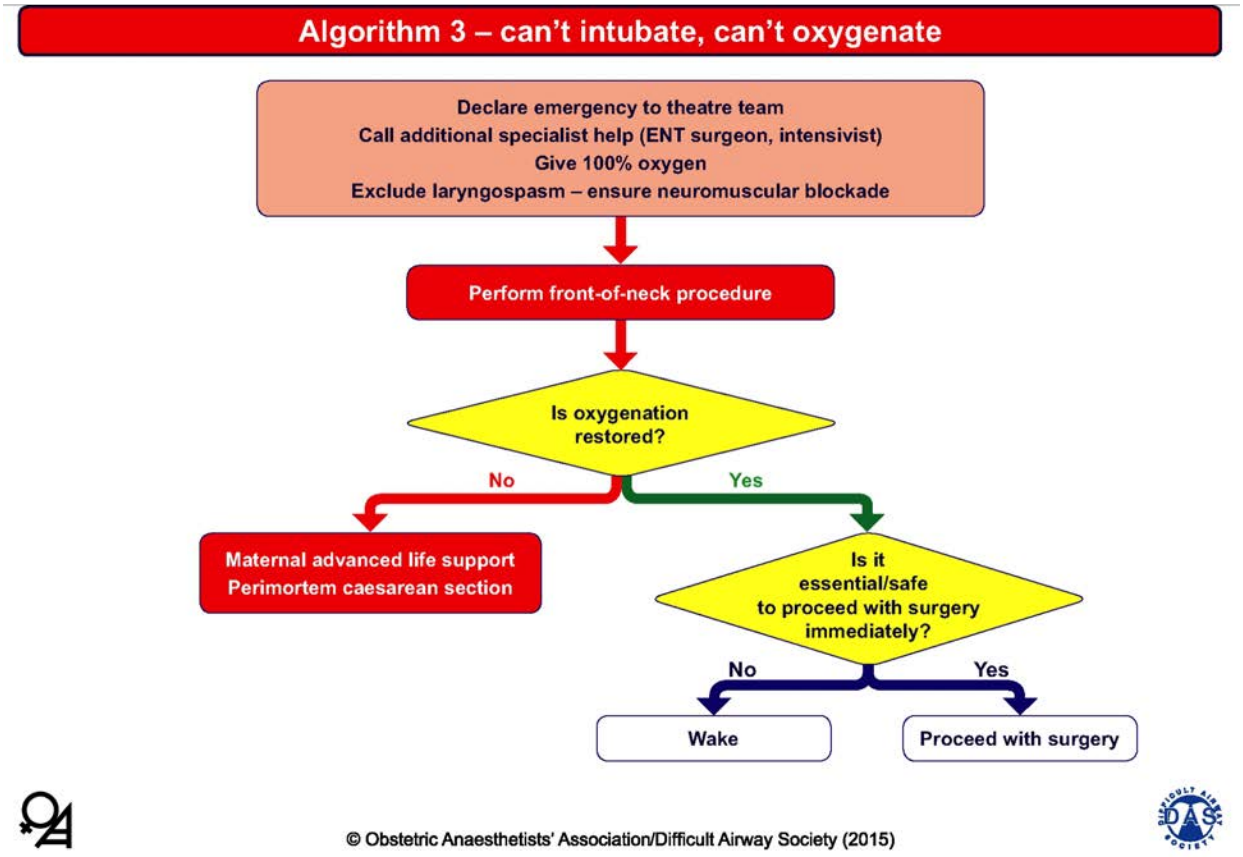


Figure 3.4.4: Algorithm for when intubation and oxygenation fail (Mushambi et al 2015)

Table 3.4.9: Factors to consider in deciding to operate (Mushambi et al 2015)

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

Table 3.4.10: Management after failed tracheal intubation (Mushambi et al 2015)

Wake

- Maintain oxygenation
- Maintain cricoid pressure if not impeding ventilation
- Either maintain head-up position or turn left lateral recumbent
- If rocuronium used, reverse with sugammadex
- Assess neuromuscular blockade and manage awareness if paralysis is prolonged
- Anticipate laryngospasm/can't intubate, can't oxygenate

After waking

- Review urgency of surgery with obstetric team
- Intrauterine fetal resuscitation as appropriate
- For repeat anaesthesia, manage with two anaesthetists
- Anaesthetic options:
  - Regional anaesthesia preferably inserted in lateral position
  - Secure airway awake before repeat general anaesthesia

Proceed with surgery

- Maintain anaesthesia
- Maintain ventilation - consider merits of:
  - controlled or spontaneous ventilation
  - paralysis with rocuronium if sugammadex available
- Anticipate laryngospasm/can't intubate, can't oxygenate
- Minimise aspiration risk:
  - maintain cricoid pressure until delivery (if not impeding ventilation)
  - after delivery maintain vigilance and reapply cricoid pressure if signs of regurgitation
  - empty stomach with gastric drain tube if using second-generation supraglottic airway device
  - minimise fundal pressure
  - administer H_2 receptor blocker i.v. if not already given
- Senior obstetrician to operate
- Inform neonatal team about failed intubation
- Consider total intravenous anaesthesia

Plan A: Direct laryngoscopy

Persistent attempts at laryngoscopy with **failure to oxygenate** the patient have resulted in **DEATH.**

- Do not have more than 3 attempts.
- The 3rd attempt should be by the most experienced person available.
- Maintain oxygenation between attempts – gentle facemask ventilation with 100% oxygen if the SpO2 is falling.
- Make improvements to the intubation conditions between attempts:
    - Head position
    - Brightest laryngoscope
    - Stylet/bougie
    - Cricoid pressure – reduce
    - External laryngeal manipulation

Failure to intubate following 3 attempts:

- Declare failed intubation
- Call for help
- Maintain oxygenation (with 100% oxygen)
- Attempt to insert a supraglottic airway (max 2 attempts) or use a facemask

Plan B and C: Supraglottic Airway insertion

Supraglottic airways such as LMA or iGEL are oral tubes with a mask on the end, which sits over the larynx, with the tip of the mask in the oesophagus. They can assist in airway management in case of failure to intubate, but **are not a definitive airway.** Aspiration and laryngospasm are still possible with a supraglottic airway in situ.

To insert:

- Release the cricoid pressure during insertion, but replace afterwards to prevent aspiration
- Hold the device like a pen
- Lubricate the back of the device
- Open the mouth. An assistant may help by doing a jaw thrust and opening the mouth wide
- Insert the device along the roof of the mouth with the mask facing the tongue and gently push it all the way down as far as it can go
- In case of LMA, insert air into the balloon as per

Table 3.4.11.

- Check for chest rise and listen for breath sounds, there should be minimal leak around the mask
- **IF supraglottic mask insertion has FAILED after 2 ATTEMPTS: STOP!**
- Return to facemask ventilation with an oral airway (Guedel). Use two people to perform facemask ventilation to ensure the best seal possible
- Consider insertion of an NG or OG tube to decompress the stomach if using facemask ventilation
- If oxygenation and ventilation are adequate, the team must decide whether it is appropriate to continue with surgery or to wake the patient up (see below)

Table 3.4.11: Cuff inflation volumes in case of LMA

Adult LMA/iGEL	Patient weight	Max. cuff inflation volume with air for LMA
3	<50kg	20ml
4	50-70kg	30ml
5	> 70kg	40ml

Failure to oxygenate despite 2 attempts at supraglottic airway insertion and 2-person facemask ventilation:

- Declare Can't Intubate, Can't Oxygenate to theatre team
- Call for help (if not already done)
- Give 100% oxygen
- Exclude laryngospasm – ensure neuromuscular blockade
- Front-of-neck access

Plan D: Can't intubate, can't oxygenate

This is a very rare but serious situation.

- If there is an ENT surgeon available, call them for immediate help.
- Provide 100% oxygen via facemask.
- Ensure adequate neuromuscular blockade as laryngospasm may be the cause
- Front-of-neck airway should be performed if all steps to oxygenate the patient have failed.
- If front-of-neck airway is successful and oxygenation and ventilation are adequate, the team must decide whether it is appropriate to continue with surgery or to wake the patient up (see below).
- If the front-of neck-airway is unsuccessful and the patient remains hypoxic, a peri-mortem caesarean section should be carried out.
- If the patient has cardiac arrest, CPR should be performed.

Surgical cricothyroidotomy as per DAS guidelines

Equipment:

- Cuffed ETT size 6.0
- Scalpel: size 10 blade on a handle
- Bougie (with a coude – angled tip)

Prior to performing a cricothyroidotomy:

- Position the patient to extend the neck.
- Identify the anatomical landmarks (use laminate, to ensure the delegates know how to correctly identify the cricothyroid membrane.
- Perform a 'laryngeal handshake' with your non-dominant hand to identify and stabilise the cricothyroid membrane.

How to perform a cricothyroidotomy when the cricothyroid membrane is palpable:

- Make a transverse stab incision through the cricothyroid membrane with your dominant hand.
- Keep the scalpel perpendicular to the skin and turn the blade 90 degrees (the sharp edge of the blade should be facing caudally).
- Swap hands and hold the scalpel in position with your non-dominant hand.
- Maintain gentle traction, pulling the scalpel towards you to open up the incision.
- Slide the coude tip of the bougie down the side of the scalpel blade with your dominant hand into the trachea.
- Advance the bougie into the trachea 10-15cm.
- Remove the scalpel, but keep the bougie in the trachea, stabilise the trachea with your non-dominant hand.
- Railroad a lubricated size 6.0 cuffed ETT into the trachea.
- Remove the bougie.
- Ventilate with high flow oxygen, inflate the cuff & confirm correct position with capnography.
- Secure the tube.

Surgical cricothyroidotomy as per DAS guidelines

How to perform a cricothyroidotomy when the cricothyroid membrane is **NOT** palpable:

- Make an 8-10cm vertical skin incision, caudal to cephalad.
- Use blunt dissection with fingers of both hands to separate tissues.
- Identify and stabilise the larynx.
- Proceed with technique for palpable cricothyroid membrane as above.

Failed intubation: When to continue with surgery

Several factors need to be considered about the risks versus the benefits of proceeding.

Maternal stability

- If the mother is stable and it is safe to wake her up and try a spinal anaesthetic instead, this should be considered.
- If the mother is unstable, if it is not safe to delay the surgery to wake her up, and a spinal is contra-indicated (or has already failed), consider proceeding with the operation.
- Obese patients, and those who are not starved are at increased risk of aspiration and therefore consideration should be given to waking these patients if it is safe to do so.

Fetal wellbeing

- If there are signs of fetal distress and delaying the surgery will cause compromise, consider proceeding with surgery.

Post Dural Puncture Headache

Headache after caesarean is common, most frequently due to exhaustion and dehydration and most will resolve with simple analgesia. A careful history and examination should be undertaken to elicit the cause.

Lying flat after a spinal anaesthetic DOES NOT prevent dural puncture headache. Early mobilization should be encouraged to prevent deep vein thrombosis. Lying flat is only beneficial if the patient develops a post-dural puncture headache.

Features of a dural puncture headache:

- Occurs 24 hours to 2 weeks following dural puncture
- Postural: worse when upright, improved by lying down
- Frontal/occipital

May have associated symptoms:

- Neck pain
- Photophobia/eye pain
- Tinnitus
- Nausea/vomiting
- Cranial nerve palsy

Management

Rule out serious causes for the headache.

- Venous thrombosis
- Intracranial haemorrhage – may have focal neurology, low GCS and signs of raised intracranial pressure (papilloedema, hypertension)
- Meningitis – pyrexia, raised white cell count
- Pre-eclampsia – check BP
- Tumour – likely to have preceded the anaesthetic, may have focal neurology and signs of raised intra-cranial pressure

Treatment

- Lying down relieves symptoms
- Adequate hydration
- Analgesia-paracetamol, ibuprofen, may require opioid (eg codeine/tramadol/oral morphine)
- Caffeine-encourage caffeinated drinks
- Anti-emetics (60% of patients experience nausea)
- Reassurance, most will get better within one week
- Epidural blood patch may be performed where facilities allow

Epidural blood patch

- Should be performed by anaesthetist who is experienced in epidural as the procedure carries a risk of causing further dural puncture.
- Strict asepsis should be followed by the anaesthetist performing the epidural and also by the assistant, who removes 30 ml of blood from the patient's vein.
- 25-30ml of the patient's own blood is injected into the epidural space (ideally at L4/L5).
- The patient should lie flat for 2 hours to allow the clot to form.
- Avoid straining, lifting, excessive bending for 48hours.
- Carries risk of dural puncture, nerve damage and failure and should only be performed in experienced hands.

Neurological complications

Neurological complications after caesarean may be due to anaesthetic complications, obstetric injury, or due to positioning of the patient during labour or surgery. It may not be apparent until after the anaesthetic has worn off. Therefore, it is important to do a post-operative check of all patients who have undergone spinal anaesthesia.

Neurological complications of spinal anaesthetic are very rare (<1/80,000 in UK obstetric population). However, they are potentially very serious.

Anaesthetic neurological complications include:

- Epidural haematoma
- Epidural abscess
- Nerve/spinal cord injury
- Meningitis

Obstetric nerve injuries are more common than anaesthetic neurological complications. They are more likely to be unilateral, will involve a peripheral nerve as opposed to a nerve root, and are less likely to be associated with pain. Most will resolve within 6 months.

Worrying features

- Worsening symptoms and signs
- Back pain associated with weakness and fever
- Bladder/bowel disturbance
- Headache and fever – consider meningitis

Management

Take a full history

- How long has the problem been there?
- Has it been getting better or worse?
- Where is affected?
- Is there pain?
- Fever?

- Loss of bladder or bowel control?
- Has the patient passed urine normally?

Examine the patient

- Detailed neurological examination – tone, power, reflexes and sensation.
- Unilateral and peripheral signs are more likely to be obstetric.
- Bilateral signs, with a motor or sensory level indicate cord injury.
- Tachycardia and fever are signs of infection, consider meningitis/epidural abscess if no other focus and there is positive neurology.
- Don't miss urinary retention, ask about urine output and examine for a distended bladder.

Treatment

- ABCDE with resuscitation where indicated.
- Take cultures and administer antibiotics in case of signs of infection.
- Repeated monitoring of the patient's neurology (power and sensation)– it is important to detect any deterioration.
- if there is worsening weakness (Bromage score – see Table 3.4.12), or loss of bladder/bowel control, **seek neurosurgical review immediately.**
- Catheterise in case of urinary retention or incontinence.
- Physiotherapy and splints to assist with recovery of function.

Table 3.4.12: Bromage Score - an increasing score indicates deteriorating neurology

Grade	Criteria	Degree of block
1	Free movement of legs	Nil (0%)
2	Just able to flex knees with free movement of feet	Partial (33%)
3	Unable to flex knees, but with free movement of feet	Almost complete (66%)
4	Unable to move legs or feet	Complete (100%)

Reference

Mushambi, M., Kinsella, S., Popat, M., Swales, H., Ramaswamy, K., Winton, A. and Quinn, A. (2015). Obstetric Anaesthetists' Association and Difficult Airway Society guidelines for the management of difficult and failed tracheal intubation in obstetrics. Anaesthesia, 70, pp.1286 – 1306. (with permission from Obstetric Anaesthetists' Association / Difficult Airway Society)

3.5 Safety in the operating theatre

Key learning points

- A hazard is a potential source of harm or adverse health effect
- Hazards in the operating room can pose a risk to both patients and staff

Surgical risks

- Wrong operation
- Surgical complication -> bleeding/tissue damage
- Retained swabs/instrument
- Infection
- Anaesthetic risks:
- Failed intubation/aspiration -> hypoxia
- Hypotension
- Wrong drug/dose
- Allergic reaction/transfusion reaction
- Nerve damage
- Environmental risks:
- Hypothermia
- Pressure injury –nerve/tissue damage
- Burns from diathermy
- Falls

Risks to staff include:

- Infection – sharps injury/splash injury/inhalation
- Manual handling -> back injury
- Trips and falls
- Radiation if X rays used
- Inhaled anaesthetic gases if scavenging is not used

Reducing Risks

Most risks are **preventable** with appropriate preparation and checks.

Communication

- Many errors are due to communication failures.
- If you see a risk to patient or staff safety, SPEAK UP! Share your concerns with the team.
- Use closed loop communication
- Use staff members' names where possible.
- Example of closed loop communication:

  Obstetrician (Mary): "John, Please give 5units of oxytocin"
  Anaesthetist (John): "You would like me to give 5 units of oxytocin IV Mary?"
  Obstetrician (Mary): "Yes"
  Anaesthetist(John): "Mary, 5 units of oxytocin given"
- Use of the WHO Safe Surgical Checklist improves communication and safety in the operating room.

Equipment

- Check equipment before each operating list.
- Maintain equipment and repair when broken. Do not use faulty equipment.
- Safe sterilization processing.
- Check sterility of instruments and swabs prior to use.

Drugs

- More drug errors are made in high-pressure situations – take extra care.
- Prepare emergency drugs in advance.
- Label the syringe as soon as the drug is drawn up.
- Check allergies prior to administering any drug.

Surgical counting

- Count swabs and instruments before skin incision is made.
- Count to be completed before closure of any body cavity (e.g. uterus, peritoneum, skin).

Physical risks

- Ensure the patient is positioned safely (wedge for caesarean), and that pressure areas are protected prior to starting the procedure.
- Check that the diathermy is correctly attached to the patient.
- Consider whether the patient needs a blanket as they will lose a lot of heat during the operation.
- Ensure that the baby is kept warm and dry.

Infection

- Respect the sterile field.
- Ensure that equipment (including monitoring, operating table) is cleaned between patients, and that surgical and anaesthetic equipment has been sterilized.

Sharps and splashes

- Count the sharp items at the beginning and end of the surgery so that no sharp is left in the patient or in the drapes, where it can cause injury to staff.
- Do not re-sheath needles, as this risks needle-stick injury.
- Do not pass a sharp directly to another member of staff – place in a kidney dish.
- Take responsibility for disposing of sharps in the sharps bin.
- Do not over-fill sharps bins.
- Wear 2 pairs of gloves to protect against sharps injuries.
- Wear eye protection to protect against splash injuries.
- In case of sharps/splash injury:
    - Wash the wound with soap and water, encourage it to bleed.
    - Apply a dry dressing.
    - Do NOT suck the wound.
    - Assess the risk of blood borne virus transmission from the patient and consider anti-retroviral prophylaxis if the patient is at high risk of HIV.

Note HIV transmission from needle-stick form a HIV positive patient is 0.3%, and this is reduced further if the patient has been taking ARVs and has an undetectable viral load.

Manual handling

- Protect yourself and your patient.
- Use the whole team to move the patient.
- Slide the patient on a sheet. You may need to roll them to put the sheet under them.
- Do NOT pull or lift patients by their arms and legs.

3.6 The WHO Safe Surgical Checklist

Key learning points

- Many errors can be prevented
- Systematic use of the WHO Safe Surgical Checklist SAVES LIVES.
- The Checklist can be adapted for obstetric practice
- The Checklist should be *read*, not memorized
- Check emergency equipment and drugs *before* the first part of the Checklist
- Ensure swabs and instruments are counted and documented *before* the skin incision
- Clear communication between team members can prevent errors

Rationale

Over 315 million surgical procedures are performed each year worldwide.

Surgical mortality outside of industrialised countries is as high as 5-10% for major surgery.

Anaesthetic mortality alone is as high as 1/150 in some parts of sub-Saharan Africa, with airway problems and anaesthetic delivery to hypotensive patients accounting for 50% of the deaths.

Provision of safe caesarean section involves delivery of safe anaesthesia, safe surgery and safe post-operative care. All members of staff play vital roles in making the patient safe.

The WHO Safe Surgical Checklist reduces mortality by up to 47% and complications by 50% when used effectively.

It is a simple and free tool to check that key safety steps have taken place. It is designed to be used to check that tasks and checks have been completed, and should not be used as a to-do list.

How to use the Checklist

Prior to taking the patient to theatre, the checks of theatre equipment and drugs should be performed by the anaesthetic and nursing staff. Figure 3.6.1 is an example of pre-operative anaesthetic checks.

The WHO Safer Surgical Checklist itself consists of 3 parts:

- Sign In (to be completed prior to anaesthesia)
- Time Out (to be completed prior to skin incision)
- Sign Out (to be completed at the end of the operation, before the patient leaves the operating room)

In addition, a Team Brief can take place prior to the patient arriving in the operating room, or together with the Sign In.

Figure 3.6.2 shows an example of the WHO Safer Surgical Checklist. Figure 3.6.3 shows an example of how the Checklist may be adapted to Obstetric practice.

The Checklist should be **read aloud** by a dedicated member of the operating room team when all team members are ready. All staff in the operating room must be silent so that they can listen and engage with the safety checks. The circulating nurse is in an ideal position to read the checklist as they will have free hands and will be able to stand in a position in the room where everyone can hear them.

It is not necessary to memorize the checklist. It should be **read aloud** every time.

The Checklist confirms that essential safety procedures have been done, and is not a 'to-do' list. Therefore, reading the Checklist aloud should only commence when the team are ready and have completed the necessary task.

Patient name _____ **Number** _____

Date of birth _____ **Procedure** _____

Site _____

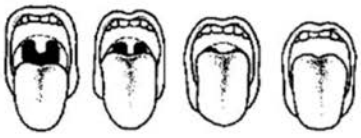
Check patient risk factors *(if yes – circle and annotate)*		**Check resources**	Present and functioning
ASA 1 2 3 4 5 E		***Airway*** – Masks – Airways – Laryngoscopes (working) – Tubes – Bougies	☐ ☐ ☐ ☐ ☐
Airway *(Mallampati classification)*  Class 1 Class 2 Class 3 Class 4		***Breathing*** – Leaks (a fresh gas flow of 300 ml/min maintains a pressure of >30 cm H_2O) – Soda lime (colour, if present) – Circle system (two-bag test, if present)	☐ ☐ ☐
Aspiration risk?	No	***suction***	☐
Allergies	No	***Drugs and devices*** – Oxygen cylinder (full and off) – Vaporizers (full and seated) – Drips (intravenous secure) – Drugs (labelled, total intravenous anaesthesia connected) – Blood and fluids available – Monitors: alarms on – Humidifiers, warmers and thermometers	☐ ☐ ☐ ☐ ☐ ☐ ☐
Abnormal investigations?	No		
Medications?	No	***Emergency*** – Assistant – Adrenaline – Suxamethonium – Self-inflating bag Tilting table	☐ ☐ ☐ ☐ ☐
co-Morbidities?	No		

Figure 3.6.1: Sample pre-operative anaesthetic checklist (WHO)

Team Brief

- The purpose of the team brief is to plan safe and efficient operations.
- It allows issues to be anticipated and addressed early, so can prevent problems later.
- It is usually led by the surgeon/obstetrician, but all team members must contribute.
- Team members introduce themselves by name and role (e.g. John, Scrub nurse).
- All cases listed for that team can be discussed (In case of elective surgery), or the next case only in case of emergency surgery.
    - Planned operation (surgeon/obstetrician)
    - Anticipated problems (surgeon/obstetrician and anaesthetist)
    - Equipment necessary (surgeon/obstetrician and scrub nurse)
    - Blood requirements (surgeon/obstetrician and anaesthetist)
    - Neonatal resuscitation equipment (midwife)
- Any issues identified are then addressed (e.g. missing equipment, need for blood cross match).

Sign-In

- All pre-op anaesthetic checks (see Figure 3.6.1) must be completed **before** Sign-In.
- To be done when the patient is in the operating room, **before** spinal anaesthesia, or **during** pre-oxygenation if patient is having GA for emergency caesarean.
- The anaesthetist and operating room nurse or assistant read the Sign-In.

Key Steps

- Confirm patient identity, operation and consent.
- Does the patient have any allergies?
- Have all anaesthetic equipment and drugs been checked?
- Is there adequate monitoring on the patient?
- Is there a risk of difficult intubation? Is equipment/assistance available?
- Is there a risk of significant blood loss requiring transfusion? Is blood available?

Time-Out

- To be performed **before** skin incision.
- In case of caesarean section, this should be performed **before** general anaesthesia (i.e. at the same time as the Sign-In), or, if a spinal is being performed, **after** the spinal block has been performed and the block is adequate for the surgery to begin.

Key Steps

- Confirm that all team members have introduced themselves by name and role and all staff required are present.
- Re-confirm the patient's name and procedure.
- Does the anaesthetist/surgeon have any concerns? (e.g. is the patient stable, is the block adequate?)

- Confirm antibiotics been given.
- Confirm sterility of the instruments (and initial swab and instrument count has been performed).

Sign-Out

- To be performed at the end of the operation, before the patient has left the operating room.

Key Steps

- Confirm that the swab and instrument count is correct (scrub nurse).
- Key concerns for recovery have been identified and management plan made (anaesthetist and surgeon/obstetrician).

Adapting the Checklist

The Checklist can be adapted to the setting. For example, the key safety checks for obstetrics may be slightly different than for orthopaedic surgery. For category 1 emergency caesarean section, the checklist may be amended for brevity (See Figure 3.6.3, where the checks for category 1 caesarean are highlighted).

In case of emergency caesarean, the Sign-In and Time-Out may be performed at the same time, before anaesthesia.

Any adaptation should be done in collaboration with all theatre staff – Anaesthetic, Surgical/Obstetric and Nurses, and the amended checklist should be trialled in simulated real-life situations.

Surgical Safety Checklist

World Health Organization | Patient Safety
A World Alliance for Safer Health Care

Before induction of anaesthesia

(with at least nurse and anaesthetist)

Has the patient confirmed his/her identity, site, procedure, and consent?
- ☐ Yes

Is the site marked?
- ☐ Yes
- ☐ Not applicable

Is the anaesthesia machine and medication check complete?
- ☐ Yes

Is the pulse oximeter on the patient and functioning?
- ☐ Yes

Does the patient have a:

Known allergy?
- ☐ No
- ☐ Yes

Difficult airway or aspiration risk?
- ☐ No
- ☐ Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?
- ☐ No
- ☐ Yes, and two IVs/central access and fluids planned

Before skin incision

(with nurse, anaesthetist and surgeon)

- ☐ **Confirm all team members have introduced themselves by name and role.**
- ☐ **Confirm the patient's name, procedure, and where the incision will be made.**

Has antibiotic prophylaxis been given within the last 60 minutes?
- ☐ Yes
- ☐ Not applicable

Anticipated Critical Events

To Surgeon:
- ☐ What are the critical or non-routine steps?
- ☐ How long will the case take?
- ☐ What is the anticipated blood loss?

To Anaesthetist:
- ☐ Are there any patient-specific concerns?

To Nursing Team:
- ☐ Has sterility (including indicator results) been confirmed?
- ☐ Are there equipment issues or any concerns?

Is essential imaging displayed?
- ☐ Yes
- ☐ Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:
- ☐ The name of the procedure
- ☐ Completion of instrument, sponge and needle counts
- ☐ Specimen labelling (read specimen labels aloud, including patient name)
- ☐ Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:
- ☐ What are the key concerns for recovery and management of this patient?

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

Figure 3.6.2: WHO surgical safety checklist

Obstetric Theatre WHO Checklist

Royal Berkshire NHS
NHS Foundation Trust

Patient Name: ……
DOB:……
Hospital No:……
NHS No:……

For Category 1 Delivery please confirm highlighted areas

One team member confirms:
Sign in: Before spinal, during preoxygenation or as epidural topped up

Checks to be done	Tick to Confirm
Anaesthetist	
ASA	I II III IV V
Any patient-specific concerns? If so, what	**Yes ☐ No ☐**
Concern for difficult regional or airway?	Yes ☐ No ☐
Is there equipment and/or help available	Yes ☐ No ☐
Surgeon	
Any unusual steps you want the team to know about?	**No ☐ Yes ☐**
Risk of Major Obstetric Haemorrhage (>2000ml)	No ☐ Yes ☐
If so, adequate iv access, warm fluids and **blood available**	Yes ☐
What oxytocic will be required? Synometrine ☐ Carbetocin ☐ Syntocinon bolus/infusion ☐	
Patient Checks	
Patient has identity band: First name/Surname DOB/Hospital Number	Done ☐
Urgency of Procedure (Category of section)	1 2 3 4
What procedure are we doing?	**Consent form checked ☐ Patient agrees ☐**
Does the patient have a known allergy?	**Yes ☐ No ☐**
MRSA positive	Yes ☐ No ☐
Rhesus negative Is blood bank aware that may have anti-D antibodies	Yes ☐ No ☐ Yes ☐ No ☐
Print Name …… Designation …… Signature ……	

One team member confirms:
Time out: Before induction of general anaesthesia or start of procedure

Checks to be done	Tick to Confirm
Are all team members present in theatre and identified?	
Surgeon ☐ Lead Anaesthetist ☐ Paediatrician/ANP ☐ **Assistant ☐ Anaesthetic ODP ☐ Runner ☐** **Scrub nurse ☐ Midwife ☐ Others (Dad) ☐**	
Patient position	**Supine ☐ Lithotomy ☐**
Wedge	**Yes ☐ No ☐**
Flowtrons applied	**Done ☐**
U/S imaging available and checked	Yes ☐ No ☐
Are there any concerns about sterility or other issues?	**Yes ☐ No ☐**
Print Name …… Designation …… Signature ……	**Reconfirm name of patient and planned procedure**

One team member confirms:
Sign Out: Before Surgeon leaves theatre

Checks to be done	Tick to Confirm
Can we confirm the procedure?	Done ☐
Blood loss agreed by surgeon, anaesthetist and idwives and recorded on operation note	Done ☐
Antibiotic prophylaxis given	Done ☐
Postoperative Tinzaparin	Not needed ☐ Prescribed ☐
Swabs, needles and instrument count correct All instruments returned by midwifery team	Done ☐ Done ☐
Any equipment problems identified	Yes ☐ No ☐
Baby labelled	Done ☐
Specimens labelled	Done ☐
Are there key concerns for recovery? **Are there any other issues to be addressed before the patient leaves theatre?**	No ☐ Recorded in notes ☐
Print Name …… Designation Signature……	Is the consultant aware that this procedure has been done ? Before To be done by

Draft 7

Rosie Jones/Imran Mohammad May 2010; Revised January 2015

Figure 3.6.3: An adapted WHO safer surgical checklist (Royal Berkshire Hospital, UK)

3.7 Caesarean section for diabetic women

Key learning points

- Diabetes is a common disease complicating pregnancy and delivery
- Beware new onset type 1 or 2 diabetes arising co-incidentally with pregnancy
- Meticulous peri-operative care is essential to avoid significant complications
- All maternity departments should have comprehensive guidelines for the management of diabetes readily available

The management of diabetes in pregnancy is complex and particular care is required around the time of any surgical delivery, whether elective or emergency.

In cases of diagnosed fetal macrosomia consideration should be given to caesarean delivery because of the elevated risk of shoulder dystocia in diabetic women.

Categories of diabetes in pregnancy

1. Pre-existing insulin dependent diabetes (Type 1)
2. Pre-exisitng Type 2 diabetes (diet or oral hypoglycaemic controlled). These tend to be older women, often multiparous and with raised BMI.
3. Gestational diabetes (pregnancy induced glucose intolerance in women who have an increased risk of Type 2 diabetes in later life.)
4. De-novo Type 1 or Type 2 diabetes arising co-incidentally with pregnancy (this may only be diagnosed when glucose levels fail to fall back to non-diabetic levels following delivery, although Type 1 diabetes arising in pregnancy often presents with keto-acidosis and is a medical emergency).

Diabetic patients are at increased risk of other complications in pregnancy including pregnancy induced hypertension and pre-eclampsia.

Good management of diabetes throughout pregnancy, delivery and postnatally is complex requires multi-disciplinary care from obstetricians, midwives, medical endocrinologists, anaesthetists and paediatricians.

Many patients with diabetes may experience a normal vaginal delivery but the incidence of caesarean section, both elective and emergency, is increased. Great care must be taken to manage blood glucose peri-operatively to avoid complications for mother and baby.

Pre-operative preparation

- Elective caesarean section for diabetic patients should be undertaken first thing in the morning if at all possible
- For women using insulin, short acting insulin should be taken with meals on the day before elective surgery but long acting insulin should be reduced the night before surgery.

- For women taking metformin, this medication can normally be taken up to and including the day prior to surgery.
- If blood glucose is <3.5 mmol/l prior to midnight on the eve of surgery, and the patient can swallow, correct hypoglycaemia by giving fast acting oral carbohydrates (sweet drinks, jelly babies etc.). Follow up with toast or biscuits.
- If the woman cannot swallow or co-operate use glucagon injection or 75 mls of 20% I.V. glucose.
- No metformin or insulin should be taken on the morning of elective surgery.

Management during surgery

- For patients under general anaesthesia, blood glucose should be monitored every 30 minutes. If under spinal anaesthesia, monitor blood glucose hourly. Good teamwork and excellent communication with anaesthetic colleagues is essential.
- If more than one meal is expected to be missed patients should be managed with a variable rate intra-venous insulin infusion (VRIII). (This is quite likely as patients will have usually missed breakfast prior to surgery and may not be ready to eat lunch afterwards).
- Also, if blood glucose is >8.0 mmol/l and/or blood ketones >0.6 mmol/l manage with a variable rate intravenous insulin infusion (VRIII).
- Ensure anti-emetic therapy is prescribed and given prophylactically to aid as rapid a resumption of normal diet as possible.

Variable rate intravenous insulin infusion preparation

- Great care must be taken in preparing this infusion.
- 50 units soluble insulin e.g. Actrapid is added to 49.5 mls Normal Saline.
- Use an infusion pump.
- Rate of infusion will vary according to blood sugar measurements, according to local guidelines.
- Choice of accompanying fluid infusion will vary according to local availability. Ideally use a solution containing a combination of 0.45% Saline and 5% dextrose if available, but choice may be limited by availability.
- Watch potassium levels and add supplementary potassium if serum level is below the normal range.

Post-operative care

- For insulin dependent diabetic patients, convert back to sub-cutaneous insulin at pre-pregnancy levels when the patient is able to eat and drink and has managed at least one meal. Ideally the transfer should take place at a mealtime.
- Ensure background insulin has been given and wait at least 30 minutes before withdrawl of VRIII to avoid rebound hyperglycaemia. (Surgery induces neuro-endocrine stress and this results in an increase in insulin resistance that may lead to hyperglycaemia).
- If the patient cannot tolerate a full normal diet, insulin levels should be reduced to take this into account.

- Check blood glucose one hour after discontinuing the VRIII and a minimum of four times over the first 24 hours following surgery, prior to meals and at bedtime.
- Aim for blood sugar levels in the awake post-operative patient of between 4-12 mmol/litre on the first day.
- If on oral hypoglycaemics prior to pregnancy, commence medication once able to eat and drink. Recommence the usual pre-pregnancy therapy when a meal is due and stop VRIII 30 minutes after treatment and meal.
- Most women with gestational diabetes should experience a return to normal blood sugars within 24-36 hours after delivery and all therapy can cease immediately following delivery.
- Patients with post-operative complications such as paralytic ileus will require prolonged therapy with VRIII and close monitoring by the multidisciplinary team is essential for safe management.
- **Note** Beware rare cases of co-incidental new onset diabetes with pregnancy. These cases may be confused with gestational diabetes but they will not experience reversion to normo-glycaemia after delivery. Manage in close collaboration with a medical endocrinologist.

All maternity departments should have guidelines for the management of diabetic pregnant and postnatal patients readily available.

Reference

Joint British Diabetes Societies for Inpatient Care. (2016). Management of adults with diabetes undergoing surgery and elective procedures: Improving standards. Available at: http://www.diabetes.org.uk/resources-s3/2017-09/Surgical guideline 2015 - summary FINAL amended Mar 2016.pdf

3.8 Immediate post-operative care

Key learning points

- Care given during the immediate post-operative period is crucial to an uncomplicated recovery
- Pay attention to danger signs and early warnings
- Be available to return to the patient
- If indicated, be prepared to return to theatre without delay

Immediate post-operative care begins when the skin incision is closed and surgery is complete. The care delivered to the patient at this time is crucial to a safe recovery with minimal complications. The surgeon, anaesthetist and other staff must be available to attend to the patient rapidly in cases where observations and signs deviate from the normal.

Care commences whilst the patient is still on the operating table and involves the following:

- Safely moving the patient from the theatre table onto a bed or trolley.
- Waking the patient (if a general anaesthetic was administered for surgery).
- Completing the final part of the WHO Safe Surgical Checklist.
- Providing care for the mother and baby in the recovery area
- Enabling skin to skin contact.
- Providing support for the early initiation of breast feeding.
- Observations of mother and baby and recognition of danger signs.
- Acting on any abnormal observations and/or danger signs.

Once a caesarean is completed, apply a sterile dressing to the wound. The area surrounding the wound should be cleaned but do not clean right over the wound itself as doing so would increase the risk of wound infection.

Before moving the patient off the operating table

- Ensure the woman is in a stable condition.
- Check that the uterus is well contracted, and rub up a contraction if it is not. Administer further utero-tonics as necessary.
- Check the vagina for blood clots and remove any present by wiping the vagina out with a swab folded over a set of sponge forceps.
- If fresh bleeding is continuing do not move the patient. If the loss is heavy further action will be required. If ensuring good uterine tone does not solve the problem, consider re-opening the patient's abdomen to find the cause.
- Check and account for all swabs, instruments and needles used.
- Estimate and document blood loss in agreement with the other theatre team members.
- Ensure antibiotic prophylaxis has been given.
- Ensure analgesia has been prescribed.
- Record the procedure in the theatre log and write up operating records.
- Ensure there is a label on the baby documenting who the baby's mother is.
- Ensure the final part of the WHO safe surgical checklist is complete.

When moving the woman to a bed or trolley, ensure that she is clean and dry

- Roll the woman to one side.
- Roll the dirty sheet close to her.
- Roll her the in the other direction, over the rolled-up sheet and then remove the dirty sheet.
- Clean the woman whilst on her side.
- Roll her into a supine position and sit her up or leave lying on her side if recovering from a general anaesthetic.
- Ensure she is covered to protect her privacy and dignity before opening the theatre doors.

Note All staff are jointly responsible for ensuring this is done, the surgeon included.

Manual handling

- When moving a patient ensure safe manual handling techniques are used. If possible, use a patient slide, rather than lifting the patient.
- When moving the patient off the theatre table onto a trolley or bed ensure the table is marginally higher than the bed to avoid lifting the patient upwards.
- Ensure the brakes are on the theatre table and the trolley or bed before you commence moving the patient.
- Warn the patient before you move her and tell her what to expect. Ask her to fold her arms across her chest.
- Ensure I.V lines, bladder catheters etc. are detached from stands, closed off and placed on the patient during the move.
- Take particular care in the post-spinal patient as they will not yet be able to move or feel their legs.
- A lead practitioner (usually the anaesthetist) is responsible for ensuring all of the team work in harmony to move the patient together and everyone is ready.

Once in the recovery area ensure the patient is provided with a private environment and support is provided to enable skin to skin contact and initiate breast-feeding. Aim to initiate breast-feeding within the first hour following surgery.

Arrange for a support person of the patient's choice to be present. This may be a relative or friend. Ensure that the privacy of any other patients in the recovery area is also protected.

Observations in the post-operative period

Use of an Early Warning Chart is strongly recommended.

Follow local protocols regarding frequency of observations.

NICE UK suggests taking observations every 30 minutes for the first two hours and hourly thereafter for 12 hours (NICE Caesarean section pathway 2017) but protocols vary according to local circumstances.

Vital signs:

- Respiratory rate, use pulse oximeter if available for oxygen saturations
- Pulse
- Blood pressure
- Conscious level

In addition, make regular checks of the wound for leakage around the dressing, fundal height, vaginal bleeding and urine drainage.

Initiate a pain scoring system.

Be alert for danger signs in the immediate post-operative period.

Note The most common problems arising in this period are respiratory problems or haemorrhage, unless the mother demonstrated signs of sepsis pre-operatively.

Beware of concealed haemorrhage. If the uterus becomes atonic, a large quantity of blood can be concealed within the cavity and loss will accumulate until a contraction is rubbed up. Equally, loss may be concealed within the peritoneal cavity. If the woman's vital signs are suggestive of haemorrhage, do not be deceived by a lack of revealed loss. One of the most common factors associated with haemorrhagic death in the post-operative period is failure to recognise warning signs and take timely action. In particular, delay in returning to theatre has been found to be a factor (Fawcus et al 2016).

Any woman who has not yet regained a fully conscious status and can talk following general anaesthesia requires one to one care, with particular attention paid to airway management.

Danger signs in the mother

- Fresh vaginal bleeding in excess of normal lochia
- Severe pain
- Abdominal distension
- Early warning score of 2 or more
- Cyanosis
- Difficulty breathing, wheezing or gasping

Danger signs in the baby

- Breathing difficulties
    - Rapid breathing (>60 breaths per minute)
    - Intercostal recession
    - Nasal flaring
    - Grunting
- Cyanosis, pallor or mottling of the skin
- Hypothermia (temperature <36C)
- Baby floppy with poor tone
- Convulsions (unlikely to occur this early)

Care of the mother in the recovery area

- Ensure good communications with the mother. If her baby has been taken to the special care baby unit, ensure that she understands the reasons why and provide her with frequent updates regarding the condition of the baby.
- Make sure she has had adequate pain relief and she is warm and comfortable.
- Position her safely, depending upon her conscious level. If she is drowsy, place her in the recovery position.
- Protect her pressure areas as she will not be able to move until a spinal anaesthetic has worn off.
- Support the mother in breast feeding and skin to skin contact with the baby.
- Monitor any intravenous lines carefully and run according to the prescribed rate.

Care of the baby in the recovery area

- Be alert for any newborn danger signs.
- Conduct a head to toe examination to check for any congenital abnormalities.
- Ensure the baby is kept warm.
- After delivery by caesarean section, especially in cases where the membranes were intact up until the point of delivery, there is a risk that the baby may develop transient tachypnoea of the newborn (TTN). This occurs when the newborn lungs contain residual amniotic fluid and need further time to dry out. A baby suffering from TTN will display signs of respiratory distress with rapid breathing, grunting, intercostal indrawing and nasal flaring. Treatment involves giving the baby oxygen either in a head box in a cot or incubator, or via nasal prongs, until the condition resolves. It is important to reassure parents that the condition is self-limiting and the baby is expected to make a rapid and complete recovery.
- Ensure any treatment required has been administered, e.g. Vitamin K injection (1 mg) i.m.

References

Fawcus, S. et al. (2016). Maternal deaths from bleeding associated with caesarean delivery: a national emergency. *S Afr Med J,* 106(5), pp.472-476.

NICE. (2017). Caesarean Section Pathway. Available at: https://pathways.nice.org.uk/pathways/caesarean-section

3.9 Early Warning Scoring

Key learning points

- Early warning scores are an objective means of patient assessment
- Early warning scores enable the detection of deterioration at an early stage
- It is more successful (and easier) to treat the deteriorating patient at an earlier stage in the process

Although in some maternity situations a patient may change suddenly from being completely well to severely ill, it is much more common that a gradual deterioration occurs.

It follows that correct observation of patients will detect early changes which herald the development of significant illness. It is always easier to treat a patient who is less sick compared to one who has already deteriorated and in whom serious complications are manifest. For example, in the treatment of haemorrhage, treatment becomes much more complex and less likely to succeed if the haemorrhage has progressed to the point that clotting problems (DIC) have developed.

Early warning scores may be applied to observations of both ante and post-natal patients in addition to patients in labour, including post-operative cases.

Early warning scores are a composite of scores awarded to each of several observations including pulse, systolic and diastolic blood pressure, respiratory rate, temperature, conscious level and urine output. (If hourly urine output is not being measured, it may be excluded from the score.)

Each observation has a score attached to it for a range of readings (see Figure 3.9.1). The lowest score, 0, relates to an observation that is normal. A patient with a composite score of 0 or 1 is in a satisfactory condition. A score of 2 or 3 should attract a repeat observation within 30 minutes and more than 3 should merit review by a medical officer who will need to consider the cause for the raised score and make an action plan. The nurse / midwife or ANM taking the observation may also interpret the cause and take appropriate action within the limits of their competence. For example, if the score of a post-caesarean patient is rising because of blood loss which is thought to be due to an atonic uterus then the midwife or ANM should not simply wait for the medical staff but should act to rub up a contraction and administer an oxytocic, reducing the delay in treating the patient and also reducing the morbidity.

Early warning scores are very useful in monitoring the progress of a patient following an intervention or treatment. A patient who has been correctly diagnosed and adequately treated will demonstrate a sustained improvement in score. Remember, the lower the score, the better the patient is! On the other hand, if a patient is in need of further intervention then the score will not settle and may become higher.

Early warning scores provide a simple to understand and uniform means of escalating a patient's care appropriately and avoids patients being missed and allowed to deteriorate until it becomes too late.

Modified Early Obstetric Warning Score (MEOWS)

Ward/Specialty ……

Name …… Age ……

Brief Medical History ……

If score 0 or 1, repeat obs 12 hourly
If score 2, repeat in 30 minutes
If score 3 or more, call DR/CO

Date	Time	RR	Score	Pulse	Score	Syst BP	Score	Dias BP	Score	Temp	Score	Cons Level	Score	Urine	Score	Total Score	Sign

Score	3	2	1	0	1	2	3
RR		<8		8-18	19-25	26-30	>30
Pulse		<40	40-50	51-100	101-110	111-129	>129
Syst BP	<70	71-80	81-100	101-159	160-200	>200	
Dias BP				<95	95-104	≥105	

Score	3	2	1	0	1	2	3
Temp	<34	34-34.9	35-35.9	36-37.7	37.8-38.5	>38.5	
Conscious Level	Un-res-ponsive	Respond to pain	Respond to voice	Alert	Irritated		
Urine (ml.hr)	0	<20	<30	≥30			

Figure 3.9.1: Example of a MEOWS chart

Example

A 28 weeks pregnant patient is admitted with a five-day history of vaginal fluid leakage. She is hot to touch and is shivering. She is put to bed and an intravenous canula started, running slowly.

The ward is busy and it is 12 hours before the patient is seen again. She is found with a BP of 70/50, a pulse of 140/minute and a respiratory rate of 30/minute. Her temperature is 39.5C and her conscious level is P. Her Early Warning Score is 11. Antibiotics are commenced but the patient deteriorates and dies within the next 6 hours.

Now imagine the same patient. She is admitted and assessed using ABCD. Her airway is open. Her breathing is rapid at 20/minute so she is treated with face mask high flow oxygen. Her circulation demonstrates a blood pressure of 110/70 and her pulse is 125/minute. An intravenous infusion is commenced and a second line also established. Her temperature is 39C and her conscious level is A. Her Early Warning Score is 5.

The doctor is called who correctly diagnoses chorio-amnionitis secondary to prolonged membrane rupture. An ultrasound scan is performed which diagnoses an intra-uterine fetal death. The patient is treated with broad spectrum intravenous antibiotics and labour is induced with misoprostol, resulting in the delivery of a stillborn infant, together with the placenta and membranes. The patient makes a good recovery.

This case demonstrates how Early Warning Scores are used to alert staff to a patient who is septic. By acting on the Early Warning Score, septic shock and death are prevented.

References

Carle, C., Alexander, P., Columb, M. and Johal, J. (2013). Design and internal validation of an obstetric early warning score: secondary analysis of the Intensive Care National Audit and Research Centre Case Mix Programme database. Anaesthesia, 68, pp.354-367

Friedman A. (2015). Maternal Early Warning Systems. Obstet Gynecol Clin N Am, 42, pp.289-298

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3.10 Maternal danger signs

Key learning points

- Never ignore danger signs
- Always do ABC then secondary survey
- Use Early Warning Charts and act on them
- Early action is easier and saves lives
- Treat specific causes of danger signs

Always be alert for danger signs in the post-operative patient and be ready to take rapid action. Danger signs are exactly that, signs that the women's life is potentially in danger!

What are danger signs?

- Severe headache
- Early warning score (EWS) >/=2
- Lochia heavy with clots or foul smelling
- BP > 140/90
- Fever >/= 38C
- Difficulty breathing
- Unilateral swollen leg
- Abnormal behaviour, restlessness or agitation
- Severe pain
- Abdominal distension
- Pallor
- Altered conscious level

Elevated early warning score

Be particularly vigilant for danger signs. Early action results in lives saved in the postnatal period. If the Early warning score is 2, repeat in 30 minutes. If it is >2 perform a head to toe secondary survey and manage according to findings. Common causes of a raised EWS in the postnatal period are bleeding and sepsis. There will always be a reason for a high score so do not ignore and hope it will go away! Early action results in lives saved, and in the end, less work for staff too, as managing severely ill patients is very time consuming.

Headache

Severe headache may be a symptom of pre-eclampsia or impending eclampsia. Eclampsia may present for the first time in the postnatal period, even without prior evidence of pre-eclampsia.

Other causes of severe headache include infections, e.g. malaria, rare causes such as venous sinus thrombosis or post-dural puncture headache.

High blood pressure (BP >140/90)

Elevated blood pressure in the postpartum period is often due to pre-eclampsia and should be treated if persistent.

Heavy lochia with clots or foul-smelling lochia

Normal lochia has three phases:

- Lochia rubra with red loss and some small clots for 3-4 days. This first 24 hours is usually heaviest, and is generally heavier than the heavy days of menses.
- Lochia serosa with pink or brownish loss from 4-10 days
- Lochia alba with cream or yellowish loss from 10 to 28 days

Following caesarean section, lochia rubra may continue for a couple of days longer and be slightly heavier.

Normally loss becomes progressively less daily. If lochia has changed from red to pink or brown and then reverts to bright red this signifies a problem, possibly retained products or infection.

Normal lochia smells like menstrual blood. Any sign of foul-smelling loss is suggestive of infection.

Infected retained products are unusual following caesarean section, as the uterine cavity should have been checked prior to closure, but if the operator failed to do this then it is possible that some pieces of placenta and membranes may remain.

Endometritis is a more likely case and it has been reported to occur in between 5-15% of patients following caesarean, or higher still if the caesarean followed a period of prolonged membrane rupture. Early onset endometritis typically presents with a fever of >/= 38°C. WHO recommends treatment with a combination of clindamycin and gentamycin. If clindamycin is not available or is unaffordable then a penicillin can be used instead. Antibiotic therapy should continue until 24-48 hours after symptom resolution.

Fever

All cases of fever require thorough assessment. Always start with ABCD assessment followed by a head to toe secondary survey to identify the source of the infection, which may be obstetric or non-obstetric in origin.

Common sources of infection include:

- Chest infection
- Urinary tract infection
- Endometritis
- Wound infection

Difficulty breathing

There are several causes of dyspnoea following operative delivery, but dyspnoea is never normal and always requires investigation.

Common causes include:

- Pulmonary Embolism
- Lung disease, e.g. exacerbation of asthma (may be caused by treatment with Beta blockers or NSAIDS)
- Aspiration pneumonitis
- Pulmonary oedema
- Anaphylaxis
- Pneumonia
- Severe anaemia
- Cardiac disease, e.g. peripartum cardiomyopathy

Unilateral swollen leg

Deep vein thrombosis (DVT) occurs in approximately four women per thousand following caesarean section in UK. If undetected, it has the potential to be life threatening if a DVT embolises to the maternal lungs.

Clinical signs of a deep vein thrombosis include unilateral leg swelling, tenderness and redness. If the thrombosis is confined to the deep veins of the calf then the pain and swelling will be found there and the diameter of the calf will be greater than the other calf. If there is more than 2 cms difference at an equivalent point, thrombosis should be suspected. A pelvic vein thrombosis is more difficult to detect but may still present with unilateral leg swelling.

Risk factors for deep vein thrombosis include obesity (BMI >30), maternal age >35 years, a past history or a family history of deep vein thrombosis, sickle cell disease or thrombophilic tendencies, surgery and haemorrhage.

Sometimes, the first presentation of a thromboembolic event will be clinical signs of pulmonary embolism, with sudden onset of dyspnoea (shortness of breath), syncope and pleuritic chest pain. The signs will depend upon the extent of the blockage to the pulmonary arterial circulation.

Always maintain a high index of suspicion for venous thromboembolism in patients following caesarean section. Treatment is both supportive and therapeutic. If the patient is showing signs of dyspnoea or hypoxia, give oxygen. Depending upon availability, commence treatment as soon as possible with heparin (unfractionated or low molecular weight) followed by a therapeutic dose of warfarin. Treatment should continue for at least 3 months. In some settings, prophylaxis with low molecular weight heparin is provided to high-risk patients for at least a week post-operatively, following risk assessment. This has resulted in a reduction in lives lost to venous thromboembolism in at risk populations although many women who would never have developed a thromboembolism have received treatment, and this may not be cost effective, depending upon the inherent risk factors in the population in question.

Abnormal behaviour, restlessness or agitation

This may be due to post-partum psychosis, an exacerbation of known mental illness or cerebral hypoxia.

Sometimes patients with abnormal behaviour are dismissed as being a nuisance but it is likely that they are seriously ill and should be carefully assessed. In cases of cerebral hypoxia there will usually be accompanying abnormal vital signs.

Severe pain

As with lochia, post-operative pain should gradually diminish, and an increase in pain is likely to signify pathology.

Chest pain may be due to:

- Pulmonary embolism
- Myocardial infarction
- Aortic dissection

Abdominal pain may be due to:

- Paralytic ileus
- Acute colonic pseudo-obstruction (Ogalvie's syndrome)
- Haematoma (rectus sheath, broad ligament, vaginal or superficial)
- Peritonitis

Abdominal distension

Distension may be due to paralytic ileus, acute colonic pseudo-obstruction or rectus sheath haematoma.

Paralytic ileus is a condition where failure of bowel peristalsis occurs, as a complication of abdominal surgery. It is distressing for the patient but is usually self-limiting. Symptoms include pain, abdominal distension and absence of bowel sounds. The patient should be kept nil by mouth until the distension resolves, usually in 2 to 3 days. Sometimes a nasogastric tube is required if there is recurrent vomiting. Some reports suggest that chewing gum may help reduce the duration of the ileus.

Acute colonic pseudo-obstruction occurs when the proximal colon is distended, as a post-surgical complication. If the dilation of the colon reaches 10 cms (measured by abdominal X ray) there is a risk of bowel perforation and necrosis which carries a high mortality rate. If spontaneous resolution does not occur then treatment with neostigmine is often successful (although contra-indicated in cases of asthma or cardiac disease). Failing all else, surgical decompression via colonoscopy or by caecostomy at appendicectomy can be tried.

In cases of both paralytic ileus and colonic pseudo-obstruction it is important to manage electrolyte and fluid balance carefully.

Pallor

Severe pallor may be a sign of anaemia, shock or both. Manage by ABC and consider transfusion if haemoglobin concentration is below 8 g/dl. Search for a source of blood loss and treat.

Altered level of consciousness

Causes:

- Toxicity
- Hypo or hyperglycaemia
- Sepsis
- Haemorrhage
- Intra-cranial events, e.g. stroke, cerebral haemorrhage
- Eclampsia
- Epilepsy
- Vasovagal syncope

A patient who fails to respond to “shake and shout” by waking up and talking has an altered level of consciousness and is seriously ill. Assess whether the patient is responsive to pain or is completely unresponsive. Always complete ABCD and secondary survey. Check pupillary reaction to light and examine for localizing neurological signs. If in doubt as to the cause, CT scanning may be helpful, if available. Treatment will vary according to diagnosis but check quickly for easily remediable conditions such as hypoglycaemia.

Reference

WHO (2015). Recommendations for prevention and treatment of maternal peripartum infections. Geneva. World Health Organisation. Available at: http://apps.who.int/iris/bitstream/handle/10665/186171/9789241549363_eng.pdf?sequence=1

3.11 Safe Blood Transfusion

Key learning points

- Timely and adequate volume transfusions save lives
- Always check the details of the patient and the blood meticulously to ensure patient safety
- If a transfusion reaction is suspected, stop the transfusion and follow guidelines

Reasons for blood transfusion

- To improve oxygenation to the tissues by increasing the circulating red cell mass (total red cell mass contributes to oxygen transport capacity not the haemoglobin level).
- Transfusing red cells at a volume of 4ml/kg will typically lead to a rise in Haemoglobin (Hb) of 1g/dl (if the patient 70-80kg).

When to administer a transfusion

- Acute blood loss: when the blood loss exceeds **30%** of the patient's circulating blood volume
  - ≥ **1500ml** if the patient is > 50kg
  - > **1000ml** if the patient is < 50kg
- When the vital signs are deteriorating in an actively bleeding patient
- If Hb <7g/dl in an otherwise fit patient, who is not actively bleeding
- If Hb 8-9g/dl in a patient with cardiovascular disease

Maternal blood volume is 100mls/kg, so for example, a 50 kg woman has approximately5 litres of blood.

The blood flow to the uterus is 700 mls per minute. A pregnant woman can exsanguinate in less than 10 minutes.

Types of blood that should be given if the patient's blood group is known

- ABO and Rh group compatible blood **or**
- Cross-matched blood

Laboratory cross-matching

- Blood is cross-matched by mixing donor and patient blood together, to check they match without any reaction (it detects minor antigens in the patient's blood). Cross-matched blood is safer to transfuse than ABO compatible blood, especially if the patient has received previous blood transfusions.
- **Disadvantage:** cross-matched blood is more expensive and it takes longer to process the sample.

The importance of the Rhesus blood group

- The Rhesus (Rh) system is the second most important blood group system after ABO system, which includes the D antigen. Red cells that carry the D antigen are D positive.
- D positive patients can receive any D type blood.
- D negative patients should receive D negative blood.
- D negative patients can make Anti-D if they are exposed to D positive cells through transfusion or pregnancy.
- Avoid transfusing D negative females of child bearing potential with D positive cells if at all possible.
- If a **Rh-negative** patient has received Rh positive blood, then the patient will require a large dose of Anti-D immunoglobulin within 48 hours of the transfusion to reduce the risk of haemolytic disease of the newborn in future pregnancies. **Remember:** the dose of Anti-D depends on the number of units of blood the patient has received (therefore this can be expensive, so try to limit the amount of Rhesus positive blood the patient receives.

Types of blood that can be given if the patient's blood group is not known

O-negative blood: If available, as it is compatible with most patients.

O-positive blood: If no O-negative is available, then O-positive blood can be given as the second choice.

What blood type can be given to which patient?

Table 3.11.1: Blood compatibility chart

Blood type	Antigen on red blood cell	Can donate blood to	Antibodies in serum	Can receive blood from
A	A	A, AB	Anti-B	A, O
B	B	B, AB	Anti-A	B, O
AB	A & B	AB	None	AB, O
O	None	A, B, AB, O	Anti-A & Anti-B	O

Group O-negative blood should be available within 5 minutes.

Group ABO compatible blood should be available within 10-15 minutes.

Cross-matched blood should be available in approximately 45 minutes (but this may take hours or days if antibodies are found).

Types of blood products

- Packed red cells
- Fresh whole blood
- Platelets
- Fresh frozen plasma
- Cryoprecipitate

Packed red cells

- Packed red cells can be stored for 35 days at 2°C to 6°
- Concentrated red cells with no clotting factors, fibrinogen or platelets
- Packed red cells must be transfused within 4 hours of removal from cold storage
- Pack volume varies 220-300mls
- Leucocyte depleted
- Can be irradiated / CMV negative

Fresh whole blood

- Contains all the necessary clotting factors and platelets as well as RBC
- **Advantages**: Blood donations can be provided with minimal equipment and infrastructure in comparison to packed red cells. Blood is warm and available for immediate use. Where products with clotting factors are not otherwise available, fresh whole blood helps to correct coagulopathy.
- **Disadvantages:** There may be inadequate screening and cross-matching of the blood, increasing the risk of infection and a blood transfusion reaction. In an emergency a suitable donor may not be available.

Platelets

- Platelets can be stored for 5 days at 22°C on an agitator rack
- **Apheresis:** single donor
- **Pooled:** whole blood derived (4 donations)
- 1 pack should increase the platelet count by 20 x 10^9/litre
- Platelets should be at least 80 x 10^9/litre for spinal anaesthesia and epidural insertion, and above 50 x 10^9/litre for other invasive procedures e.g. insertion of a central line.
- Platelets play a primary role in haemostasis i.e. the prevention of bleeding. To be given during a massive blood transfusion, DIC, prophylactic platelet transfusion, on-going bleeding or platelet dysfunction disorders.
- **DO NOT** administer platelets through an administration set that has previously been used for red cells or other components as this may cause aggregation of the cells.

Fresh Frozen Plasma

- FFP can be stored for 2 years at - 25°C.
- Pack volume varies between 200-300mls.
- **Dose:** 12-15ml/kg.
- The ABO group of the FFP should be compatible with the recipient, as it's a relatively common cause of acute transfusion reaction. Cross-matching is not done for FFP.
- **Indications:** DIC, Thrombotic Thrombocytopenic Purpura (TTP), coagulation factor deficiency & abnormal bleeding.
- FFP should not be used in the management of hypovolaemia.

Cryoprecipitate

- It is prepared from FFP by slow thawing at 4-6°C.
- It is pooled from 5 donations and stored for 2 years at - 25°C.
- **Dose (adult):** 2-4 units.
- The ABO group of cryoprecipitate should be compatible with the recipient, as it's a relatively common cause of acute transfusion reaction. However, cross-matching is not done for cryoprecipitate.
- **Indications:** Used exclusively to increase fibrinogen levels in massive transfusions and DIC.

Giving blood and blood products

Giving sets to be used

- A giving set with a clot filter in it (170-200µm), in order to prevent clots and clumps of platelets/white blood cells that form during collection and storage of the blood products.
- **DO NOT** give calcium or calcium containing products through the same giving set or cannula as this will cause precipitation and therefore clotting.

Increasing the speed of transfusion

- Insert a large bore cannula, as doubling the diameter of the cannula increases the flow rate by **16 times.**
- Use two large bore cannulas (the biggest size cannula available in the hospital) if the patient is bleeding significantly, and is haemodynamically unstable.
- Use a pressure bag (**up to 300mmHg**, a pressure greater than this can cause haemolysis) or squeeze the bag manually.
- Place a three-way tap on the giving set and use a large syringe (20ml or 50ml) to give the blood to the patient.

Blood transfusion: Collecting blood for cross-matching for pre-transfusion

- Introduce yourself to the patient, stating your name and job role.
- Gain consent from the patient before performing the procedure.

Instructions for safely collecting blood for pre-transfusion testing

Step 1: Ask the patient to tell you their full name and date of birth. Check this information against the patient's wristband for accuracy. In some hospitals, wrist bands are not available. Ask the patient the questions then check the patient's identity against their medical records

Step 2: Check the following ID details on the patient's wristband or medical records:

- First name
- Last name
- Date of Birth
- Hospital number

Compare these against the patient's blood request form (if pre-printed/written).

Step 3:

- Take the blood sample and immediately after, handwrite the group and save tube.
- Label the sample tube with details from the patient's wristband or records.
- Then complete the blood request form with details from the patient's wristband or records.
- Check that the details on the sample tube and blood request form match before sending them to the Hospital Transfusion Laboratory (HTL).

Checking blood prior to administration

- Introduce yourself to the patient, stating your name and job role.
- Check that the patient has consented to receiving a blood transfusion.

Before collecting the blood from the blood bank you must

- Check the blood has been prescribed & ensure no special requirements are needed e.g. irradiated blood or that a diuretic isn't required post transfusion.
- Check adequate venous access has been established before requesting the blood products to be collected from cold storage.
- Ensure baseline observations have been done prior to commencing the blood transfusion e.g. temperature, HR, BP, RR.

Instructions for safely checking blood prior to starting a blood transfusion

Step 1: Before setting up the transfusion undertake a visual inspection of the blood product/bag e.g. check for discolouration, blood clots, leakages.

Step 2: Identifying the correct patient

In an **AWAKE** patient – ask the patient to tell you their name & date of birth, & check this against their identity wristband or records.

In an **ANAESTHESTISED** patient – check the patient identity wristband or accompanying records against their paperwork. Be very careful to ensure the records belong to the correct patient.

Step 3: Check the patient's details on the laboratory produced label attached to the unit of blood against the patient's wristband or records. This must be done together with the second midwife/nurse.

- Check the FIRST NAME is the same on both
- Check the LAST NAME is the same on both
- Check the HOSPTIAL NUMBER is the same on both
- Check the DATE OF BIRTH is the same on both

Step 4: Before commencing the blood transfusion, you must check the laboratory produced label attached to the unit of blood against the unit of blood. You must check:

- The donor component numbers are the same
- The blood groups are the same (e.g. A, B, AB, O)
- The Rhesus types are the same (e.g. positive or negative)
- The expiry date of the unit of blood
- If there are any special requirements, e.g. CMV negative

Step 5: Prime the giving set (with a mesh filter) with the blood for transfusion, not with other fluids e.g. Ringer's Lactate.

Transfusion reactions

The majority of serious blood transfusion reactions are apparent within 30 minutes of starting the transfusion. A blood transfusion reaction can be mild, moderate, or severe/life threatening.

Signs and symptoms of a blood transfusion reaction

- Fever, chills, rigors, myalgia, nausea
- Urticaria, rash, pruritus, flushing
- Angioedema
- Dyspnoea, stridor, wheeze, hypoxia
- Hypotension or hypertension, tachycardia
- Pain
- Severe anxiety or feeling or 'impending doom'
- Bleeding

Types of adverse blood transfusion reactions

- **Acute Transfusion Reactions:** are reactions that occurring at any time up to 24 hours after the transfusion of blood or blood products.
- **Delayed complications of Transfusion:** Complications of transfusion can occur days or weeks after transfusion.
- **Transfusion transmitted infections:** Hep A, B, C, E, HIV, Malaria, Bacteria, Prion, vCJD, HTLV1.

Acute transfusion reactions

1. Acute haemolytic reaction

ABO incompatibility is the most severe blood transfusion reaction there is e.g. if group B blood is given to a group O patient. Only a few mls of the wrong blood will trigger a massive immune response leading to shock and DIC (disseminated intravascular coagulation). Individuals may die from circulatory collapse, severe bleeding or renal failure, often within minutes or hours of receiving the incorrect blood.

Patients can present with the following signs and symptoms:

- Fever, chills, chest pain, flank pain
- Burning sensation at the site of the blood transfusion
- Dyspnoea, anxiety
- Tachycardia, hypotension
- Haemoglobinuria

Management: Discontinue the blood transfusion and replace the giving set immediately. Patients may require supportive care with:

- Fluid resuscitation
- The patient may need inotropes, respiratory and/or renal support in a high dependency or intensive care unit
- Blood component therapy for DIC with bleeding

2. Transfusion Related Acute Lung Injury (TRALI)

TRALI occurs due to a high titre antibody in donor plasma that reacts with the recipient neutrophils or HLA antigens. It can occur during or within 6 hours of a blood transfusion, and presents with the following signs and symptoms:

- Acute dyspnoea
- Hypoxia
- Fever
- Hypotension
- **CXR:** Pulmonary vascular congestion or pulmonary oedema

Management: Ensure the airway is patent and start high flow oxygen. The patient may require full ventilatory support in intensive care setting. **Do not** give diuretics to a patient with TRALI, as this will increase their morbidity and mortality, as they will already have a depleted intravascular volume.

3. Transfusion Associated Circulatory Overload (TACO)

TACO can occur when a large blood volume is transfused or if the blood is transfused to quickly in a patient with a compromised cardiovascular system.

TACO can develop during the transfusion or within 6 hours following the completion of the blood transfusion. The patient will present with some of the following symptoms:

- Dyspnoea
- Orthopnoea
- Tachycardia
- Hypertension
- Peripheral oedema
- CXR: may show cardiomegaly or pulmonary congestion

Management: Ensure the airway is patent, and start high flow oxygen. Left ventricular failure due to fluid overload, should be treated with loop diuretics.

4. Reaction to bacterial contamination of blood

When blood products contain bacteria that have grown to a high concentration. This is likely to cause a rapid onset of hypotension, rigors and cardiovascular collapse.

Management: Discontinue the blood transfusion and replace the giving set. If possible, take blood cultures from the patient, and then start of broad-spectrum antibiotics.

5. Allergic, urticarial reaction

This is a common acute transfusion reaction affecting 1-2% of patients receiving red cell components, but is even more common with FFP or platelet transfusions.

Management: Temporarily discontinue the blood transfusion. Administer antihistamines to the patient.

6. Anaphylaxis

Severe anaphylaxis is rare. However, if this does occur discontinue the transfusion of blood products instantly, and change the giving set.

Signs and symptoms of anaphylaxis:

- Airway: Swelling, hoarseness, stridor
- Breathing: rapid breathing, wheeze, fatigue, cyanosis, oxygen saturations <92%
- Circulation: cold, clammy, sever hypotension, tachycardia
- Disability: drowsy, confusion, coma

Emergency management:

- ABCDE
- Call for help immediately
- Lie the patient flat, and raise the patient's legs
- Give Adrenaline (this is what will save the patient's life!)
    - **You MUST administer IM Adrenaline immediately**
    - Adult dose = 500 micrograms / 0.5ml of 1:1,000 adrenaline
    - Repeat every 5 minutes, if the patient is no better.
- Give IV fluids: 500-1000ml Crystalloid

- Give Chlorphenamine 10mg IM or slow IV
- Give Hydrocortisone 200mg IM or slow IV

Remember: Monitor the patient throughout (HR, BP, oxygen saturations, $ETCO^2$ if available), as patients can have rapid experience cardiovascular collapse and then a cardiac arrest.

7. Hyperkalaemia

Beware of hyperkalaemia when transfusing large volumes of blood > 6 units.

Management: As per local protocols

8. Hypocalcaemia

Transfusion of stored red blood cells can lead to hypocalcaemia due to the addition of citrate to the stored blood.

Remember: hypocalcaemia can worsen coagulopathy

Management: Calcium Gluconate 10mg over 10 minutes IV

Management of a blood transfusion reaction

Initital steps

The management of a blood transfusion reaction will depend on the reaction is mild, moderate, or severe / life threatening. However, the initial steps should be the same regardless of the severity of the reaction:

- STOP the blood transfusion.
- Maintain IV access.
- Rapidly assess **ABCDE.**
- If the reaction is severe / life threatening call for help immediately.
- Check identification details between the patient, their wristband or records, and the compatibility blood component.
- Visually inspect the unit of blood looking for evidence of clumps, discolouration and the expiry date (this should have been done prior to starting the blood transfusion, but check again).
- Check the patient's observations (HR, BP, oxygen saturations and temperature).

Signs and symptoms of a mild acute transfusion reaction

- Temperature > 38C **and** a rise of 1-2C from baseline and / or
- Pruritus / rash but no other features

Signs and symptoms of a moderate acute transfusion reaction

- Temperature > 39C **or** a rise of > 2C from baseline and / or
- Systemic symptoms: chills, rigors, myalgia, nausea and vomiting, angioedema, dyspnoea

Signs and symptoms of a severe / life-threatening acute transfusion reaction

- **A**irway and / or **B**reathing and / or **C**irculatory problem

Management of a mild acute transfusion reaction

- Medical staff (doctor or senior nurse / midwife) should be informed of a mild acute transfusion reaction, but the transfusion may be continued with appropriate treatment and close observation.
- **STAY ALERT** a mild reaction may be the early stages of a severe / life-threatening reaction.
- Treat mild febrile reactions with Paracetamol (500mg – 1g in adults).
- Treat mild allergic reactions with antihistamine and slow the rate of the blood transfusion.

Management of a moderate acute transfusion reaction

- **Moderate febrile symptoms:** In most cases the transfusion will be discontinued. Only continue the transfusion after the patient has been assessed, and if the reaction is transient and the patient recovers with only symptomatic intervention and / or there is an alternative explanation for the patients sign and symptoms.
- **Moderate allergic symptoms:** May include angioedema and dyspnoea but are not severe enough to be deemed life-threatening. Consider administrating antihistamines and / or oxygen and / or salbutamol nebuliser.

Management of a severe / life-threatening acute transfusion reaction

- Call for help immediately.
- Disconnect the blood transfusion **immediately**, but do not discard the unit of blood.
- Maintain venous access with intravenous physiological saline or Ringer's Lactate.
- Monitor the patient e.g. HR, BP, oxygen saturations, temperature, and urinary output.
- Ensure the patients airway is patent, and if the patient is hypoxic give high flow oxygen via a mask with a reservoir.
- Inform Hospital Transfusion Laboratory (HTL) immediately (especially important if the patient received the wrong unit of blood – as this will prevent a further 'wrong blood' incident happening to another patient) and return the blood component and any other units of blood issued to the laboratory urgently.

Other potential hazards associated with blood transfusion

- Inappropriate & unnecessary blood transfusions
- Incorrect handling & storage of blood products
- Incorrect blood component being transfused

Monitoring a patient during a blood transfusion

- Patients should be nursed in an environment where they can be observed throughout the transfusion episode.
- Transfusion of each unit of blood must be completed within 4 hours of removal from the controlled storage.

- The early check is the most important set of observations, the majority of major adverse reactions occur within the first **15 minutes** after starting the blood transfusion.
- Prior to commencing a blood transfusion, you must do a set of observations on the patient: HR, BP, oxygen saturations and temperature.
- After the blood transfusion has been started then patient observations (HR, BP, oxygen saturations and temperature) must be taken:
    - **15 minutes** after the start of each unit and
    - on completion of each unit
- If the patient is haemodynamically unstable, unconscious or receiving a rapid blood transfusion then observations must be done more frequently.

Options for transfusion in malaria endemic areas

Some hospitals routinely give anti-malarials to transfusion recipients.

Some hospitals treat the donated blood units with anti-malarials, and discard any blood with high malarial parasite counts.

Module 4: Management of the Second Stage of Labour

4.1 Assisted Vaginal Delivery: decision-making

Key learning points

- All staff involved should be familiar with indications, contraindications, prerequisites for performing assisted vaginal deliveries
- Strict adherence to guidelines will reduce complications from assisted vaginal delivery
- Always assess descent of the fetal head by abdominal or bi-manual palpation

Classification of, indications and contraindications for Assisted Vaginal Delivery (AVD)

Less than 5% of deliveries in sub Saharan Africa are by instrumentally assisted vaginal delivery, the rates in the UK are 10-15% and about 4.5% in the USA. There is evidence of decreasing trend in AVD worldwide while caesarean sections are on the increase (Ameh and Adaji 2011; Ameh and Weeks, 2009).

Indications for assisted vaginal delivery (RCOG 2020)

Fetal

- Presumed fetal compromise

Maternal

- To shorten and reduce the effects of the second stage of labour on medical conditions (e.g. cardiac disease Class III or IV*, Marfan's disease with dilated aortic root, hypertensive crises, myasthenia gravis, spinal cord injury patients at risk of autonomic dysreflexia).

Inadequate progress

- Nulliparous women – lack of continuing progress for 3 hours (total of active and passive second-stage labour) with regional anaesthesia, or 2 active second stage hours without regional anaesthesia
- Multiparous women – lack of continuing progress for 2 hours (total of active and passive second-stage labour) with regional anaesthesia, or 1 hour active second stage without regional anaesthesia
- Maternal fatigue/exhaustion

Classification for assisted vaginal delivery

Classifying AVD is important for a standard classification system:

- Bench marking
- Audit and comparison between studies

The classification list below defines the delivery by station and position (RCOG 2020)

Outlet

- Fetal scalp visible without separating the labia.
- Fetal skull has reached the pelvic floor.
- Rotation does not exceed 45º.
- Fetal head is at or on the perineum.

Low

- Fetal skull is at station +2 but not on the perineum.
- Two subdivisions:
    - Non rotational of ≤45°.
    - Rotational >45°.

Mid

- The fetal head is no more than 1/5th palpable per abdomen.
- The leading point of the skull is at station 0 or +1.
- Two subdivisions:
    - Non rotational of ≤45°.
    - Rotational >45°.

High

- Not included in the classification as operative vaginal delivery is not recommended in this situation, where the head is 2/5th or more palpable abdominally and the presenting part is above the level of the ischial spines.

Preventing an assisted vaginal delivery

The following measures can be taken to prevent an operative vaginal delivery (RCOG 2020):

- All women should be encouraged to have continuous support during labour.
- Use of upright or lateral positions and avoiding analgesia can reduce the need for operative vaginal delivery.
- Delayed pushing in primiparous women with an epidural can reduce the need for rotational and mid-cavity delivery.

Contraindications to performing assisted vacuum delivery

- AVD with vacuum should be avoided at gestations less than 32 weeks + 0 days.
- AVD with vacuum should be used with caution at gestations between 34 weeks + 0 days and 36 weeks + 0 days.
- Macerated stillborn fetus
- When the indications and pre-requisites are not confirmed.

Trial of assisted delivery

- Trial of assisted delivery is indicated for operative vaginal births with a higher risk of failure and should be conducted in a place where caesarean section can be immediately conducted if the trial fails.
- Higher rate of failure is associated with:
    - Maternal body mass index over 35
    - Estimated fetal weight over 4000g or clinically big baby
    - Occipito-posterior or occipito-transverse position
    - Mid-cavity delivery or when 1/5th of the head palpable per abdomen. This is because the biparietal diameter is still above the level of the ischial spines.
- Fetal injuries have been associated to delay between failed AVD and a caesarean section.

Pre-requisites, consent and equipment

Prerequisites for assisted vaginal delivery (RCOG 2020)

- **Full abdominal and vaginal examination** (accurate assessment of descent may require bi-manual palpation).
- Head is ≤1/5th palpable per abdomen.
- Vertex presentation.
- Cervix is fully dilated, and the membranes ruptured.
- Exact position of the head can be determined so proper placement of the instrument can be achieved.
- Assessment of caput and moulding.
- Pelvis is deemed adequate. Irreducible moulding may indicate cephalo–pelvic disproportion.

Preparation of mother

- A clear explanation should be given, and informed consent obtained.
- Appropriate analgesia is in place for mid-cavity rotational deliveries. This will usually be a regional block.
- A pudendal block may be appropriate, particularly in the context of urgent delivery.
- Maternal bladder has been emptied recently. In-dwelling catheter should be removed, or balloon deflated.
- Aseptic technique.

Preparation of staff

- Operator must have the knowledge, experience and skill necessary.
- Adequate facilities are available (appropriate equipment, bed, lighting).
- Back-up plan in place in case of failure to deliver. When conducting mid-cavity deliveries, theatre staff should be immediately available to allow a caesarean section to be performed without delay (less than 30 minutes).
- A senior obstetrician competent in performing mid-cavity deliveries should be present if a junior trainee is performing the delivery.
- Anticipation of complications that may arise (e.g. shoulder dystocia, postpartum haemorrhage).
- There should be personnel present who are trained in neonatal resuscitation.

Consent is required for AVD

- The patient should be communicated with in clear and simple language about the progress of their labour, their condition and that of their baby and the options for delivery.
- For deliveries in the delivery room, if possible, a written consent is obtained but at least verbal consent should be obtained. This should subsequently be documented in the delivery notes.
- For a trial of assisted vaginal delivery in theatre, a written consent is required.

In some health systems, specific written information for women is provided (RCOG 2012).

Equipment for assisted vaginal delivery

There are various types of AVD equipment. The standard vacuum delivery equipment has the following parts:

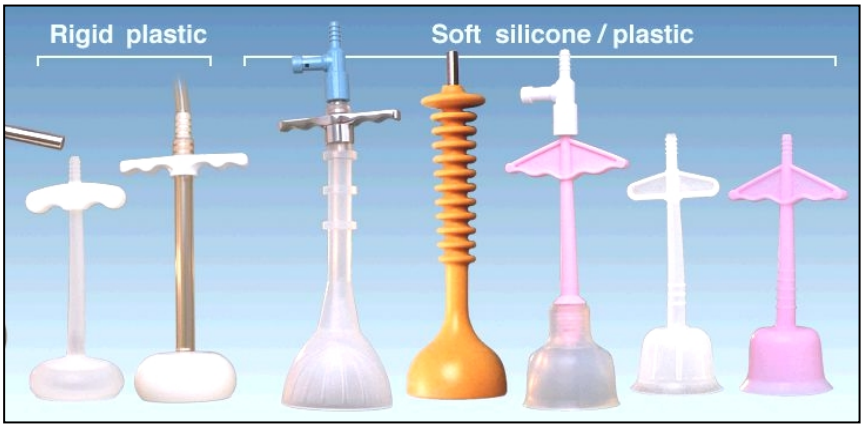

Figure 4.1.1: Various types of soft and rigid plastic cups, all with fixed right angle stems

- **Cup:** These are hard/rigid (metal or hard plastic) or soft cups (silicon or soft plastic) (Figure 4.1.1 and Figure 4.1.2). The centre of the cup attaches at the *flexion point* on the fetal scalp. Soft cups are associated with fewer cosmetic marks on the fetal scalp. The chignon (artificial caput succedaneum) formed in the cup on the fetal scalp when the vacuum is induced is the mechanism for attachment. The chignon rapidly decreases in size within an hour, to become a diffuse swelling like the normal caput, disappearing over a day or two. The hard / rigid cups

form a better chignon than soft cups. The soft cups are less effective than the rigid cups in achieving vaginal delivery and are more prone to pop offs.

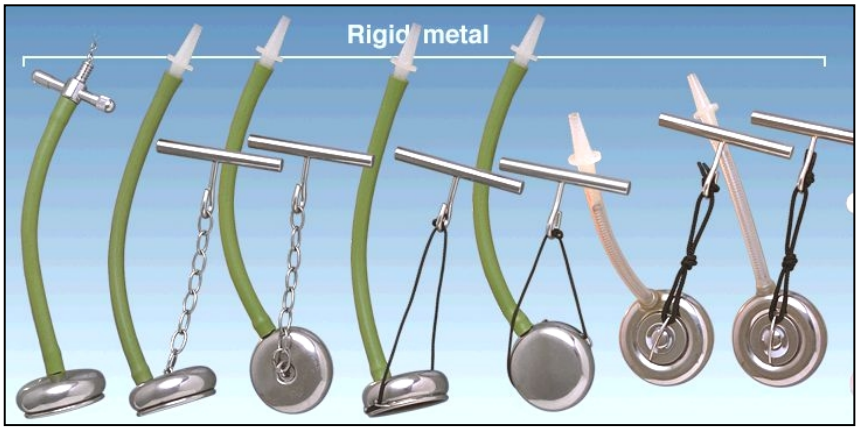

Figure 4.1.2: Metal cups with rigid stems, including Malmstrom and Bird Modification

- **Stem:** Flexible or Rigid. The flexible stem makes the cup easily manoeuvrable, so it can be placed easily in occipito-transverse and posterior positions without distortion of the anatomy of the vagina. For occipito-posterior deliveries with a rigid stem, use a posterior cup with the stem attachment to the edge of the cup. A centrally inserted rigid cup would prevent correct application in the occipito-posterior position.
- **Vacuum pump systems:** Pumps can manual (hand or foot) or electric. Depending on the design of the equipment, one or two operators may be required to operate it. The vacuum delivery equipment has a gauge, this guides the operator to achieve the maximum pressure require for a successful delivery (600mmHg/0.8bar/80kPa). This is equivalent to the border between the green and the red zone on the Kiwi Omni cup gauge (Vacca, 2009).

The clinician should choose the instrument most appropriate to the clinical circumstances and their level of skill.

Vacuum and forceps delivery are associated with different benefits and risks. Failed delivery is more likely with vacuum compared to forceps (see below).

The options for rotational deliveries include:

- Manual or digital rotation
- Direct traction or rotational forceps
- Rotational vacuum extraction

Vacuum extraction compared with forceps is: (O'Mahoney et al 2010)

- more likely to fail delivery with the selected instrument (OR 1.7; 95% CI 1.3–2.2)
- more likely to be associated with cephalohematoma (OR 2.4; 95% CI 1.7–3.4)
- more likely to be associated with retinal haemorrhage (OR 2.0; 95% CI 1.3–3.0)
- more likely to be associated with maternal worries about baby (OR 2.2; 95% CI 1.2–3.9)
- less likely to be associated with significant maternal perineal and vaginal trauma (OR 0.4; 95% CI 0.3–0.5)
- no more likely to be associated with delivery by caesarean section (OR 0.6; 95% CI 0.3–1.0)
- no more likely to be associated with low 5-minute Apgar scores (OR 1.7; 95% CI 1.0–2.8)no more likely to be associated with the need for phototherapy (OR 1.1; 95% CI 0.7–1.8).

4.2 Assisted vaginal delivery: Techniques

Key learning points

- Correct determination of the position of the fetal head is key to application of the cup over the Flexion point
- Always assess descent abdominally
- Always check that no vaginal tissue is trapped under the cup prior to commencing traction

It is very important to routinely determine the position and station of the presenting part and document this.

- Important to determine progress of labour
- to appreciate the mechanism of labour
- to ensure pre-requisite for conducting AVD are present

Terminologies used for positions: Left, right, anterior, posterior, lateral/transverse. Left/right is maternal left/right rather than operator left or right.

90% of cephalic presentations are occipito-anterior (OA), 10% are occipito-transverse or posterior and 50% of these will rotate to OA position

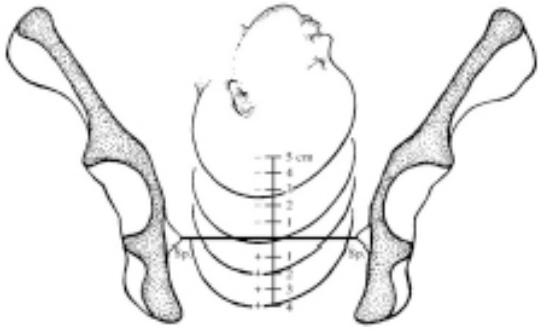

Figure 4.2.1: Illustration of position (vertex in the cephalic presentation) as it relates to the ischial spines of the maternal pelvis

Position: DOA, LOA, ROA, ROT, LOT, DOT, ROP, LOP (D=Direct, L= Left, R=Right)

The position of the baby in relation to the presenting part of the mother's pelvis. It is expressed to the denominator which may be

- **Occiput in vertex**
- Sacrum in breech presentation
- Mentum (chin) in face presentation

Station refers to the descent of the denominator relative to the maternal ischial spines. It is the distance in centimeters above or below the ischial spines to the leading boney point of the presenting part. The decent may be determined via abdominal palpation Crichton's rule of Fifths) but this may be difficult in the presence of excessive abdominal fat, or tense maternal muscles due to pain. Decent can be determined vaginally as well but service caput may make this difficult in practice.

Station: -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5 cms. Mid cavity (0-+1), low cavity (+2 to +3), outlet (+4 to+5)

Procedure for assisted vacuum delivery

1. Ensure the equipment is in working order by testing on a gloved hand.
2. Explain the procedure and why you are recommending it to the patient and obtain informed consent. Explain that she has tried very hard to deliver her baby but that she now needs some help. Emphasise that it will be a joint effort and that you will be pulling as she pushes, but that it will still be essential for her to push when requested. Offer to show the patient the vacuum cup.
3. Position the patient in the lithotomy position but semi-recumbent. She should not be flat on her back.
4. Inflitrate the perineum with local anaesthetic. It is good practice to do this whether or not an episiotomy is planned. During assisted vaginal delivery the perineum stretches much more rapidly that during crowning in normal labour and this is very painful. It is kind and respectful to provide analgesia.
5. Warn the patient that cup insertion is likely to be painful but it will be very quick.
6. Hold the cup in the vertical axis to insert. Place two fingers of your free hand in the posterior fourchette and depress to make room for the cup insertion.
7. Try to avoid the cup scraping over the clitoris and urethral orifice as this would be very painful. Bruising to the urethral orifice may lead to a risk of urinary retention later.
8. Once the cup is within the vagina it should be orientated into a horizontal position ready for application to the flexion point.

Recognizing and preventing complications

Complications are associated with assisted operative vaginal delivery.

Maternal complications

- Vaginal tissue entrapment under the cup: Vagina and labia minora are at risk of being trapped beneath the cup when the fetal head is at the pelvic outlet (station +4/+5). Careful examination before applying traction to rule out any tissue entrapment is mandatory. This will be covered in the technique breakout sessions.
- Anal sphincter and ano-rectal injury are more common with forceps as compared to vacuum deliveries. See Chapter on OASIS for examination after delivery to rule out obstetric anal sphincter injuries.
- Sequential deliveries are more associated with both maternal and newborn complications. The risk of intra-ventricular haemorrhage is increased almost 3-fold (adjusted odds ratio of 2.22 (1.24-3.97)). The risk of intracranial haemorrhage, retinal haemorrhage and feeding difficulty is also greater (RCOG 2011).

- Risk factors associated with sphincter damage include the following
  - Nulliparity, large fetal size
  - Prolonged second stage of labour
  - Persistent occipito-posterior position
  - Episiotomy

Neonatal complications (Vacca, 2009, RCOG, 2011)

- Cosmetic scalp effects
  - chignon,
  - cup discoloration and
  - bruising
- Clinically non-significant injuries
  - retinal haemorrhage (1-29%)
  - blisters,
  - superficial scalp abrasions (2-10%)
  - cephalohaematoma (6-11%)
  - subcutaneous haematoma and mild jaundice (3-30%)
- Clinically significant injuries
  - extensive or deep scalp lacerations,
  - subgaleal (sub-aponeurotic) haemorrhage and severe fetal anaemia (<0.5%)
  - intracranial haemorrhage (<0.3%)
  - skull fracture (<0.1%)
- Indirect and coincidental effects
  - brachial plexus injury
  - fracture of clavicle associated with shoulder dystocia
  - neonatal respiratory depression in an infant with pre-existing signs of fetal compromise in utero

Table 4.2.1: Distinguishing chignon, cephalohaemotoma and subgaleal haemotoma

	Chignon	**Cephalohaematoma**	**Subgaleal haemotoma**
Neonatal effect	Cosmetic scalp effects	Non-clinically significant injury	Clinically significant effect, anaemia may be life-threatening
Relationship to periosteum	Above	Below	Above
Relationship to aponeurosis	Above	Below	Below
Crosses the suture lines	Yes	No	Yes
Gravity dependent	No	No	Yes
Neonatologist management	No	Yes	Yes

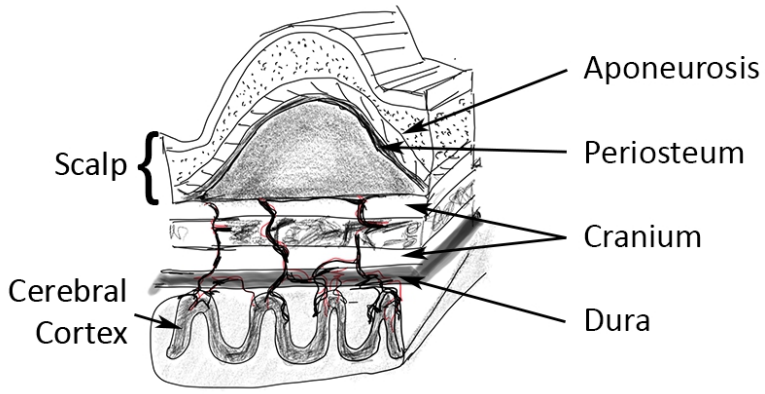

Figure 4.2.2: Cross-section of the newborn skull, illustrating cephalohaematoma

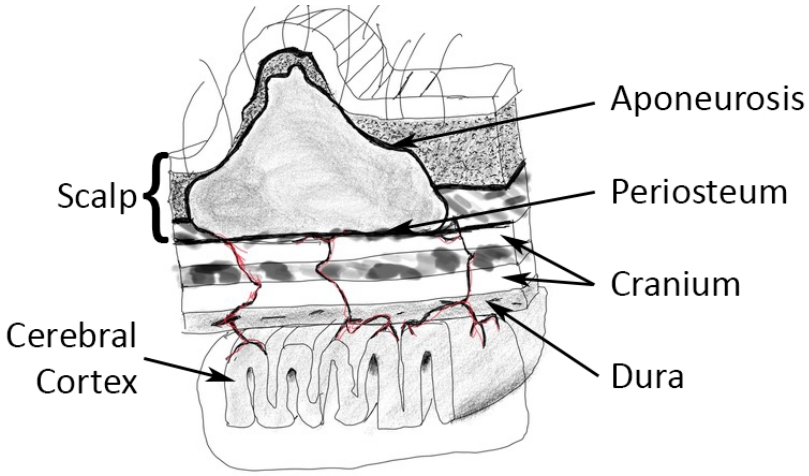

Figure 4.2.3: Cross-section of the newborn skull, illustrating subgaleal haematoma

Avoiding complications

Complications can be avoided by:

- Adequate training of clinicians, this affects the instrument of choice
- Adequate case selection based on good clinical examination, history and adherence to valid indications
- Discipline about when to stop trying

Likelihood of injuries are more when:

- Prolonged traction: Do not maintain traction between contractions, no need to reduce pressure between contractions
- Sudden cup detachment: Adequate placement of the non-pulling hand, providing counter traction, stopping and re-achieving optimal suction pressure if pressure loss is identified (gauge, hissing sound of air escaping between the cup and scalp and lifting of the cup from the scalp)
- Abrasions are unlikely to occur without cup detachment.

Flexion point, insertion distance determination and cup placement

You will need to identify the fetal position with certainty, identify the flexion pint: 3cm inform of the posterior fontanelle. The edge of the cup should be at the edge of the posterior fontanelle. The midpoint of the cup should be 3cm from the posterior fontanelle. (Figure 4.2.4).

Take note of the 6 and 11cm marks on the stem of the Kiwi Omni cup. Show participants how to measure the distance from the tip of their middle finger to the proximal interphalangeal joint (usually 5-6cm) and from the finger-tip to the meta-carpal-phalangeal joint (usually 10-11cm). Use a uterine sound or clear school ruler to do this (Figure 4.2.5)

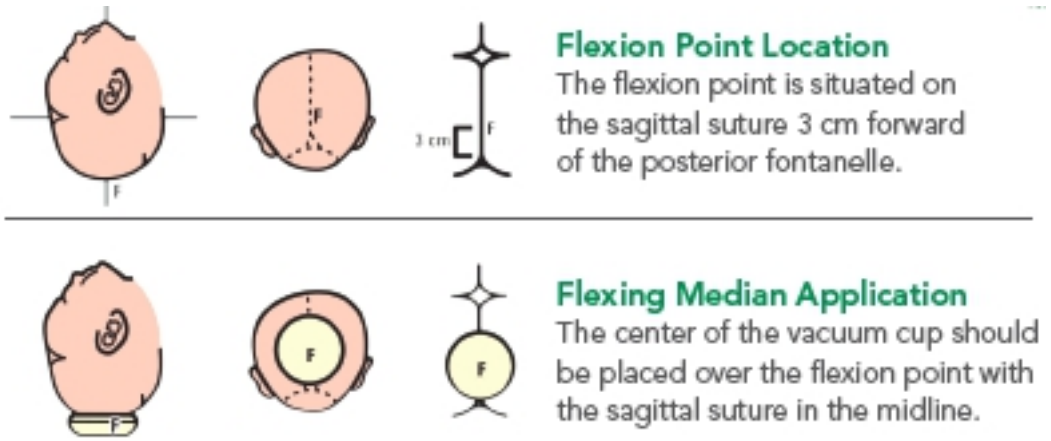

Figure 4.2.4: Flexion point location (Vacca A 2009)

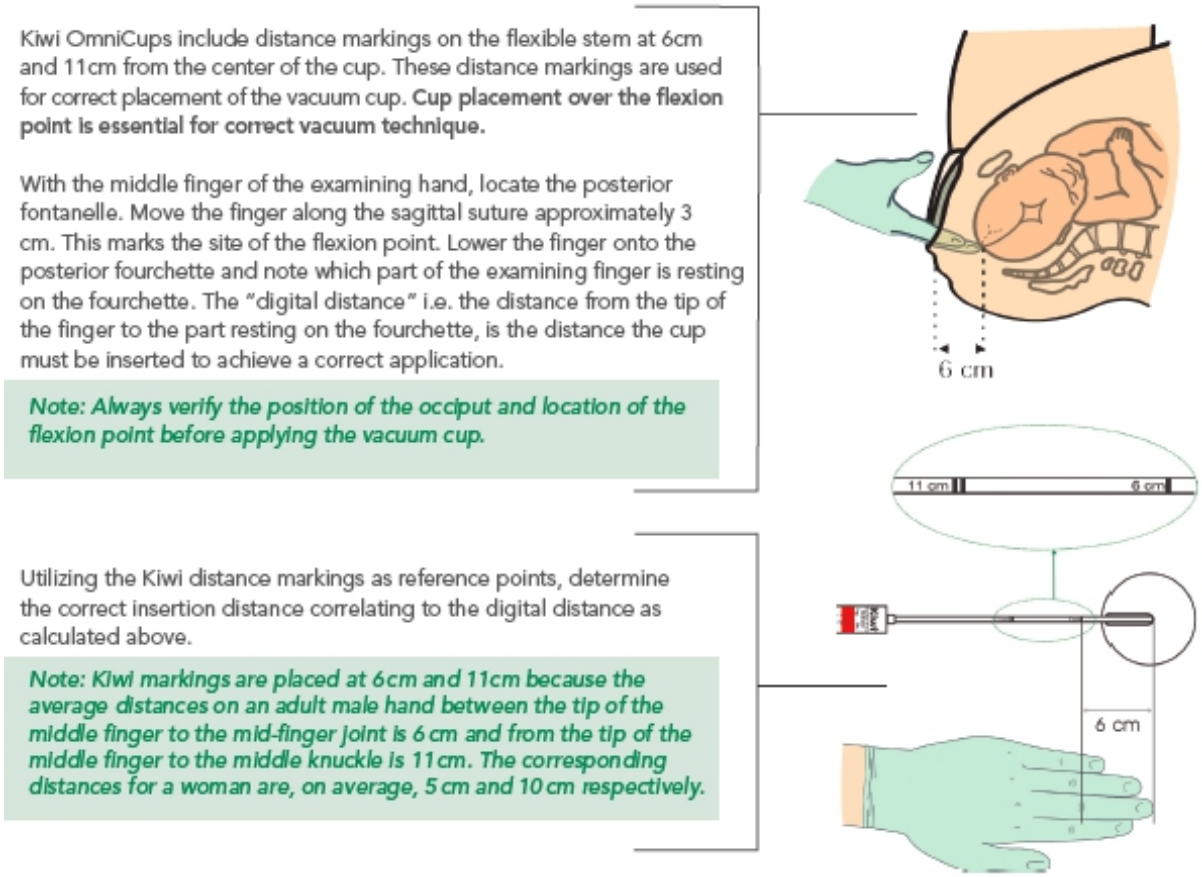

Figure 4.2.5: Determining the insertion distance (Vacca A, 2009)

Transverse and posterior positions

The flexion point tends to remain in the midline (Figure 4.2.6). Since the flexion point is located on the fetal head anterior to the posterior fontanelle, it will move through a much smaller arc in the birth canal than that of the posterior fontanelle and therefore will be situated closer to the midline of the mother's birth canal irrespective of position and attitude of the head. However, station, position, and attitude will alter the distance of the FP from the introitus. For practical purposes, therefore, the vacuum cup should be inserted the calculated insertion distance along the midline axis of the maternal pelvis without the need for significant lateral movement**.**

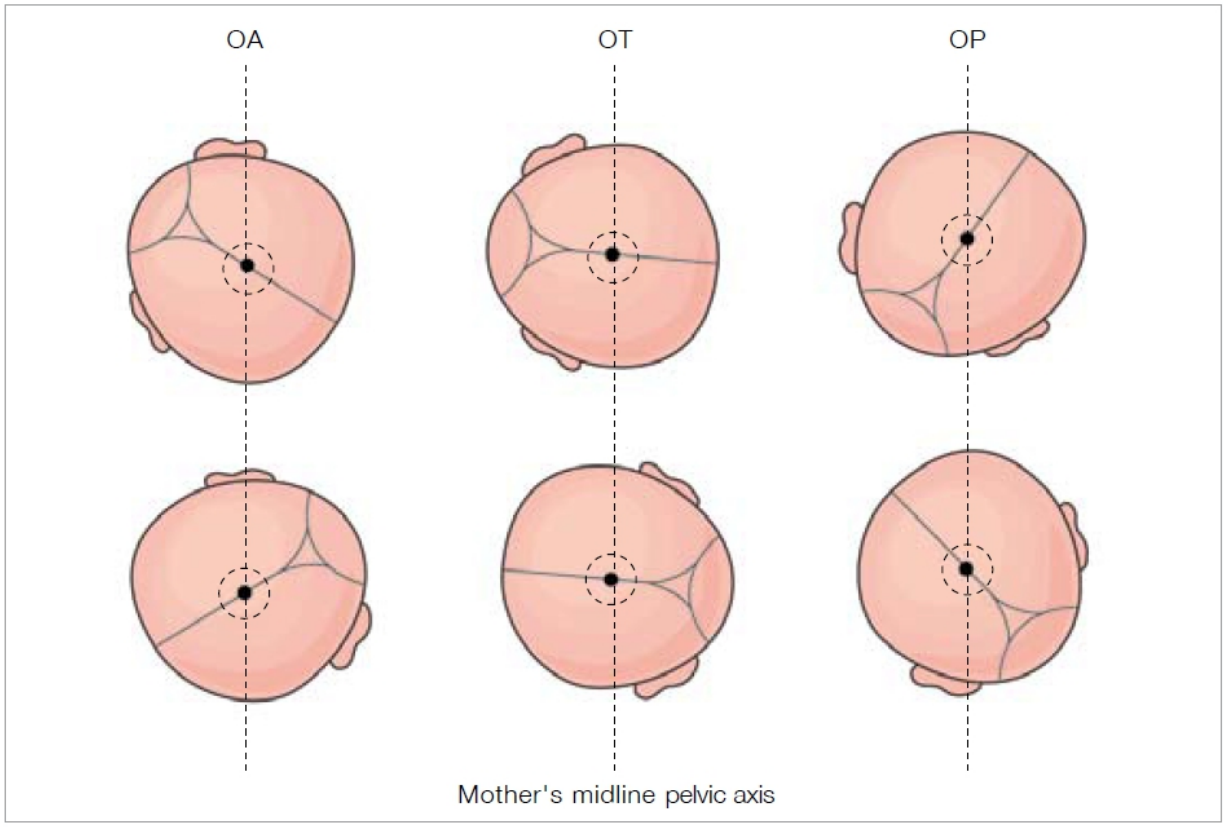

Figure 4.2.6: Tendency of the flexion point to remain in the midline irrespective of the position (Vacca A, 2003)

The non-pulling-hand and the direction of pull

You should only pull

- When you have achieved maximum pressure.
- The patient has a contraction and you have instructed her to push, reassuring her that you will assist her.
- Ruled out any tissue trapped between the cup and the baby's head.
- Position your non-pulling hand. The index finger of your non-pulling hand should be on the baby's head while your thumb should be on the cup. This non-pulling hand should provide counter traction. With the index finger you should appreciate descent as the head comes down the pelvis with each pull. With your thumb should lift if the cup is lifting off the scalp, in which case you will also hear a hissing sound and notice that you are losing pressure (look at the gauge). At this point you stop, re assess and reapply pressure. If all the rules are adhered to you should not have a pop off, with each pop off, the risk of neonatal complications increases.
- The direction of pull should always be at right angles to the cup and in the midline of the maternal pelvis.

- When you have the appropriate height of the delivery bed for the operator. This is important as it ensures that you 'get your angles right' and you do not pull at an acute angle or away from the midline of the maternal pelvis. To achieve this, you should alter the height of the bed, sit on a chair or go on one knee.

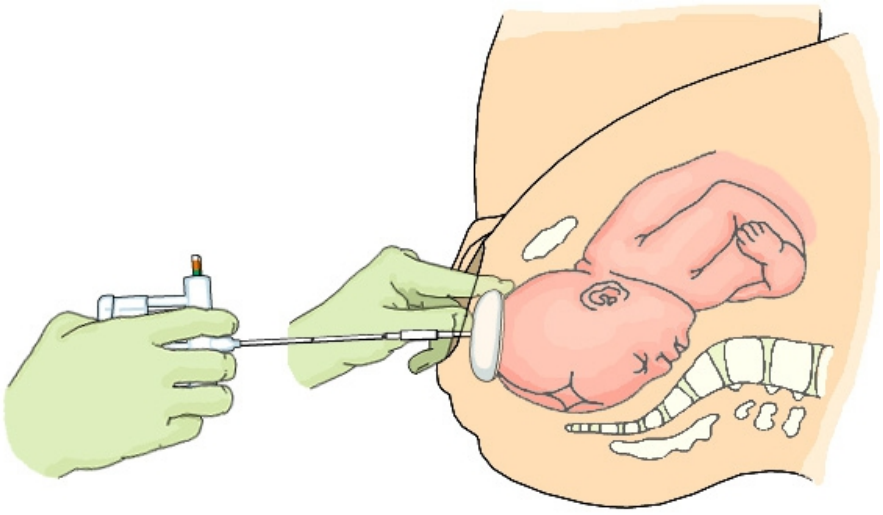

Figure 4.2.7: The non-pulling hand and the direction of pull

Other key points relevant to the correct technique

- Traction should be smooth, avoid jerky movements, rotating or side-to-side movement.
- There is no need to sustain pressure when a contraction is over.
- If more than one pull is carried out during a single contraction, it is recorded as one pull.
- Only about 11kg of traction force is required (Vacca, 2003).

Common causes of pop-offs

Preventable

- Misplaced cup, not on the flexion point
- Excessive traction (>25 lbs./11kgs)
- Inappropriate axis of traction
- Inadequate vacuum level (not at the top of the green, 600mmHg / 0.8kg/cm)
- Excess fluid pulled into system
- Insufficient maternal effort
- Faulty equipment

Not Preventable

- Severe caput/molding/oedema
- Excessive hair
- Large fetus (>4000gms)
- Primigravid patients

When to abandon the procedure

Assisted vacuum delivery should be abandoned:

- If there is no evidence of progressive descent with moderate traction during each contraction.
- If delivery is not imminent following three contractions of a correctly applied instrument by an experienced operator.
- If you reach the 15-minute total time limit.
- If the vacuum cup detaches ("pops-off") more than twice.

Note Beware of sequential deliveries (forceps following vacuum), this caries a significantly increased risk of intra cranial haemorrhage and asphyxia.

Advice for future deliveries

Women should be encouraged to aim for spontaneous vaginal delivery in subsequent pregnancies there is a high probability of success. The procedure itself doses increase the risk of a non-successful vaginal delivery.

Documentation and audit of practice

It is good practice to regularly audit operative vaginal deliveries. But the audit will only be meaningful if good records are kept of every procedure. An example of an assisted vaginal delivery record is provided at Figure 4.2.8

Audit should be carried out to improve practice of AVD as a unit and for the individual. It may also be useful in knowing were training should focus.

Some useful indicators to determine during an audit include the following;

- percentage of women with failed operative vaginal delivery
- rate of sequential instrument use
- case notes review to audit appropriate management of women with failed operative vaginal delivery
- sequential instrument use, i.e. when to use a sequential instrument and when to abandon
- percentage of women with third- and fourth-degree perineal tears
- rate of neonatal morbidity, composite trauma (subgaleal haemorrhage/brachial plexus injury/fracture/facial nerve palsy/cerebral haemorrhage), low Apgar <7 at 5 minutes and cord arterial pH <7.1
- documentation of written or verbal consent for operative vaginal delivery
- documentation of written consent for trial of operative vaginal delivery in operating theatre
- accuracy of documentation.

Reference

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ASSISTED VAGINAL BIRTH RECORD

Patient details: (addressograph)

Operator: Grade:
Supervisor: Grade:

Indication (s) for birth: .....

Classification of OVB: Outlet □ Low □ Mid-pelvic □ Rotation > 45^0 Yes □ No □

Classification of CTG: Normal □ Suspicious □ Pathological □ **Liquor**: Clear □ Meconium □ None seen □

Prerequisites:
Place of birth Labour Room □ Theatre □
Analgesia Local □ Pudendal □ Regional □
Consent Verbal □ Written □
Bladder emptied Yes □ No □

Examination
1/5ths per abdomen: 0 □ +1 □
Dilatation: Fully □
Position: OA□ LOA□ ROA□ OP□ LOP□ ROP□ LOT□ ROT□
Station: 0□ +1□ +2□ +3□
Caput: 0□ +□ ++□ +++□
Moulding: 0□ +□ ++□ +++□

Procedure
Instrument used (tick all)
Vacuum: Sialastic □ Kiwi □ Metal anterior □ Metal posterior □
Forceps: Rotational □ Non-rotational □ Outlet □

Number of pulls:

Traction: Gentle □ Moderate □ Strong □

Maternal effort: Sub-optimal □ Optimal □

Placenta: Physiological □ CCT □ Manual □

Episiotomy: Yes □ No □
Perineal tear: 1st degree □
2nd degree □
3rd / 4th degree □ *(complete proforma)*
Other □ *(complete proforma)*

Multiple instrument use Yes □ No □
Examination before second instrument
1/5ths per abdomen 0 □ +1 □
Position: OA□ LOA□ ROA□ OP□ LOP□ ROP□ LOT□ ROT□
Station: 0□ +1□ +2□ +3□
Caput: 0□ +□ ++□ +++□
Moulding: 0□ +□ ++□ +++□

Decision for second instrument:
.....
.....

Time of decision:
Time instrument applied:
Time second instrument applied:
Time of birth:

EBL.....

Baby: M □ F □ Birth weight..... (g) Apgar: 1....5.....10.... **Cord pH**: Arterial ..... Venous.....
Post-birth care: **Base excess:** Arterial ..... Venous.....
Level of Care Routine □ High Dependency □
Syntocinon infusion Y □ N □
Catheter Y □ N □ Remove.....
Vaginal Pack Y □ N □ Remove.....
Analgesia prescribed: Y □ N □ Diclofenac 100mg PR Y □ N □
Thromboembolic Risk: Low □ Medium □ High □ *(complete VTE assessment proforma)*
Thromboprophylaxis prescribed: Y □ N □

Additional details: (use additional operation note if needed)

Template to be adapted for local use

Signature:..... **Date:**.....

Figure 4.2.8: Assisted Vaginal Birth Record (RCOG 2020)

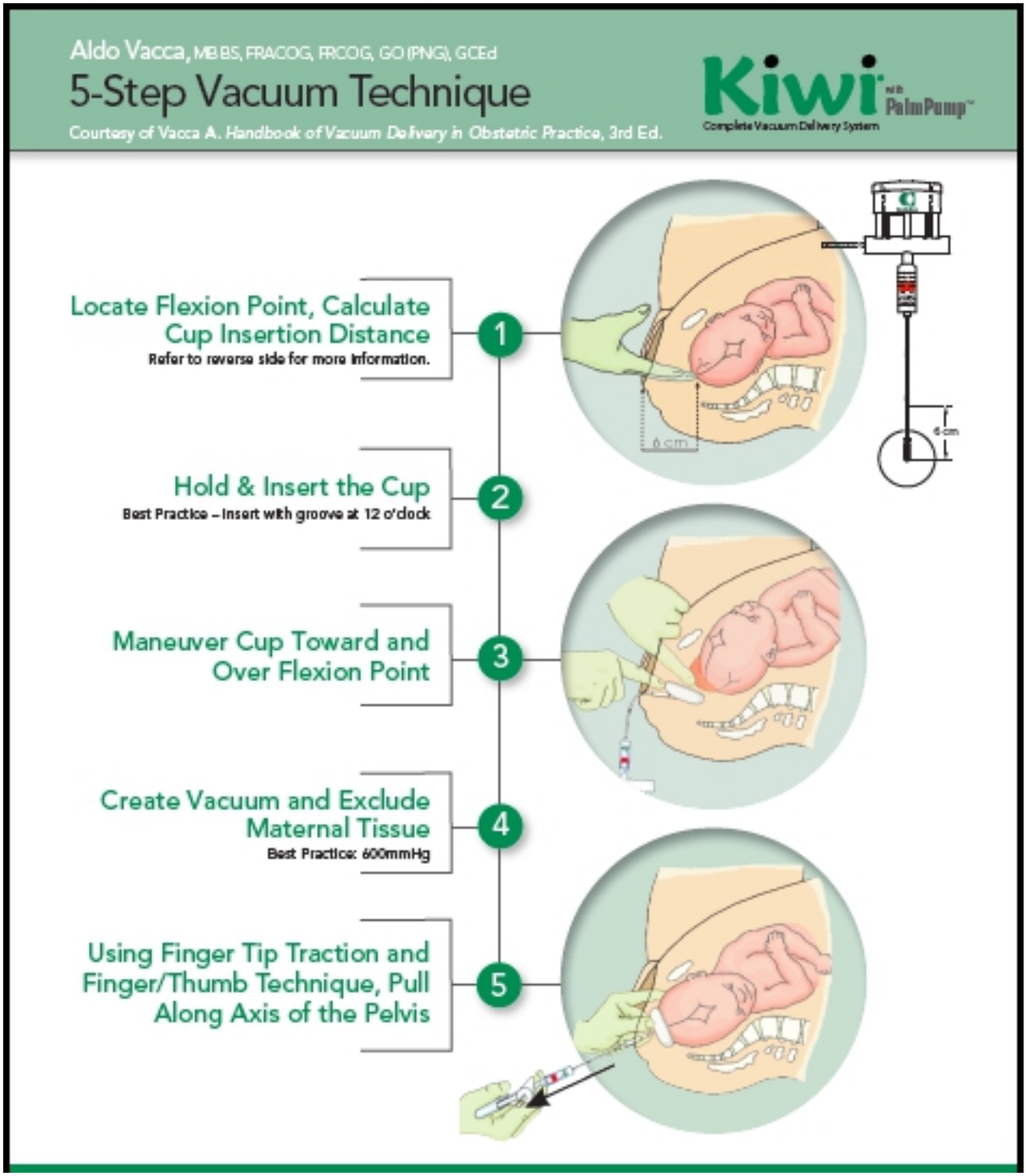


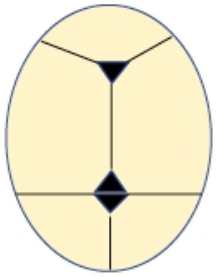
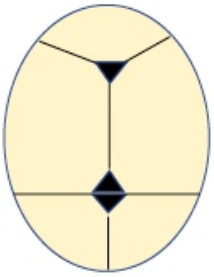
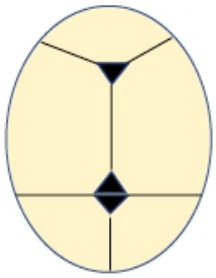
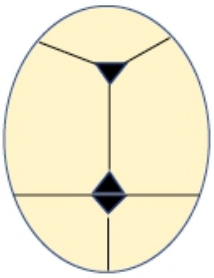
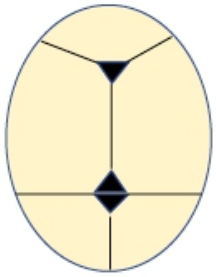
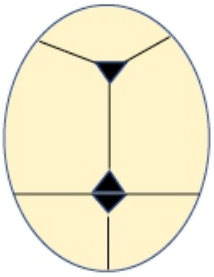
Figure 4.2.8: Sample assisted vaginal delivery record (RCOG 2011)

Figure 4.2.9: 5 step vacuum technique (Vacca A, 2003)

Self-assessment progression sheet:

Instruction: Please mark were the cup was placed after delivery of the head.

Participant initials_____ Date of training_____

Attempt number 1	**Attempt number 5**
	
Attempt number 2	**Attempt number 6**
	
Attempt number 3	**Attempt number 7**
	
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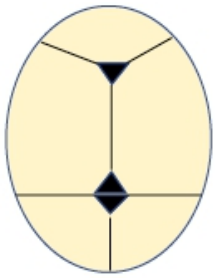
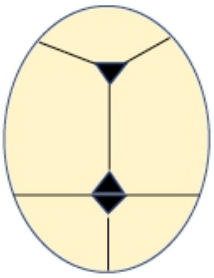
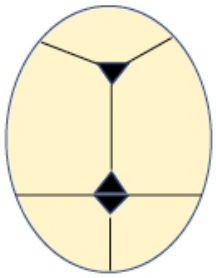
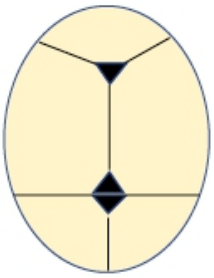
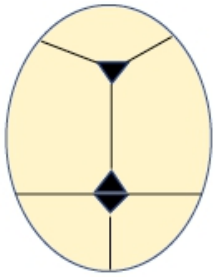
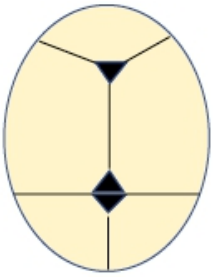
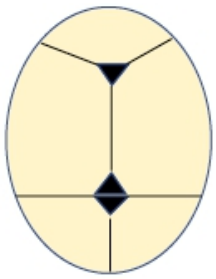
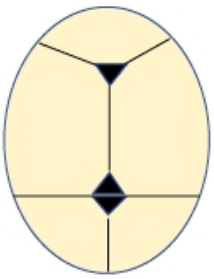
	
Self-assessment of progress	Satisfied Unsatisfied

Which of the 5 steps will you like improve on?

Attempt number 9	**Attempt number 12**
	
Attempt number 10	**Attempt number 13**
	
Attempt number 11	**Attempt number 14**
	
Overall self-assessment of progress	Satisfied Unsatisfied

Key take home messages:

1) _____

2) _____

3) _____

Any other comments: _____

4.3 Identification and repair of third and fourth degree tears (obstetric anal sphincter injuries)

Key learning points

- To understand the classification of perineal trauma and Obstetric Anal Sphincter Injuries (OASIS)
- To review the anatomy of the female perineum
- To appreciate risk factors for OASIS
- To consider risk mitigation strategies
- To learn to repair OASIS
- To provide appropriate after-care following OASIS repair

Third and fourth degree tears, known as Obstetric Anal Sphincter Injuries (OASIS) can occur at any vaginal delivery. If not detected and repaired these injuries result in anal incontinence (the involuntary loss of flatus and/or faeces) and a significant deterioration in the quality of life.

Classification of perineal injury

Table 4.3.1: Classification of perineal injury

Classification	Description
First-degree tear	Injury to perineal skin and/or vaginal mucosa
Second-degree tear	Injury to perineum involving perineal muscles but not involving the anal sphincter
Third-degree tear	Injury to perineum involving the anal sphincter complex
Grade 3A tear	Less than 50% of external anal sphincter (EAS) thickness torn
Grade 3B tear	More than 50% of EAS thickness torn
Grade 3C tear	Both EAS and internal anal sphincter (IAS) torn
Fourth-degree tear	Injury to perineum involving the anal sphincter complex (EAS and IAS) and anorectal mucosa

OASIS includes third and fourth degree tears.

It has been shown that women with grade 3B and 4 tears tend to have worse long-term outcomes as compared to those with 3A/B tears. They are more prone to developing faecal incontinence and an associated diminished quality of life (Roos et al 2010).

Incidence and Risk factors

The exact incidence of anal sphincter injury is not known and varies between institutions. Anal sphincter injuries are not always recognised and this results in under-reporting. In UK the reported incidence is 2.9% with an incidence of 6.1% in primiparous, as compared to 1.7% in multiparous women (Thiagamoorthy et al 2014).

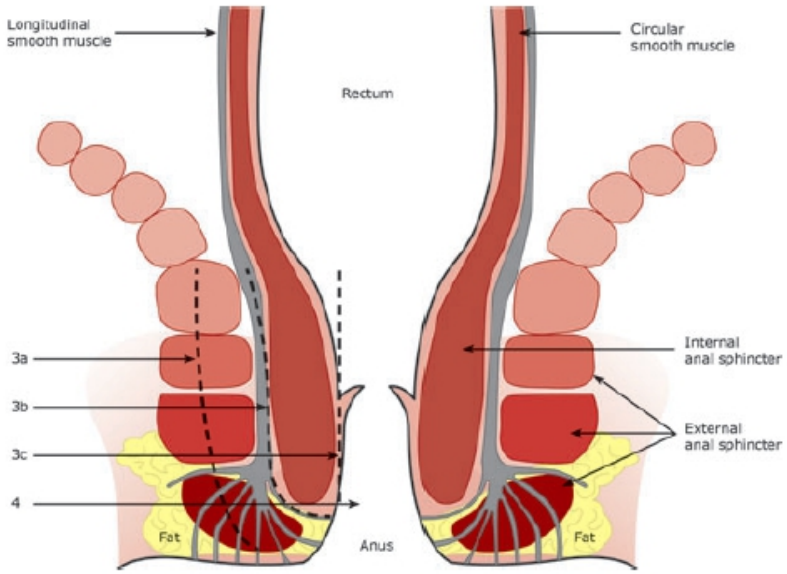


Figure 4.3.1: Schematic representation of OASIS classification (Lone et al 2012)

Although it cannot be predicted in advance which patients will sustain an OASIS, the following risk factors have been reported: (RCOG 2015)

- Asian ethnicity (OR 2.27, 95% CI 2.14–2.41)
- Nulliparity (relative risk [RR] 6.97, 95% CI 5.40–8.99)
- Birthweight greater than 4 kg (OR 2.27, 95% CI 2.18–2.36)
- Shoulder dystocia (OR 1.90, 95% CI 1.72–2.08)
- Occipito-posterior position (RR 2.44, 95% CI 2.07–2.89)
- Prolonged second stage of labour:
- Duration of second stage between 2 and 3 hours (RR 1.47, 95% CI 1.20–1.79)
- Duration of second stage between 3 and 4 hours (RR 1.79, 95% CI 1.43–2.22)
- Duration of second stage more than 4 hours (RR 2.02, 95% CI 1.62–2.51)
- Instrumental delivery:
- Ventouse (vacuum) delivery without episiotomy (OR 1.89, 95% CI 1.74–2.05)
- Ventouse (vacuum) delivery with episiotomy (OR 0.57, 95% CI 0.51–0.63)
- Forceps delivery without episiotomy (OR 6.53, 95% CI 5.57–7.64)
- Forceps delivery with episiotomy (OR 1.34, 95% CI 1.21–1.49)

It is clear from these figures that assisted vaginal delivery without episiotomy confers an added risk, especially forceps delivery. Even with an episiotomy, the risk with forceps delivery remains elevated, whereas the combination of a vacuum delivery together with an episiotomy is protective. Prolonged second stage of labour is associated with OASIS, and the longer the second stage, the greater the risk.

Reasons for inaccurate incidence of OASIS

- Under-reporting by patients due to embarrassment about symptoms
- Failure to diagnose OASIS
- Lack of disclosure by clinicians who fear being blamed for OASIS

Prevention

OASIS cannot be prevented entirely, but it is possible to reduce the risk of occurrence.

- Whilst routine episiotomy is not advocated, however, there is evidence that if an episiotomy is required, the cutting angle is important.
- Because the perineum stretches by 170% in the transverse direction and 40% in the vertical direction as the head crowns, there are significant differences between the episiotomy incision angles and the suture angles. Episiotomies incised at 6o ° result in suture angles between 43 - 50°, whereas those cut at 40° result in a suture angle of 22°. If the episiotomy angle is too acute (<30°) or too lateral (>60°) there will be an increased risk of OASIS (Kapoor et al 2015). It is important to bear the changes due to perineal stretching in mind when cutting an episiotomy, in order to minimise the risk of OASIS.
- Perineal support as the head crowns (hands on technique) has been found to be protective.
- If standing on the patient's right side, use your left hand to control delivery of the head.
- The right hand protects the perineum.
- The patient should not push actively as the head crowns.
- If the perineum is very tight or rigid, consider episiotomy as described above.
- Application of a warm compress to the perineum during the second stage of labour is also protective. The compress should be held on continuously during and between contractions to be effective (Aasheim et al 2011).

Identification of OASIS

- All patients with perineal trauma should be examined to exclude or diagnose OASIS.
- Explain to the women what you plan to do and why and obtain informed consent.
- Examination is best done with the patient in lithotomy if any doubt (the aim is that the women is comfortable whilst achieving good perineal exposure).
- Examine with good light and exposure, and perform visual inspection.
- Offer adequate analgesia.
- Place finger in anal canal and use thumb in the body of the tear. Use a pill-rolling action to determine thickness of tissue in area of anal sphincter. If the tissues are very thin an anal sphincter injury will have occurred.
- Remind participants to change gloves after anal/rectal examination.
- Be aware of the differences in appearance between the internal and external sphincters.
- Also check for button-hole lesions above the level of the anal sphincter complex.

Note Sometimes superficial tears to perineum may extend to the anal margin, this does not mean the anal sphincter is torn.

General principles of repair

- Informed consent
- Ideally in theatre
- Position in lithotomy
- Spinal anaesthesia
- Aseptic precautions
- Excellent light
- Good visualisation: Presence of an assistant or a self-retaining retractor
- A trained and experienced surgeon
- The right equipment
- Use the correct sutures
    - 3-0 polyglactin or locally available equivalent should be used for anorectal mucosa because it causes less irritation and discomfort compared to polydioxanone (PDS) or catgut sutures.
    - For repair of EAS/IAS, use monofilament sutures such as 3-0 PDS or modern braided sutures such as 2-0 polyglactin or equivalent.
    - Bury any knots beneath the superficial perineal muscles to minimize the risk of the knot and suture migration to the skin.

If repair under these conditions cannot be achieved immediately following birth it is preferable to wait and make appropriate arrangements rather than to attempt repair in sub-optimal circumstances.

Following effective, spinal anaesthesia the anal sphincter should be inspected carefully to grade the extent of the tear. This is often difficult as there will be bleeding and if the external sphincter has been torn throughout its entire thickness, it is likely that one end at least will have retracted into the surrounding tissues. This must be identified and held with Allis forceps.

For a full thickness external sphincter injury, either an overlapping or end to end technique can be used. There is no evidence that either method is superior. For partial thickness repairs to the external sphincter, an end to end technique should be used.

Note During knot tying, remind participants about safe needle discipline. Turn the tip of the needle inwards in the needle holder so that the sharp tip is shielded by the needle holder and no-one can obtain a needle stick injury. **THIS IS VERY IMPORTANT.**

Repair technique

- If the anal/rectal mucosa itself is torn, this must be repaired first. Depending upon the suture material available, this can be repaired either with continuous or interrupted sutures. Tying the knots within the anal canal minimises tissue reaction and infection if catgut is used, but if polyglactin is available this is not a factor, as the sutures dissolve by hydrolysis.
- Examine the tear carefully to identify the apex of the tear in the anal/rectal mucosa and insert a suture 0.5 cms above the apex of the tear with the ends of the suture on the rectal side.

- Continue with either interrupted or mattress sutures to the point where the anal mucosa reaches the perineal skin and tie off.
- If the anal mucosa has torn internally to above the level of the anal sphincter complex, invariably both internal and external anal sphincter muscles will have torn.
- For third degree tears, prior to closure of the external sphincter it is important to determine whether the internal sphincter is intact or not. If damaged, it should be repaired separately. It may be identified as a white layer between the external sphincter and the anal mucosa. Depending upon the suture material used (3-0 or 4-0 polyglactin or catgut absorbable suture), the tear may be repaired with either continuous non-locked sutures (preferably) about 0.5 cms apart or interrupted sutures. If using interrupted sutures, ensure all knots are on the anal/rectal mucosa side.
- Ask an assistant to hold the surrounding tissues back using the Langenbeck retractors.
- If the internal sphincter is torn, repair using interrupted mattress end-to-end sutures. Avoid using figure of eight sutures as this may compromise the blood supply to the muscles.
- During knot tying, remind participants about safe needle discipline. Turn the tip of the needle inwards in the needle holder so that the sharp tip is shielded by the needle holder and no-one can obtain a needle stick injury. THIS IS VERY IMPORTANT.
- For complete (full thickness) external sphincter tears, identify the ends of the external sphincter. Hold with Allis forceps and dissect as necessary to ensure that there is sufficient sphincter tissue available for an overlapping technique to be used. For a full thickness external sphincter injury, either an overlapping or end to end technique can be used. There is no evidence that either method is superior.
- Suture using a mattress technique inserting needle from the distal end of the top side of the muscle on one side of the sphincter about 1.5 cms away from the edge. Bring suture out on underside.
- Take the same suture through the other side of the torn sphincter again from top to bottom, this time about 0.5 cms away from the edge of the tear. Next reverse the needle and come back from bottom to top about 1 cm more proximally.
- Bring the suture through the first side of the torn sphincter again from bottom to top.
- Cut the suture, clipping the two ends with a small artery clip and leaving enough length to tie later.
- Repeat with another suture placed more proximately in the external sphincter. Once the two sutures have been inserted, pull the ends together gently and tie off. Try not to pull too tightly to avoid the suture material cutting through the ends of the muscle, but at the same time, tight enough to ensure overlap and approximation of the tissues.
- If the external sphincter tear is partial rather than complete repair should be end-to-end and not overlapping.

Following repair to the anal sphincter complex, continue with the remainder of the perineal repair as usual.

Post-operative care

Prescribe a course of broad-spectrum antibiotics to reduce the risk of infection and wound dehiscence.

Use of a stool softener such as lactulose is recommended for 10 days following the repair to reduce the risk of hard stools causing disruption to the repair

The importance of perineal hygiene should be explained to the patient.

Future deliveries

Whilst every effort should be made to ensure that the repair is as good as possible there will be some women who do go on to experience either temporary or permanent problems with anal sphincter control. This may take the form of faecal urgency, incontinence of flatus or of faeces. One study found that at 3 years after the injury, 18% of women complained of faecal urgency, 15.1% of incontinence of flatus and 10.5% of faecal incontinence.

If there is evidence of residual anal sphincter functional impairment then consideration should be given to offering a patient the choice of a caesarean section for future deliveries. The risk of a recurrence of OASI has been found to be 7% (Jangö et al 2017) and of these recurrent cases, 50% reported subsequent incontinence. The risk of this must be explained to patients and set against the risks of caesarean section, allowing women to make an informed choice.

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Thiagamoorthy, G., Johnson, A., Thakar, R. and Sultan, A. (2014). National survey of perineal trauma and its subsequent amanagement in the United Kingdom. Int Urogynecol J, 25(12), pp. 1621-1627.

Module 5: Surgical Obstetric interventions

5.1 Surgical techniques for uncomplicated caesarean section

Key learning points

- Always remain calm and maintain situational awareness during surgery
- Know where help is to be found if an emergency arises
- Ensure the patient is correctly positioned with left lateral tilt
- Reduce infections by meticulous cleaning prior to commencing surgery
- Employ evidence-based good practice rather than habit
- Do not rush
- Be gentle with tissues

There are probably as many variations on caesarean section technique as there are surgeons, and most will undoubtedly consider that "their way" is best. However, it is very important that technique is based as much as possible on reliable evidence as to which techniques lead to the best outcomes, both in the post-operative period and in the longer term, rather than habit and prejudice.

General principles of safe surgery

- Careful preparation
- Senior help present or nearby if likely to be needed
- Excellent communications with other staff, and the patient
- Good positioning of the patient
- Thorough skin preparation
- Aseptic technique
- Bright lighting
- Good exposure
- Correct equipment in good order
- Any extras likely to be needed available
- Remain calm and maintain situational awareness

Always prepare carefully and use the WHO safe surgical checklist. Ensure all other team members are aware of any complications anticipated.

There is no room for pride when it comes to safe surgery. Always ensure that you know where to get senior help quickly at all times, but especially if complications are anticipated. Do not attempt surgery that you have not been trained for, and signed off as competent to undertake. In some settings where senior help is not available it is wise to transfer the patient prior to planned surgery. Even in an emergency situation, if you are aware that the measures required are beyond your own level of competence, try if possible to stabilise the patient for transfer to a higher centre rather than risk undertaking a procedure, getting into difficulties that you cannot resolve and have the patient die on the operating table. It is however recognized that in some emergencies the situation is so acute that there is no choice but to operate there and then, but try to avoid this if possible unless you have sufficient experience to cope safely.

Always ensure good communications within the entire team. All staff should be spoken to respectfully, no matter how fraught the situation. Give instructions or requests that are clear and precise. Before applying fundal pressure for delivery, if the patient is awake, warn them what you are about to do as they may experience some discomfort. If you intend to exteriorize the uterus, warn the anaesthetist before proceeding.

In any emergency, maintaining good communications is of even greater importance.

Do not be tempted to rush. It is better to be thorough and avoid later complications than to perform a rapid caesarean only to return to theatre with a patient later.

Always be gentle when handling human tissues.

Good positioning

All pregnant women (> 20 weeks gestation) should be placed on the theatre table with a left lateral tilt of 15-30°. This may be achieved by either tilting the table or inserting a wedge if the table does not tilt laterally. Left lateral tilt is really important for the avoidance of supine hypotension especially in patients who have undergone spinal anaesthesia, as the spinal may also give rise to hypotension. However, all patients should be tilted, including those under general anaesthesia.

Thorough skin preparation and aseptic technique

Scrub your hands thoroughly, ensuring all surfaces are included. An effective scrub should take five minutes to complete. Wear a waterproof apron under your theatre gown and cover your head with a hat. Masks are optional, as the protection afforded by a mask from air-borne bacteria and viruses lasts only a few minutes, but the surgical team may wear a mask and visor to protect their faces and eyes from splashes of blood or liquor. Many surgeons prefer to double glove as an added protection against the effects of needle-stick injury or just to minimize the risks caused by any glove leakage. Once scrubbed, gowned and gloved, do not touch anything unsterile and aim to keep your hands above waist level at all times.

Ensure that the bladder has been catheterised using aseptic technique prior to commencing the procedure.

A systematic review (Haas et al 2018) found that vaginal cleansing with povidone iodine solution or chlorhexidine solution prior to caesarean section reduces the risk of post-operative endometritis.

Ensure the skin is cleaned thoroughly, using an alcohol-based preparation. Clean from the area you intend to make the incision outwards.

It is best to allow time for the antiseptic to dry before draping the patient with sterile drapes, leaving the area for the incision adequately exposed.

Lighting

Ensure that a well-functioning bright light is in place. All surgical procedures require good lighting. Without this, bleeding vessels may not be noticed, leading to complications. If your facility is subject to power cuts, ensure that a back-up plan for lighting is readily available, using batteries if necessary. Theatre managers are responsible for ensuring that adequate lighting is always available for surgery.

Exposure

Always ensure good exposure of the operative field by making adequate-sized incisions and asking the assistant to provide appropriate retraction. Make good use of the incision you have made. It is of little us making a large skin incision if the rectus sheath or peritoneum is then not opened adequately to allow full visualisation.

Equipment and extras

Always check that equipment is correct, complete and in good working order. Scissors should be sharp and there should be adequate numbers of clamps, especially Green-Armytage clamps. Ensure that the equipment is laid out neatly so that everything is clearly visible. Learn the correct names for each piece of equipment to aid clarity of requests to the scrub nurse. Make sure that any extra pieces of equipment you may need, for example, a condom catheter balloon or extra sutures, are readily available so that they can be accessed without delay.

Remain calm

In emergency situations it is all too easy to become stressed and even panic-stricken. Try to stay calm as panic will never help in resolving the situation. It is important to maintain a good level of situational awareness. So, for example, if you are having difficulty extracting the fetal head when it is deeply impacted in the pelvis, ask a staff member to shout out the time at one-minute intervals, to avoid trying any particular manoeuvre for too long before moving on to another.

Confer continuously with the anaesthetist regarding the dynamics of blood loss to enable them to manage fluid replacement appropriately. They will need to know whether and when you have succeeded in controlling a haemorrhage.

Specific techniques for caesarean surgery

Skin incision

The skin may be incised using either the Pfannenstiel incision, the Joel Cohen incision or the sub-umbilical midline incision.

A Pfannenstiel incision is made 2 cms (2 finger widths) above the pubic symphysis and is 12-15 cms long. The incision is cut in the shape of a smile with the lateral edges upturned to direct the incision in line with the Langer's lines (lines determined by the alignment of connective tissue in the skin) to minimize scarring.

A Joel-Cohen incision is made in a straight horizontal line 2-3 cms below an imaginary line connecting the iliac crests. It is also 12-15 cms long.

In practice, many surgeons perform an incision that is a mixture of these two incisions. For example, many prefer the lower level of the Pfannenstiel incision as it is cosmetically preferable, but tend to cut in a straight line. Provided the incision does not extend too far laterally this is acceptable.

A midline longitudinal incision should only be made if you know in advance that a Classical (vertical) incision will need to be made on the uterus. Although some surgeons prefer this approach as it requires less dissection and there are less blood vessels involved, it is much more uncomfortable for

the patient afterwards, and there is an increased risk of scar dehiscence, so it should be avoided unless absolutely necessary.

Do not make a larger skin incision than is necessary to obtain adequate access. Remember it is the skin incision that the patient will see and judge your surgery by.

Take care to allow for the tilt of the table and ensure that you are incising equally on both sides of the midline.

Subcutaneous adipose tissue

If there has been no previous surgery, make a small midline incision in the adipose tissue and fascia and then extend laterally with your fingers (blunt dissection). This may not be possible if scarred from previous surgery, in which case use careful sharp dissection. Look out for perforating vessels (superficial inferior epigastric veins) about 4 cms lateral to the centre on either side and either cauterise or ligate as you go. Try not to miss these as otherwise the ends will retract but later may bleed and form a haematoma.

Rectus sheath

The rectus sheath should also be opened centrally at the same level as the skin incision. The incision should be extended by either blunt or sharp dissection., again taking care to ligate any vessels as you go. The lateral edges of the sheath are muscular (formed from the external oblique, internal oblique and transversus muscles).

Divide the sheath from the underlying rectus muscles both superiorly and inferiorly to create enough room for access to the peritoneal cavity. A common mistake is failure to dissect far enough superiorly, which then restricts entry into the peritoneum.

Part the recuts muscle in the midline but be careful not to put your fingers under the muscle in-between the muscle and peritoneum as by so doing you risk tearing vessels that will bleed and form a sub-rectus haematoma later.

Peritoneal cavity

Enter the peritoneal cavity high up to avoid bladder injury, especially in cases of repeat surgery. Blunt entry is preferable but if not possible, elevate a portion of peritoneum with two clips and ensure that no bowel is caught between the clips before cutting a small hole in the peritoneum that can then be digitally enlarged. It may be necessary to divide the rectus sheath from the muscles higher up at this point if access is problematic.

Once inside the peritoneal cavity, carefully divide any adhesions that are prohibiting access to the lower segment of the uterus before opening the visceral peritoneum at the level of the utero-vesical fold and gently pushing the bladder down. This must be done very carefully, especially in cases of repeat surgery, in order not to damage the bladder. If necessary when the bladder is very adherent and the lower segment very thin, make the incision into the lower segment higher to avoid this difficult area.

Opening the uterus

Make a small horizontal incision into the uterus centrally. Cut slowly through the fibres, wiping blood away with a finger as you go so that you can see clearly and avoid cutting too deep and damaging the fetus with the knife. If possible, aim to avoid cutting through the membranes at this stage, although this is sometimes difficult.

The uterine incision can be enlarged either bluntly using fingers, or using scissors. If dissecting with scissors, place two fingers in between the fetus and the interior blade to protect the fetus. Curve the incision slightly upwards laterally to avoid large vessels. An alternative to using scissors to curve the incision is to make one superficial stroke with a knife in a U-shape. The uterine incision should be at least 10 cms long to deliver the fetus safely without risking tearing the edges of the incision. It is a mistake to make the incision too narrow and thereby risk causing uncontrolled angle extensions.

Delivery of the baby and placenta

The baby is usually delivered by placing the operator's right hand under the head and scooping up, but in cases where the head is impacted, using the left hand may be easier (the other way around for left-handed surgeons who stand on the patient's left side). Once you have successfully placed your hand under the head ready to flex and deliver, and brought the head out of the maternal pelvis, ask your assistant to apply steady fundal pressure in lieu of contractions.

Having delivered the head, avoid excessive traction to deliver the shoulders. It is quite possible to cause brachial plexus damage even at caesarean section. It is preferable to hook your fingers into the anterior axilla to deliver the shoulder.

Once the anterior shoulder has delivered, the rest of the baby will normally follow with ease.

After briefly lifting the baby to show to the mother, provided the baby is breathing regularly, place the baby between the mother's legs and allow for delayed cord clamping. At this point it is important to apply Green-Armytage clamps to the uterine angles to minimize blood loss, as there are frequently large angle vessels and blood loss can be rapid. After the anaesthetist has given an intravenous slow bolus of oxytocin (5 I.U.) wait for spontaneous placental separation provided loss is not heavy. After a delay of one to three minutes the cord may be clamped and cut and the baby given to the midwife. Deliver the placenta by cord traction. Once the baby has been checked and dried, he or she may be placed on the mother's chest for the remainder of the procedure for skin-to-skin contact. Cover the baby with a warm towel.

Once the placenta is delivered it is of great importance to check the uterine cavity digitally with care. This must always be done at caesarean to exclude any remaining fragments of placenta or membrane that may lead later to post-partum bleeding if left behind. Some operators prefer to cover their hand with a thin gauze swab as the added friction may help detach any membrane fragments.

Closure of the uterus

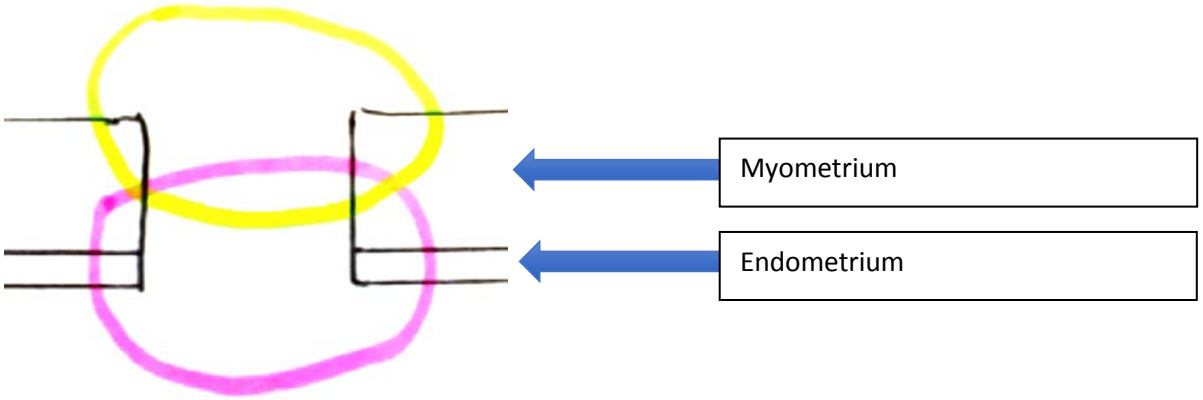
There has been much debate as to whether the uterus should be exteriorised for closure, or left in situ. Some studies have suggested less post-operative pain and a more rapid return to bowel activity of the uterus is left in situ for closure. The only systematic review (Zaphiratos et al 2015) conducted did not look at post-operative pain. The danger with exteriorisation is that as there will be tension

on the uterine vessels while the uterus is exteriorised, the incision may appear to be dry following closure, but once the uterus is replaced into the abdominal cavity and the tension reduced, then any unsecured vessels will start to bleed. Without careful inspection of the incision in situ, this may be missed, leading to post-operative haemorrhage. Although there are no absolute recommendations, overall it seems better not to exteriorise the uterus in most circumstances but rather to repair the incision in situ.

Close each angle separately, checking for any bleeding vessels both inside and outside of the angle. If only one angle is sutured prior to closure of the incision, there may be bleeding vessels within the other angle that are concealed.

Another issue of considerable controversy has been that of whether the uterus should be closed using a single or double layer technique. Although in the short term there is probably little difference, in the longer term single layer closure may lead to later problems. Ultrasound studies (Bij De Vaate et al 2014, Roberge et al 2014) have shown that single layer closure can lead to ultrasonically detectable notches in the non-pregnant uterus following single layer closure and this may predispose to other problems including scar rupture in subsequent labour.

If a double layer method is used the incision should closed so that raw tissues are brought together



as shown:

Figure 5.1.1: Double layer closure

Some surgeons prefer to close with locking sutures but there is evidence that non-locked sutures are associated with greater scar thickness. (Roberge et al 2014)

Checking the adenexae

Always check the fallopian tubes and ovaries. Any ovarian cysts found should be removed. Small simple cysts can be punctured and drained but larger cysts should be removed, either by cystectomy or oophorectomy if no functional ovarian tissue can be identified or if there is a suspicion of malignancy. Most large cysts found at caesarean are benign dermoid cysts and malignancy is rare. If cysts are left to remain in situ there is a risk they will to undergo torsion as the uterus involutes, resulting in a gangrenous ovary and an acute abdomen.

Note that even large cysts may be hidden either up in the para-colic gutter of in the Pouch of Douglas, so make sure that both ovaries are identified unless one had been surgically removed previously.

Peritoneal closure

It is generally considered best not to close the visceral peritoneum, as to do so frequently results in the bladder being pulled higher up, causing problems for consequent surgery. Ensure any bleeding vessels in the utero-vesical fold are cauterized or ligated and leave this peritoneal layer to heal spontaneously.

There is more controversy regarding the closure of the parietal peritoneum, but there is evidence that if the parietal peritoneum is closed then significantly less adhesions form (Lyell et al 2005). Other studies have disputed this finding. The CORONIS study, a large randomized controlled trial with a three-year follow-up, only reported on indirect evidence of adhesions and concluded that no-closure of the peritoneum made no difference. However, the real difference is found at repeat laparotomy when adhesions may be found between the peritoneal contents (omentum and bowel) and the back of the rectus sheath, or elsewhere within the peritoneal cavity. This was not reported on in the CORONIS three-year follow-up study, despite many of the women having had a repeat caesarean within that time. It is likely that adhesions form when the parietal peritoneum is not closed due to persistence of rectus muscle divarification. When the rectus muscles have divarificated and do not come together immediately after surgery, in the absence of peritoneal closure there is nothing to stop abdominal contents from adhering to the back of the rectus sheath, leading to adhesions that may be asymptomatic in the short term but may cause significant delays when attempting a further caesarean section in the future. It is therefore recommended that the parietal peritoneum is closed.

Rectus sheath closure

Prior to closing the rectus sheath, inspect both the underside of the sheath and the rectus muscles for signs of bleeding. It is very important that any leaking vessels are ligated or cauterized prior to sheath closure to avoid a sub-rectus sheath haematoma developing. These vessels may temporarily go into spasm or retract within the muscle fibres, but they must be located.

When closing the sheath, do not pull too tightly on the suture line, to avoid post-operative pain. If the sheath is closed tightly mobilization will become more difficult and painful. The sheath is not a haemostatic layer and therefore the sutures may be slightly loose.

Superficial layers and skin

Closure of Scarpa's fascia is optional but is recommended if the depth of tissue from the sheath to the skin is more than 2 cms deep.

The skin may be closed by a variety of methods but a soluble sub-cuticular suture will be most comfortable for the patient and is likely to leave the best scar. Remember that it is the skin scar by which the patient will make a judgement regarding the quality of your surgery! If a soluble suture is not available a non-absorbable suture may be used and removed after 5 days. For obese patients, some surgeons prefer to use interrupted sutures to avoid the requirement to remove them all at once.

When cleaning the area prior to applying the dressing do not clean over the wound itself, but apply antiseptic to the surrounding area before applying a dressing.

Make sure all swabs, instruments and needles are accounted for prior to removing the patient from the operating table.

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5.2 Complex Caesarean Sections

Key learning points

- Prepare in advance as much as possible
- Ensure good light
- Involve senior staff
- Ensure blood and other essentials are available
- Any caesarean may be unexpectedly complex

Not all caesarean sections are straightforward and there is always the possibility that any procedure may become unexpectedly complex.

Caesarean sections are more likely to become complex in the following circumstances:

- Caesareans performed at full dilation
- Fibroid uterus
- Adhesions of rectus sheath to uterus
- Intra-peritoneal adhesions
- Abnormal fetal lie
- High fetal head
- Placental problems: Anterior placenta praevia, placenta accreta (morbidly adherent placenta)
- Bleeding problems, coagulopathy secondary to abruption or major haemorrhage
- Inter-locked twins
- Prematurity with inadequately formed lower segment
- Very thin lower segment
- Ovarian cysts
- Morbid obesity
- Multiple previous abdominal surgeries, including caesarean sections
- Overly rotated uterus

In many of these situations, difficulties can be anticipated and forward plans made. Such plans must encompass anaesthesia in addition to surgery.

General principles

- If complexities are anticipated, ask for help in advance, or warn a more senior and experienced surgeon that you may need assistance. In cases of particular complexity, where life-threatening problems are likely to occur, arrange for the caesarean to be performed by the most experienced surgeon. This will apply to cases such as those complicated by placenta praevia, for example.
- Ensure that you have an experienced assistant who you are used to working with.
- Good lighting is essential. Theatre lights need to provide bright light and to be flexible so that they can be angled to point in the most appropriate direction. Ensure that all bulbs are working. It is good practice to maintain a small stock of replacement bulbs. LED lights can be utilized to augment theatre lighting.

- Check in advance that all necessary equipment and packs are prepared and in working order, including a plentiful supply of surgical swabs and a hysterectomy pack.
- Keep an emergency obstetric haemorrhage tray or box in theatre, including the equipment required for balloon tamponade.
- Ensure that any drugs that may be required are available, e.g. tranexamic acid.
- Send blood for group and save or cross matching and ensure the availability of blood for transfusion, including if possible autologous transfusion. Warn the blood bank technicians in advance that extra blood may be required. For major haemorrhage or coagulopathy, if fresh frozen plasma is available, aim to transfuse on the basis of 1 unit of blood to 1 unit of FFP.
- Ensure the availability of tranexamic acid to be used in accordance with WHO guidance (2017).
- Always use the WHO safe surgical check list before commencing any procedure, including prior to anaesthesia.
- Maintain continuous teamwork and good communications with all colleagues. Discuss the case with your anaesthetic colleagues in advance in order that the safest means of anaesthesia can be planned. Communicate with the patient so that she understands the risks and the further measures that may be required.

Caesareans at full dilation

Sometimes the decision as to whether to attempt a trial of assisted vaginal delivery or to deliver by caesarean section is very difficult. This decision is affected by many factors, not least the availability of a health care worker who is trained and experienced in undertaking complex assisted vaginal delivery.

At full dilation, the lower segment is sometimes quite stretched and thin and both the cervix and bladder may be pulled higher up. The uterine incision should be made 1-2 cms higher than usual to take this into account and avoid cutting into the uterus at the level of or even below the cervix.

Rather than opening the uterus in a straight line, it is best to curve the angels of the incision in a cephalad direction, in the manner of a smile. This will help avoid any angle extensions downwards into areas where both the ureters and blood vessels are very close to the uterine edges.

If the fetal head is deeply impacted in the pelvis, in particular following a failed attempt at vaginal delivery, ask an assistant to push up and flex the fetal head from within the vagina. This should be commenced prior to performing the uterine incision as sudden decompression may lead to uncontrolled uterine incision angle extensions otherwise.

The surgeon may find it easier to disimpact and deliver the fetal head with the hand other than the one they normally utlise. For right-handed surgeons this will mean delivering the fetal head with their left hand, standing facing the maternal feet.

Avoid disimpaction of the head during a uterine contraction, it is much more straightforward when the uterus is relaxed. In difficult cases uterine relaxant drugs may help, including inhalational anaesthetic agents, Glyceryl trinitrate or beta-mimetic drugs such as Salbutamol or Terbutaline.

An alternative method to try when a deeply impacted head cannot be delivered is the reverse breech extraction method. The operator inserts a hand into the uterus and finds either fetal buttocks or a fetal foot or feet, and the baby is delivered by the breech. To do this, it may be

necessary to make a deliberate J-shaped upwards extension of one side of the uterine incision. T-shaped incisions are best avoided if possible as they heal with a point of weakness, but sometimes there is no alternative. There is some evidence from a systematic review to suggesting that reverse breech extraction is a more favourable means to deliver in cases fetal head impaction at caesarean. (Jeve et al 2016).

When the fetal head is impacted and difficult to deliver, it is important to maintain situational awareness, and not continue to try one manoeuvre for too long before moving on to an alternative, in order to avoid severe fetal hypoxia associated with a prolonged uterine incision to delivery interval. An assistant or the anaesthetist can help by calling out the time at one or two-minute intervals.

Following delivery, care must be taken to ensure uterine contractility as uterine atony is more common following a prolonged second stage of labour. It is sensible to commence an oxytocin infusion (30 I.U. in 500 mls normal saline) following the usual bolus dose or alternatively, give rectal misoprostol 800 micrograms at the end of the procedure.

Uterine fibroids

The location, quantity and size of uterine fibroids will determine the degree of difficulty encountered at caesarean and the methods that need to be employed in order to conduct a safe delivery. Fibroids may either grown into and distort the uterine cavity, or be intra-mural, serosal or pedunculated. The most difficult fibroids encountered at caesarean are those situated in the area where a lower segment incision would normally be made. In the presence of large fibroids located within the anterior lower segment, it may be best to make a classical uterine incision in order to avoid cutting into fibroids and run the risk of causing excessive bleeding which may be difficult to control. If such an eventuality is anticipated as a result of antenatal scanning, plans can be made to perform a midline skin incision rather than a low transverse incision.

It is probably best to avoid the added complications that may occur if a myomectomy is performed at the time of the caesarean unless the fibroids are pedunculated with a stalk that is easily transectable. In extreme cases, it is occasionally necessary to exteriorize the gravid uterus and make a posterior uterine incision to conduct the delivery. This approach is rarely necessary but occasionally it may be the only means of safe delivery possible. A large vertical skin incision will be required in this situation.

Added precautions against post-partum haemorrhage are helpful in cases of large uterine fibroids, especially where fibroids are distorting the uterine cavity.

Adhesions

Adhesions following previous surgery are a common finding in the course of caesarean section. A study in Ghana found that adhesions were present in 51% of cases where there had been one previous caesarean, and 62% of cases with a history of more than one caesarean. (Nuamah et al 2017). Adhesions add to operating time, and may lead to an increased risk of organ damage, haemorrhage, post-operative infection and long-term abdominal pain. Adhesions between the anterior abdominal wall and the uterus may increase dextro-rotation and should be divided prior to opening the uterus.

Adhesions that are obscuring access to the area of the planned uterine incision must be dissected carefully and methodically. Dense adhesions should be clamped and tied off after ensuring that they contain no viscera such as bowel or bladder.

Adhesion prevention

Evidence from Lyell at al (2005) suggests that that closure of the parietal peritoneum may reduce the risk of adhesions to the back of the rectus sheath, and experience suggests that closure is beneficial. This is because the divarification of the rectus abdominus muscles (a common occurrence in pregnancy) is unlikely to resolve spontaneously immediately after delivery. Persistent divarification allows loops of bowel or omentum to protrude through the peritoneum and adhere to the back of the rectus sheath, causing adhesions to develop.

It is good practice to leave the peritoneal cavity clean of blood as the presence of quantities of blood and clots within the cavity may predispose to adhesion formation.

High fetal head

Occasionally the fetal head will remain high, especially in cases of planned pre-labour caesarean section. If possible, aim to rotate the head to a lateral position and flex. If the head does not descend with fundal pressure following membrane rupture then the operator has two further options:

- Reverse breech extraction
- Instrumental delivery through the caesarean incision

An instrumental delivery may be achieved using either forceps of vacuum equipment. For a vacuum delivery, it is easiest to use a Kiwi device, if available. If not, small forceps such as Wrigley's forceps are the instrument of choice. As always with assisted delivery, the position of the fetal head must first be ascertained in order that the instrument is applied in the correct position.

As the head is high, the alternative of a reverse breech extraction is often relatively easy to perform.

Abnormal fetal lie

Extended breech

Reach into the uterine cavity, find and flex a fetal knee, bring down a foot and apply traction or deliver fetal buttocks.

Transverse lie with fetal back uppermost

Find a fetal foot and deliver as for extended breech.

Transverse lie with fetal back down

Try external rotation of the fetus prior to opening the uterus. If this fails a J-shaped extension to the uterine incision or an inverted T-shaped incision may be required.

Placental problems

The placenta may cause difficulties at caesarean section due to its location, especially if anterior and in the lower segment (anterior placenta praevia) or if all or part of the placenta is morbidly adherent (placenta accreta). These problems may be compounded is cases where they occur simultaneously.

Placenta praevia located posteriorly is more easily dealt with as the baby is delivered prior to placental separation, although there remains an increased risk of post-partum haemorrhage due to the reduced ability of the lower segment to contract and seal off blood vessels within the decidual bed.

Where the placenta is situated anteriorly, it may overlie the area where the uterine incision is usually made. There are often large blood vessels visible on the serosal surface of the uterus in such cases, and opening the uterus will then result in rapid blood loss.

It is best to open the uterus slightly higher. Studies have demonstrated that if the placenta is underlying the uterine incision, it is better to use fingers to create a channel between the uterus and placenta and open the membranes directly, rather than to cut through the placenta. (Verspyck et al 2015).

In cases where placenta accreta (morbidly adherent placenta) is suspected in combination with anterior placenta praevia then opening the uterus at a site distant from the placenta is advised (RCOG Green-top Guideline 27, 2011). This will usually mean performing a classical incision. If the placenta fails to separate following delivery of the baby, the placenta should be left in situ in its entirety. Attempts to separate the placenta forcibly will tend to result in catastrophic blood loss and should be avoided.

Beware of post-partum haemorrhage. If the placental bed is oozing following delivery of a low-lying placenta, haemostatic sutures may be inserted into the decidua. However, sometimes it is hard to reach all the bleeding points, especially when the placenta has overlain the cervix directly. It is often useful to insert a (non-inflated) balloon (either ready-made or condom catheter balloon) into the cavity prior to uterine closure. The tail of the catheter is pushed down through the cervix from above. After the uterus has been closed, if bleeding is on-going, the balloon is inflated. In this circumstance filling to approximately 300mls is required to achieve haemostasis. The balloon can be deflated and removed 24 hours later provided there is no further blood loss.

Bleeding problems

In cases of severe placental abruption, severe pre-eclampsia or massive haemorrhage a coagulopathy may develop. In this case there will be a general tendency for blood to ooze from multiple points. It is essential to maintain good communication with the anaesthetist and theatre staff who can liaise with the laboratory regarding the provision of fresh frozen plasma and platelets, if available. In the absence of this fresh whole blood should be requested if at all possible. It will be very difficult to stop the blood loss until coagulopathy has been corrected. Tranexamic acid should be used (1gram I.V. over 10 minutes, repeated after 30 minutes if bleeding not settled). Take extra time to secure all bleeding points securely with sutures or diathermy and consider balloon tamponade within the uterine cavity.

Interlocked twins

This problem can arise when the first twin is presenting by the breech and the second is cephalic. If the fetuses are facing one another, their chins can become locked as the breech baby descends. If the position is not detected antenatally, this may result in the delivery of the body of the breech twin and retention of the head within the uterine cavity, trapped behind the chin of the second, cephalic, baby. It is not usually possible to disimpact the heads vaginally and a caesarean is required. It may be necessary to deliver the cephalic baby by means of a reverse breech extraction in order to disimpact the two heads. The first twin's head can then be pushed out vaginally from above. There is a significantly increased risk of post-partum haemorrhage.

Prematurity

In cases of prematurity requiring a caesarean section, the lower segment of the uterus may not be adequately formed, and may be too narrow to allow for a wide enough transverse uterine incision to allow for delivery. A lower segment longitudinal incision in the uterus may be necessary.

Another problem, especially in cases of breech presentation, which are more common with prematurity), is that the uterus may clamp down on the fetus following membrane rupture. In such cases, having a uterine tocolytic prepared and ready to use is a sensible precaution.

Very thin lower segment

A thin lower segment is often found in cases with one or more previous caesareans. It is preferable to incise the uterus higher in order to avoid the thin area altogether if possible.

Beware that in such cases the bladder is often drawn up and also adherent to the uterus. Again, aim for a higher incision, as dissection of the bladder may result in bleeding that is difficult to control.

A two-layer uterine closure may not be possible when the lower segment is very thin.

Ovarian cysts

These are usually found incidentally at caesarean. The ovaries should always be located and inspected. If not removed, ovarian cysts may lead to ovarian torsion as the uterus involutes and present as an avoidable acute abdominal emergency.

Ovaries containing cysts may be difficult to locate. They may either be impacted in the Pouch of Douglas behind the uterus, where they may have blocked engagement of the fetal presenting part. Alternatively, they may have tracked high up in the para-colic gutter into the upper abdomen. If very large, it may occasionally be necessary to puncture and drain the cyst to enable delivery, although intact delivery is always preferable if possible, because of the small risk of seeding the peritoneal cavity with potentially malignant cells. Large cysts found at caesarean are usually benign teratomas, but, if possible, histological examination should be undertaken to exclude malignancy. Smaller simple cysts may be punctured and drained in situ to preserve ovarian function.

Morbid Obesity

Ensure that the weight limit for the operating table has not been exceeded.

Due to anaesthetic issues it may be necessary to operate with the head of the table elevated. To aid exposure, once the rectus sheath is opened, apply two Littlewood or other toothed clamps to the upper edge of the sheath. Tie the clips with one end of a sterile bandage and give the other end to the anaesthetist and ask them to apply traction.

Interrupted sutures to the skin may be preferable, as there is an increased risk of wound infection and breakdown. Removing individual sutures may allow for better drainage of any collections without loss of integrity to the entire length of the scar.

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5.3 Prevention and management of post-partum haemorrhage following caesarean section

Key learning points

- Act fast in cases of post-caesarean haemorrhage, it is easier to treat before the onset of DIC
- Always do ABCD, remember to give oxygen in cases of haemorrhage
- Remember the 4 T's, tone, tissue, trauma and thrombin. Any combination of these may be present simultaneously.
- Call for help and be prepared to return to theatre without delay if required

Post-partum haemorrhage is defined as a clinically estimated blood loss in excess of 500 mls after vaginal birth or 1000 mls after caesarean section (including intra-operative loss), or any blood loss sufficient to cause hemodynamic instability.

There are four causes of post-partum haemorrhage:

- **Tone** (uterine atony, the most common cause)
- **Tissue** (retained products, i.e. pieces of placenta and membranes)
- **Trauma** (includes surgical incision related bleeding)
- **Thrombin** (clotting disorders, usually occurs consequent to the development of Disseminated Intravascular Coagulopathy)

Note These causes are not mutually exclusive and can occur singly or in any combination.

In all cases of post-partum haemorrhage from whatever cause, give tranexamic acid 1 mg intravenously (100 mg per ml at 1 ml per minute over a ten-minute period) as soon as possible after the onset of the haemorrhage. If bleeding continues after 30 minutes following treatment with tranexamic acid, or restarts within a 24- hour period, give a second dose. (WHO recommendation 2017 following the WOMAN trial).

Common pitfalls in cases of maternal death due to caesarean related haemorrhage include:

- Failure to assess risk factors prior to the caesarean adequately.
- Failure to notice alterations in the patient's vital signs and detect and manage shock.
- Failure to appreciate the significance of an alteration in the patient's condition.
- Failure to take timely action.
- Reluctance to return to theatre.
- Reluctance to perform hysterectomy.
- Lack of sufficient transfusion.
- Failure to adequately treat antenatal anaemia.

(Maswime and Buchmann 2016)

General principles of management of haemorrhage

- Always do ABCD: diagnose then treat. Remember to give oxygen if tachypnoeic.
- Give tranexamic acid early as above.
- Perform secondary survey, remember there can be a combination of causes of PPH.
- Estimate blood loss using vital signs.
- Remember blood supply to the term uterus is 700 mls per minute so loss can be very rapid.
- Use a major obstetric haemorrhage protocol.
- Always use the WHO safe surgical check list.
- Plan ahead for potentially difficult cases, ensuring the most experienced senior staff are available.
- Ensure blood is readily available for transfusion.

Tone

Prevention of tone disorder

- Identify cases at particular risk in advance, e.g. multiple pregnancy, fibroid uterus, polyhydramnios.
- Avoid prolonged labour by adhering to use of the partograph and paying attention to the action line.
- Give oxytocin at delivery (5 I.U. intravenously slowly).
- If added risk factors are present, consider an oxytocin infusion for at least 4 hours post-operatively (30 – 40 I.U. in 500 mls normal saline at 125 mls per hour).
- Ensure the bladder is kept empty (retain the catheter following caesarean until the patient is mobile and able to go to the toilet).
- Check that the uterine cavity is empty before closing the uterus, by digital examination of the cavity after delivering the placenta by controlled cord traction.

Diagnosis of tone disorder

- Be alert to any deterioration in maternal observations by using the Early Warning Chart.
- Suspect if revealed blood loss is greater than expected.
- If the fundal height is higher than expected, especially if the uterus also feels soft, suspect concealed loss within the uterine cavity.
- In cases of caesarean for placenta praevia, blood loss from the lower segment is common. The lower part of the uterus is not as contractile as the upper uterus.
- If the decidual bed is not compressed, it will continue to ooze. Blood retained in the uterine cavity forms into clots. These clots then prevent the uterus from contracting in the same manner as do other retained products.

Treatment of tone disorder

- Rub up a contraction (after warning the patient this may be painful). If the spinal anaesthetic has not worn off the pain will be minimal but otherwise it is likely to be quite painful due to the recent surgery.
- Blood clots should be expelled from the cavity once it has contracted.

- Give further oxytocics. Commence with an extra bolus of 5 I.U of Oxytocin by slow intravenous injection followed by an oxytocin infusion if not already in place. The recommended dose for an Oxytocin infusion varies. The RCOG Greentop Guideline (2016) recommends 40 I.U in 500 mls Normal Saline, given at a rate of 125 mls/hour.
- Misoprostol 600-800 micrograms can be given rectally or sublingually, although where oxytocin has already been administered giving misoprostol as an adjunct confers no added benefit (Mousa et al 2014 Cochrane database of systematic reviews). However, when it is not possible to give oxytocin then misoprostol should be given.
- Ergometrine is also very useful but is often not available. If available give 0.25 mgs (250 micrograms) I.M. or I.V. Ergometrine should not be used in patients suffering from hypertension or pre-eclampsia.
- An alternative if available is prostaglandin F2-alpha (Carboprost or Hemabate) 0.25 mgs I.M. but this also may not be available in some settings.
- If pharmacological methods are not successful in stopping the bleeding, move to apply pressure from within the uterine cavity. This is best achieved by means of balloon tamponade. A purpose-made balloon such as a Rusch or Bakri balloon can be used but a condom catheter balloon is equally effective and a great deal less expensive and more readily available.

To make a condom catheter balloon tamponade

1. Tie a condom over the end of a Foley catheter, covering the holes in the catheter. The condom should be tied such that about 2/3 of the condom is available to fill. Tie firmly with two threads but not so tightly that the catheter lumen is obscured.
2. Grasp the anterior lip of the cervix and insert into the uterine cavity manually. Inflate the small Foley balloon, as you would when it is in a bladder. (This will prevent the condom slipping off from the catheter).
3. Attach the Foley catheter to the giving set.
4. Fill the condom until the bleeding settles, then clamp the Foley. With an atonic uterus it can take up to 800-900 mls for the pressure to be sufficient to stop the bleeding.
5. Ensure that the balloon is retained within the uterine cavity, using a vaginal pack if necessary, to keep it in place.
6. Insert a urinary catheter into the bladder if not already present.
7. Commence an Oxytocin infusion 30-40 I.U. in 500 mls. Run for 4 hours. (It may be necessary to continue this for longer in some cases).
8. Monitor the patient's vital signs regularly (at least hourly).
9. Keep the balloon in the uterus for a minimum of 12 hours. Remove between 12-24 hours after insertion, preferably not at night-time.
10. To remove, let out 100-200 mls initially. If no bleeding the you can let out all the rest of the fluid and slide the balloon out through the cervix.

11. Continue to observe the patient closely for the next 2 hours and check the uterine fundus to ensure contractility is maintained and blood loss is normal.

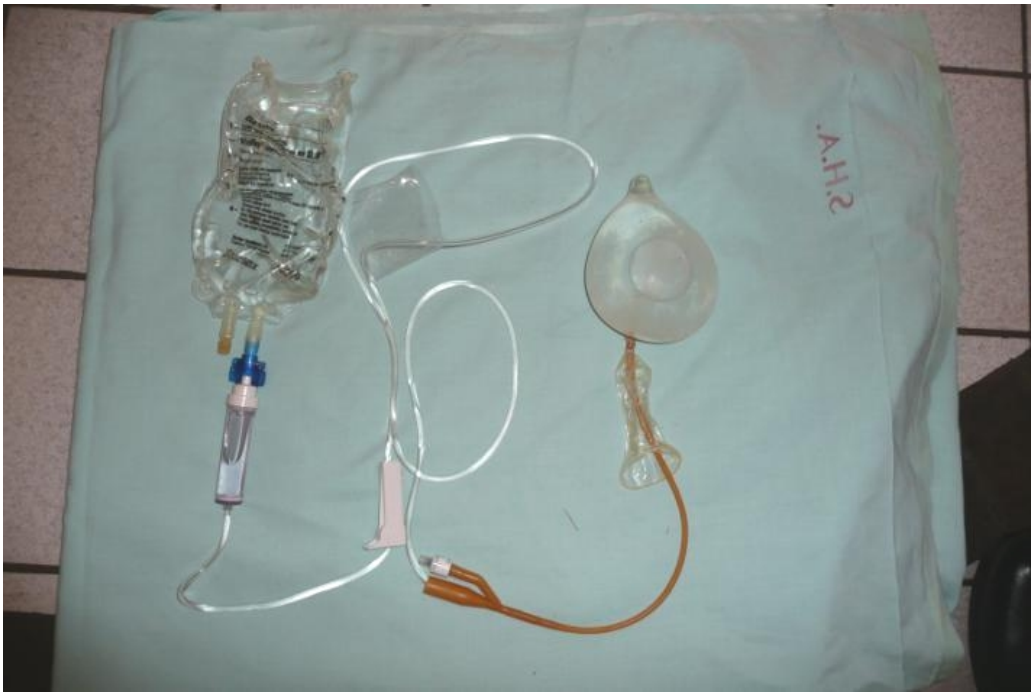

Figure 5.3.1: A condom-catheter balloon

If the patient returns to theatre and a laparotomy is performed, a **B-Lynch suture** (see

Figure 5.3.2) or a modified version can be performed. This is a means of achieving mechanical compression of the uterus to prevent relaxation. A true B-Lynch suture can only be inserted if the uterine cavity is opened, but a modification can be performed with a closed uterus, or other compression sutures employed.

In some circumstances, both a B-Lynch suture and balloon tamponade can be used simultaneously, but in that case the balloon will be filled less, usually to approximately 200-300 mls. The advantage of doing this is that it helps to prevent the uterus from relaxing with the balloon in situ.

Both bi-manual and aortic compression can be used as a temporising measure.

Bi-manual compression

To perform this manoeuvre, first rub up a contraction and expel clots.

- Place one hand into the vagina and make a fist.
- Push upwards on the uterus.
- With your other hand on the maternal abdomen compress the uterus between your two hands.

Performing effective bi-manual compression is very tiring for the operator. It should not be considered as a curative treatment for uterine atony but as a temporising measure, to reduce blood loss while preparing to apply other more definitive treatments.

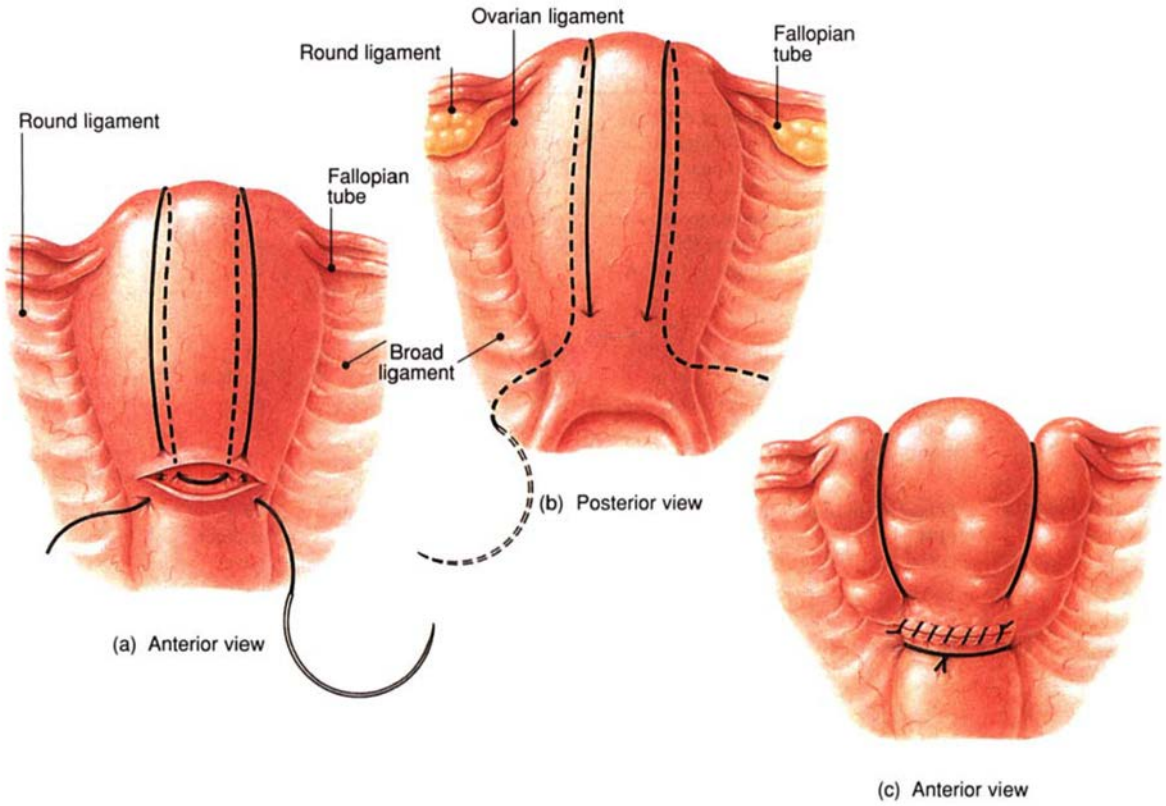

Figure 5.3.2: B-Lynch suture

Aortic compression

Another helper can compress the abdominal aorta by pressing on it externally using a fist. This may be done simultaneously to bi-manual compression, or as an alternative. It is also a temporising measure to reduce blood loss rather than a definitive treatment.

In some places a non-pneumatic compression garment may be used (Miller et al 2013). This garment is made from neoprene. It wraps around the legs and trunk of the patient and helps to maintain blood pressure. There is a pad in the abdominal component that also applies pressure to aid compression. This method is particularly useful when a patient needs to be transported to another facility for definitive treatment.

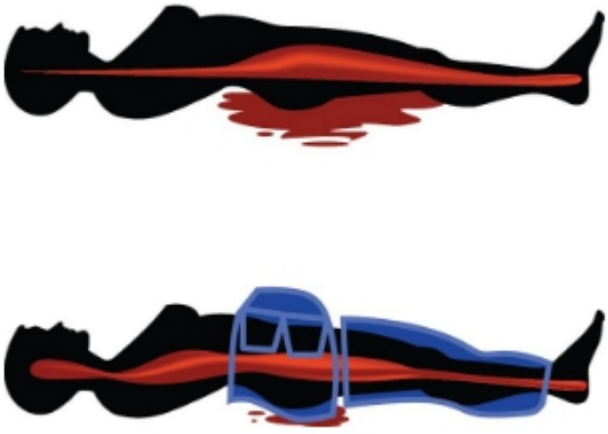

Figure 5.3.3: LifeWrap non-pneumatic anti-shock garment - NASG (Source: Global Health)

Note Reduction of blood loss is important, not least because the greater the blood loss, the more likely the patient is to develop disseminated intravascular coagulopathy (DIC). Once DIC has developed, it then becomes much more difficult to arrest the bleeding, as the blood has lost its ability to clot.

Tissue (retained products)

It is rare for there to be haemorrhage from retained products following a caesarean, but if the operator has failed to check the uterine cavity carefully prior to closure then some placental tissue or membranes may be retained and cause bleeding. If the placenta and membranes are available, check them carefully to ensure completeness. Always place the placenta on a flat, well-lit surface to do this. If there is any doubt as to completeness, then exploration of the uterine cavity is required. As there is a fresh scar in the uterus the cavity must be explored very gently with either a hand or a blunt instrument, to avoid damage to the suture line.

Tears or trauma

To avoid post-operative bleeding from the uterine incision, good suturing technique must be employed. Ensure all knots are securely tied. Both angles of the uterine incision should be secured separately and visualised from both the mucosal and serosal surfaces of the wound to ensure all bleeding points are contained within the sutures.

If there are any extensions or tears to the incision they must be carefully explored to ensure that the base of any extension is included in the sutures.

Always check the suture line on the uterus when the uterus is in situ within the maternal abdomen and under no tension to ensure that haemostasis is adequate.

Note If there is a suspicion of a surgically related bleed then it is important to return to theatre early for a re-look laparotomy. Delay in re-laparotomy has been identified as a significant cause of maternal death from post-caesarean haemorrhage.

Thrombin (clotting disorders)

In the context of caesarean section, disorders of clotting are usually caused by a consumption coagulopathy when the clotting factors have been used up in the course of the haemorrhage. However, this may be exacerbated when the haemorrhage occurs related to a placental abruption or in cases of eclampsia or severe pre-eclampsia when DIC is liable to occur at an earlier stage.

Treatment of DIC requires replacement of clotting factors and/or platelets.

In the absence of the availability of these, fresh whole blood should be used for replacement.

Note One of the reasons for taking prompt action in cases of haemorrhage to arrest the blood loss is to try to avoid the onset of DIC. Once DIC has occurred the haemorrhage becomes much more difficult to treat effectively.

Surgery

If a B-Lynch or other compression sutures plus balloon tamponade are insufficient to arrest the haemorrhage, further surgery is indicated.

If sufficient expertise is available tying off the uterine or internal iliac vessels can be attempted but, if the loss is heavy and continuing, it may be best to resort to a hysterectomy in order to save the mother's life. This may be a total or sub-total hysterectomy depending upon the circumstances. If the loss is not coming from the very bottom of the lower segment or the cervix itself then often a sub-total hysterectomy is preferable as it is more straightforward to perform and there is less risk of further bleeding afterwards.

References

Maswine, S. and Buchmann, E. (2016). Causes and avoidable factors in maternal death due to cesarea-related haemorrhage in South Africa. *IJGO,* 134, pp. 320-323.

Miller, S, et al, (2013) Non-pneumatic anti-shock garment (NASG) a first-aid device to decrease maternal mortality from obstetric haemorrhage: a cluster randomised trial. *PLoS One* 8(10): e76477

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5.4 Documentation following caesarean section

Key learning points

- Good documentation needs to be clear, legible and thorough
- Documentation is an essential part of patient care
- Documentation can help avoid and manage complications
- Documentation is essential for wise future decision-making and patient counselling

Clear and thorough documentation is key to providing quality care to patients, and is an essential component of patient care. If complications develop post-operatively it is essential that health care providers can refer to records. For example, if a woman experiences bleeding post-partum in excess of what may be considered normal, then the records should demonstrate whether or not the uterine cavity was checked for the presence of any retained products. Whether or not it has been checked may determine the subsequent actions taken to investigate and treat the bleeding.

Clear documentation is of great importance if and when further surgery, including subsequent caesarean in another pregnancy, in contemplated. If difficulties were recorded, this may determine by whom, where and how the next caesarean is performed.

Documentation is likely to be more comprehensive if a proforma is used, as this may serve as a reminder or check list to ensure all necessary points are covered.

Consideration should be given to the location of caesarean section records. Records should be filed securely within the patient's medical record and kept in a well-organized filing system for future reference. Best practice is to give the patient a summary to retain, indicating the reason for the caesarean and any difficulties or complications encountered. She should be told to keep this summary in a safe place and show it to health care workers if she chooses to give birth elsewhere in the future.

Points to include in caesarean documentation

1. Patient demographics: Name, date of birth, patient identification number
2. Date and time of procedure, including decision to delivery interval
3. Title of operation, e.g. Lower segment caesarean section (LSCS) or Classical Caesarean Section. If sterilization or any other additional procedure is included, this should be added to the title, e.g. Lower Segment Caesarean Section + bi-lateral tubal ligation.
4. Emergency or elective (planned) procedure?
5. Reason(s) for the procedure. This is of huge importance. Caesareans may be performed for either recurrent or non-recurrent reasons. This will have a bearing on future management. For example, if a woman had a caesarean for fetal distress, this is a situation unique to that particular pregnancy whereas a caesarean performed for obstructed labour will influence future management to a much greater extent. The size and shape of her boney pelvis cannot alter and she may well risk a recurrence of the same problem in future, with worse

consequences as she will have the added problem of a uterine scar posing the risk of scar rupture.

6. The gravidity and parity at the time of the caesarean, including how many (if any) previous caesarean sections.
7. Names of staff present and their roles, e.g. surgeon, assistant, scrub nurse, anaesthetist, midwife.
8. Timing of knife to skin, delivery of the baby and completion of surgery.

Records of the procedure

1. Type of skin incision: e.g. Joel-Cohen, Pfannenstiel, midline.
2. If there was a previous scar, was it excised?
3. Ease of access into the peritoneal cavity, any problems encountered? E.g. any adhesions to the underside of the rectus sheath? Was the dissection blunt or sharp? Was there any bleeding problem at this level?
4. In the peritoneal cavity, were any adhesions present? If so, were they divided and how? (In some difficult cases the front of the uterus may be partially or almost entirely adherent to the peritoneum or the back of the rectus sheath, rendering uterine entry very difficult, especially if the adhesions are very dense. Loops of bowel, omentum or the bladder may be caught up within adhesions). Even after careful dissection, adhesions have a tendency to reform, so this is important information to record for the future.
5. Was any problem encountered in dissecting the bladder from the lower segment of the uterus to expose the area of uterus for incision? Sometimes, especially with repeat surgery, the bladder may be very adherent and great care is necessary to avoid damage to the bladder. Any bladder damage and means of repair MUST be fully documented.
6. The condition of the lower segment:
    a) Thick
    b) Normal
    c) Thin
    d) Very thin (see-through)
    e) Intact, button hole dehiscence or rupture
7. The nature of the uterine incision:
    a) Transverse lower segment
    b) High transverse
    c) Vertical lower segment
    d) Classical (vertical and extending into the upper segment)
    e) Other
8. Any extension of the uterine incision:
    a) T-shaped
    b) J-shaped
    c) Other

9. How was the uterus opened? Knife, scissors, fingers, combination.
10. Lie of the baby prior to uterine opening and station of presenting part.
11. When the membranes ruptured? Prior to the procedure, after uterine opening?
12. Condition of the liquor: Clear, meconium stained, blood stained, foul-smelling?
13. The engagement of the presenting part (as judged by abdominal palpation).
14. Any difficulties encountered with delivering the baby, e.g. was the head deeply impacted or very high? If difficult, what measures were taken to overcome the problem and deliver the baby. If the time from uterine incision to delivery was excessive (greater than 4 minutes) this should also be recorded.
15. Any trauma to the baby, e.g. knife trauma, fractures.
16. Apgar scores, (and cord arterial and venous pH measurements, if performed)..
17. Location of the placenta within the uterus.
18. Placental separation:
    a) Spontaneous
    b) Manual
    c) Any difficulties
19. Uterine cavity:
    a) Empty
    b) Any abnormalities of the cavity: Normal, septate or bi-cornuate
20. Any problems with the placental bed: Excessive bleeding
21. Any additional measures, e.g. Insertion of balloon (Rusch, Bakri or Condom-catheter), B-Lynch suture.
22. Uterine closure:
    a) How many layers
    b) Locked sutures or not locked?
    c) Any extra heamostatic sutures required?
    d) Suture type
23. Condition of fallopian tubes and ovaries:
    a) Any abnormalities.
    b) Any procedures undertaken, e.g. Bi-lateral tubal ligation, ovarian cystectomy, oophorectomy.
24. Closure of visceral peritoneum: Yes/No
25. Closure of parietal peritoneum: Yes/No
26. Haemostasis ensured under rectus sheath. Any extra haemostatic sutures or diathermy?
27. Closure of rectus sheath: Suture type.
28. Scarpa's fascia closed: Yes/No..
29. Skin closure: Method, e.g. subcuticular, interrupted, continuous.

30. Skin closure: Type e.g. clips or suture, type of suture
31. Estimated blood loss. This is very important. Estimates of loss should be made based upon contents of any suction device (bearing in mind liquor volume may also be contained within this device, state and number of surgical swabs used, amount of blood under the patient).
32. Recommendations for any future delivery, e.g. trial of labour, planned caesarean, further delivery not advised, or not applicable (if bi-lateral tubal ligation has been performed).
33. Instructions for post-operative care, especially if the procedure was complicated, e.g. prolonged catheterization if the bladder was damaged and repaired.

This will seem a long list, but with the help of a proforma it becomes easier. All the information is important and will help to direct care for the patient both in the recovery period and in future pregnancies.

5.5 Documentation of Anaesthesia

Key learning points

- Good documentation enables effective continuation of care
- Good documentation protects the patient from future complications

The Gold Standard of record keeping is defined (Good Practice, 2006) as:

> "In providing care you must keep clear, accurate & legible records, reporting the relevant clinical findings, the decision made, the information given to patients, and any drugs prescribed or other investigation or treatment."

Record keeping

- Is an accurate health record
- Enables the patient to receive effective continuing care
- Enables the healthcare team to communicate effectively
- Allows another doctor or professional members of staff to assume care of the patient at any time
- Enables the patient to be identified without risk of error
- Facilitates the collection of data for research, education & audit

Information to be documented on an anaesthetic chart

Basic data required

- Name of surgeon(s)
- Name of anaesthetist(s)
- Date of operation
- Type of operation: e.g. caesarean section (this must include category of caesarean section) or manual removal of placenta
- Grade of anaesthetist
- Name of supervising anaesthetist (if there is one)

Patient demographics

- Full name of patient
- Date of birth
- Gender
- Hospital number
- Weight, height and BMI (ideally)

Pre-operative assessment (see Chapter 3.3)

Additional information to document

ASA grade

Table 5.5.1: ASA grade descriptors

ASA grade	Description
1	A normal healthy patient, (that is, without any clinically important comorbidity and without a clinically significant past/present medical history)
2	A patient with mild systemic disease
3	A patient with severe systemic disease
4	A patient with severe systemic disease that is a constant threat to life
5	A moribund patient who is not expected to survive without the operation
6	A declared brain-dead patient whose organs are being removed for donor purposes

Anaesthetic technique used (see anaesthetic chart examples to see how to document in full for both types of anaesthetic general and spinal).

- GA Induction technique:
  - Gas induction – document inhalation agent used
  - IV induction – document type of drug and dose used
- GA Maintenance technique:
  - Inhalation gas – end tidal of agent or MAC being administered
  - TIVA (total intravenous anaesthesia) – dose and rate of administration
- General anaesthetic extras to be documented:
  - FiO2 (e.g. if 50% oxygen is been administered to the patient FiO2 will be 0.5)
  - Tidal volume
  - Respiratory rate
  - PEEP – if available or being used
  - PIP (peak inspiratory pressure)

Intubation documentation

- Grade of intubation
- Size of endotracheal tube (ETT) e.g. size 7.0mm

Regional anaesthesia

- Spinal anaesthetic (see Table 5.5.2)

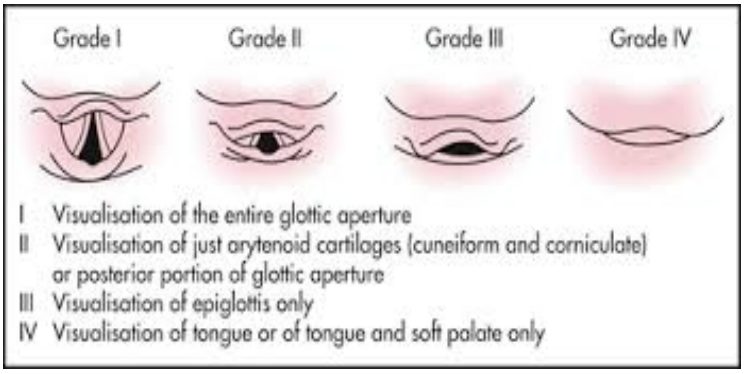


Figure 5.5.1: Intubation grades

Table 5.5.2: Example of how to document a spinal anaesthetic

Name of anaesthetist performing the spinal anaesthetic	
Time the spinal anaesthetic was inserted	
Type of aseptic technique used	hat, gloves, gown, mask, drape
Type of skin preparation used	0.5% chlorhexidine
Level of insertion	L3/L4
Number of attempts	2, first attempt bony obstruction
Spinal needle used	25G Sprotte 103mm (gauge, type of spinal needle and length)
Drugs administered	0.5% Heavy Marcaine 2.4mls with 300 micrograms Diamorphine
Block assessment	Motor block: full Sensory block: T4 (L), T4 (R) Sensory block tested with: ice and pinch
Time anaesthetic ready for surgery	23.04
Patient comfort	comfortable throughout

Intravenous drugs administered

- Pre-operative drugs given e.g. ranitidine
  - Dose
  - Time of administration
  - Route of administration
- Intra-operative drugs given
  - Dose
  - Time of administration
  - Route of administration

Anaesthetic machine & monitoring

- Document to say whether the anaesthetic machine has been checked prior to administration of the anaesthetic and by whom.

Type of patient monitoring used (this will depend on the type of anaesthetic)

- HR
- BP
- O_2 Saturations
- $ETCO_2$ (if available, as this forms part of 'Gold standard' monitoring)
- Temperature
- Urine output

Documentation of physiological variables

- Pre-induction observations must be documented
- HR, BP, O_2 Saturations & $ETCO_2$ should be recorded at least every 10 minutes throughout the case (including Induction)
- **Note** If the patient is haemodynamically unstable, observations should be recorded on the anaesthetic chart **every 5 minutes**

Fluid balance

- Venous access:
  - Gauge of cannula e.g. 18G
  - Site of insertion e.g. left forearm
- Fluid administered:
  - Type e.g. Ringer's Lactate
  - Volume im mls or litres
- Fluid output (if a catheter is in-situ):
  - Volume in mls
  - Document if its clear, blood stained, concentrated
- Blood loss:
  - Volume in mls or litres
  - Blood loss may be estimated or actual

Post-operative instructions

- Pain relief:
  - Document that the post-operative pain regime has been handed over to the recovery nurse.
- Oxygen therapy:
  - Document target saturations e.g. 94-98% so the nurse can titrate the amount of oxygen accordingly.
- Immediate post-operative fluids:
  - Type of fluid e.g. Ringer's Lactate
  - Rate fluid is to be infused e.g. 125ml/hr or 1litre to be infused over 8 hours

- Monitoring requirements:
    - What type of monitoring is require in recovery e.g. HR, BP, Temperature, fluid input/output, oxygen saturations, blood sugar.
    - Frequency of observations e.g. every 5 minutes for 30 minutes, then every 15 minutes for 30 minutes.
- VTE prophylaxis:
    - What type and time VTE prophylaxis is to be given following the spinal anaesthetic
    - **Note** VTE prophylaxis should be given 6 hours after the spinal anaesthetic has been administered

Further documentation

- Anaesthetic technique
    - What type of anaesthetic that has been discussed and agreed with the patient e.g. spinal anaesthetic or general anaesthetic
- Anaesthetic risks that have been discussed with the patient
    - Spinal anaesthetic risks
    - General anaesthetic risks
- Critical incidents or complications:
    - Any critical incidents or complications MUST be accurately documented on the anaesthetic chart
    - It is also important to inform the patient of any critical incidents or complications that arise during the operation, so this information can be relayed to other anaesthetists in the future
    - Examples of a critical incident or complication are: failed or difficult intubation, pain during the operation, major obstetric haemorrhage

Note See anaesthetic chart documentation examples for both a spinal and general anaesthetic below.

Reference

Good Practice 3rd Edition 2006 – a guide for departments of anaesthesia, critical care & pain management. Created by the RCOA & AAGBI

Date: 15/09/2018	Anaesthetist(s): Dr William King	Operation: LSCS	Surgeon(s): Miss Queenie
Theatre: 1	Skilled anaesthetic assistant: Y	Machine checked: Y	IV access: 14G L hand

Regional Anaesthetic Type: Spinal — Hat Y Mask Y Gloves Y Gown Y Chlorhex. 0.5% Y

Position: Sitting Y L. Lateral ☐ R. Lateral ☐ **Level:** L3 / L4 Midline Y Paramed. ☐ **Attempts:** 1

Spinal Needle: 25G Sprotte 103 mm — **Epidural** Needle: Space at: ____ cm Catheter at: ____cm

0.5% heavy bupivacaine 2.4 ml — 2% lidocaine ____ ml (+ adrenaline ☐ + bicarb ☐) ***and/or*** ____% bupivacaine ____ml

Diamorphine 300mcg ***or*** Fentanyl__mcg — Fentanyl____mcg +/- Diamorphine____mg **Catheter removed** ☐ **Tip** ☐

Block level: Cold: **R** T4 **L** T4 Touch: **R** T6 **L** T6 Sacral Block Y Motor Block Y

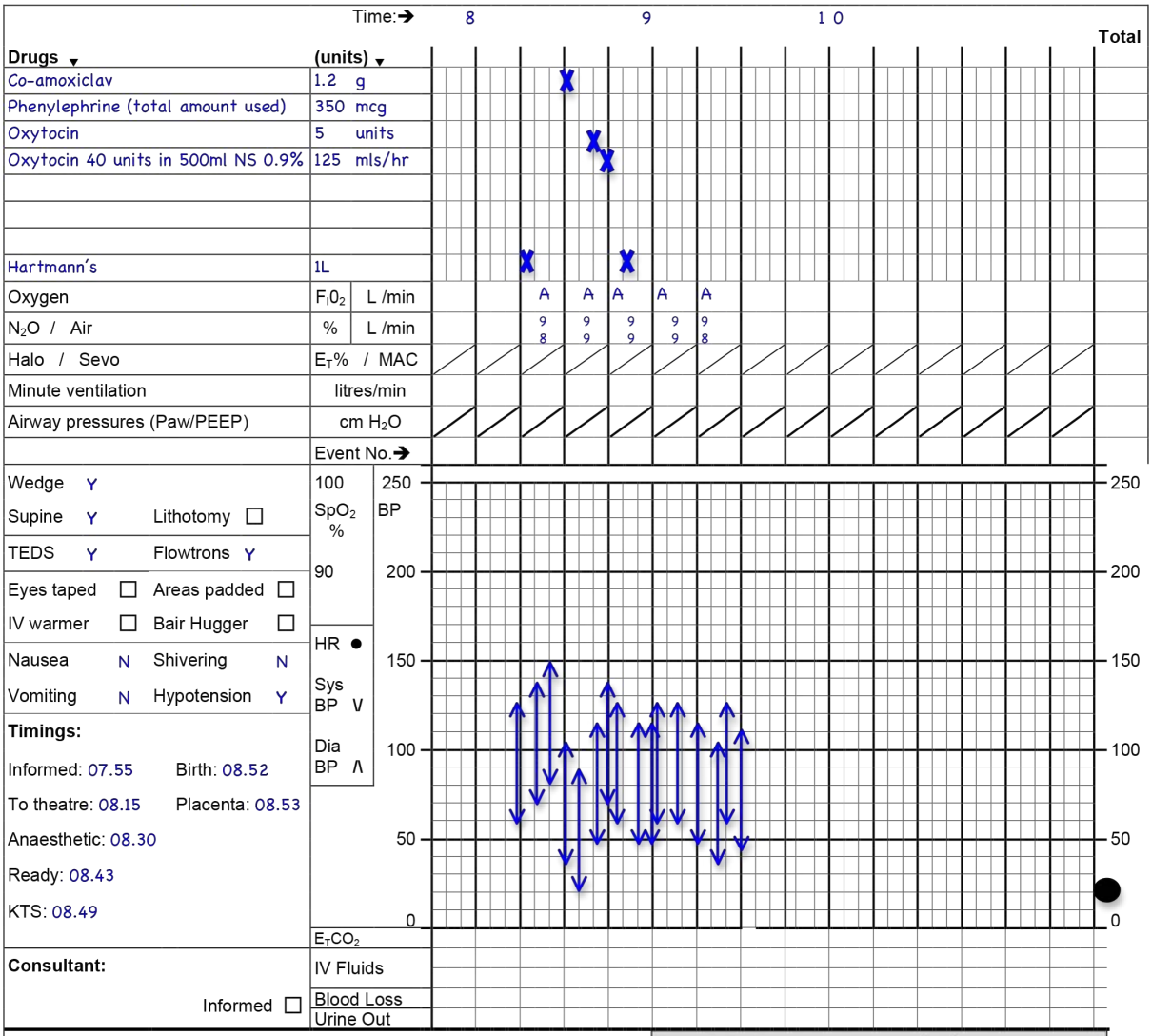
General Anaesthetic Pre-O_2 ☐ RSI + cricoid ☐ Bougie ☐ Grade:

Ventilation/comments:

Comments & Events

Patient discomfort? N GA offered? Declined?

Monitoring	
SpO_2	Y
ECG	Y
NIBP	Y
E_TCO_2	☐
$F_I O_2$	☐
Temperature	Y
Anaes. Gases	☐
Airway Press.	☐
Nerve Stim.	☐



Post operative and recovery handover: EBL 650mls

Clexane 40mg at 14.30

Name & Grade: Dr William King (Reg)

Obstetric Anaesthesia Record

PATIENT DETAILS

Hospital No. H345789

Surname: Rose

Forenames: Elizabeth

DOB: 26th July 1985

Name of anaesthetist performing the pre-operative assessment: Dr William King

Date and Time of assessment: 15th September 2018 08:00 am

Procedure proposed: Caesarean section

Assessment of urgency: CAT 2 for failure to progress

ASA: 2

BP:	110/75
HR:	83
Temp:	37.3
Weight:	91kg
Height:	1.65m
BMI:	33.4
Smoker:	No
Alcohol:	No

Anaesthetic History:

Previous GA, no issues

Previous spinal anaesthetic, no problems

Examination:

Chest clear

Heart sounds normal, no murmurs

Medical History:

Mild asthma, no hospital admissions & no recent antibiotics or steroids needed

Surgical history:

Appendicectomy

Obstetric History:

G2 P1

38+3 weeks gestation

Previous normal vaginal delivery

Antenatal problems: Iron deficiency anaemia

Placenta Location: anterior high

Starvation History:

Food: > 6 hours Fluid: > 2 hours

Airway Assessment:

Mallampati: 3

Mouth Opening: Good

Jaw Slide: Jaw A

Neck Extension: Good

Thyromental distance: > 6.5 cm

Any Dental issues? No loose teeth or dentures

Drug history: Salbutamol inhaler

Iron tablets

Acid reflux: Yes NSAIDs OK? Yes

ALLERGIES

NKDA

FBC:	Biochemistry:	Coagulation:	Group & Save: Yes	ECG: No
Hb 9.4g/dL Plts 138	Not required	Not required	Cross match:	

PLAN/CONCERNS: SPINAL ANAESTHETIC

CONSENT: ☐ Regional ☐ GA ☐ Suppository ☐ Other:

Regional anaesthesia risks

- Failure & conversion to GA
- Low Blood Pressure
- Nausea and vomiting
- PDPH (<1:200)
- Nerve damage (1:12,000)
- Itching & Shivering
- Need for a urinary catheter

General anaesthesia risks:

- PONV
- Dentition damage
- Sore throat

Post operative analgesia:

Discussed with the patient

Date: 15/09/2018	Anaesthetist(s): Dr William King	Operation: LSCS	Surgeon(s): Miss Queenie
Theatre: 1	Skilled anaesthetic assistant: Y	Machine checked: Y	IV access: 14G L hand

Regional Anaesthetic Type: GA — Hat ☐ Mask ☐ Gloves ☐ Gown ☐ Chlorhex. 0.5% ☐

Position: Sitting ☐ L. Lateral ☐ R. Lateral ☐ **Level:** Midline ☐ Paramed. ☐ **Attempts:**

Spinal Needle:

0.5% heavy bupivacaine ___ml

Diamorphine __mcg ***or*** Fentanyl__mcg

Epidural Needle: Space at: _____ cm Catheter at: _____cm

2% lidocaine ____ ml (+ adrenaline ☐ + bicarb ☐) ***and/or*** ____% bupivacaine ____ml

Fentanyl____mcg +/- Diamorphine_____mg **Catheter removed** ☐ **Tip** ☐

Block level: Cold: **R** ☐ **L** ☐ Touch: **R** ☐ **L** ☐ Sacral Block ☐ Motor Block ☐

General Anaesthetic Pre-O_2 Y | RSI + cricoid Y | Bougie Y | Grade: 2 Size: 7 ETT Tied: 21cm

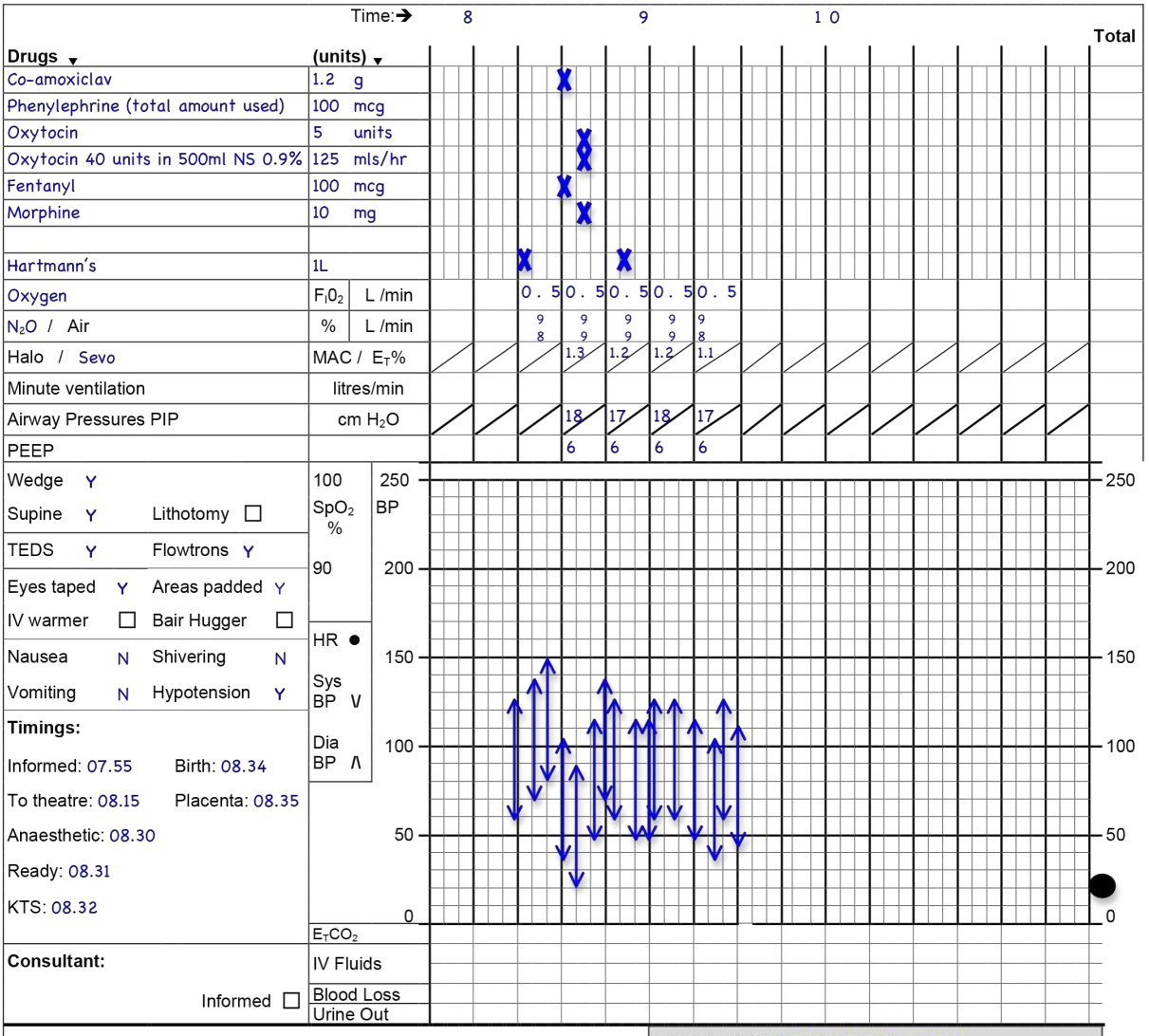
Ventilation/comments:

Induction Drugs

Propofol 200mg, Suxamethonium 150mg

Patient discomfort? N GA offered? Declined?

Monitoring	
SpO_2	Y
ECG	Y
NIBP	Y
E_TCO_2	Y
$F_I O_2$	Y
Temperature	Y
Anaes. Gases	Y
Airway Press.	Y
Nerve Stim.	Y



Wedge Y

Supine Y Lithotomy ☐

TEDS Y Flowtrons Y

Eyes taped Y Areas padded Y

IV warmer ☐ Bair Hugger ☐

Nausea N Shivering N

Vomiting N Hypotension Y

Timings:

Informed: 07.55 Birth: 08.34

To theatre: 08.15 Placenta: 08.35

Anaesthetic: 08.30

Ready: 08.31

KTS: 08.32

Consultant:

Informed ☐

Post operative and recovery handover: EBL 650mls

Clexane 40mg at 14.30

Name & Grade: Dr William King (Reg)

Module 6: Post-operative Care, Discharge Planning and Audit

6.1 Pain Management

Key learning points

- Lack of adequate pain management can lead to many complications
- The entire team are responsible for pain management
- It is important to address the cause of the pain in addition to managing the pain
- Prevention of pain is better than cure
- Always monitor patients on opiates for respiratory depression

What is pain?

Pain is "an unpleasant sensory and emotional experience associated with actual of potential tissue damage, or described in terms of such damage" (International Association for the Study of Pain)

Why should we treat pain?

Failure to manage pain in our patients puts them at risk of many complications:

- Thrombosis – pain prevents mobilisation
- Respiratory tract infection – pain prevents deep breathing and coughing
- Inflammatory changes in the body
- Untreated pain may progress to chronic pain
- Harmful psychological effects
- Delayed hospital discharge

Effective analgesia is important following caesarean section to allow the woman to mobilize. If she is not in pain, she will be able to get out of bed and care for herself and her baby.

Who is responsible for pain management?

It is the responsibility of the whole team! The anaesthetist and surgeon both play a role in preventing and treating post-operative pain. Nursing and medical staff have responsibility for assessing and treating pain in the post-operative period.

Pain Management is our Job!

How can we assess pain?

Ask the patient!

By listening to the patient, we can understand the severity of their pain, the location, nature and the likely cause. The most common cause of pain in a patient following caesarean section is due to the surgical wound. However, there are many potential causes, and taking a history and examining the patient is the key to eliciting these.

Other possible causes of pain following caesarean section:

- Constipation/ileus
- Urinary retention
- Headache – dehydration, sleep deprivation, dural puncture, venous sinus thrombosis
- Infection – urinary/uterine/wound
- Thromboembolism – causing leg pain and swelling
- Haematomas including vaginal, broad ligament
- Pre-existing pain conditions

Severity of pain

Several different scales may be used, pick one that works for your hospital. Document the pain score on the patient's chart so that you can see the trend over time.

Pain scales

Mild – Moderate – Severe (use language that the patient will understand)

Numeric scales

- 0 – 10 (where 0 = no pain and 10 = the worst pain imaginable)
- 0 – 3 (where 0 = no pain, 1 = mild pain, 2 = moderate pain, 3 = worst pain imaginable)

Objective assessment

- Increased HR, RR and BP are physiological responses to pain. They are non-specific, and may be due to other causes, but still form a useful part of the assessment of the patient with pain.

Prevention of pain

No surgery is completely painless, but we can minimize the post-operative pain by using pre-emptive analgesia. It is much easier to stay on top of pain using pre-emptive analgesia than to try and treat it when the patient is in severe pain.

Prevention is better than cure!

Intra-operative techniques to prevent pain

Spinal anaesthetic

Fentanyl is a short acting opioid and therefore will provide analgesia during the surgery but it does not provide post-operative analgesia. Intrathecal Diamorphine (300microg) or preservative-free Morphine (100microg) have longer duration of action and therefore provide post-op analgesia for up to 18 hours. However, these drugs may be difficult to procure and carry an increased risk of late respiratory depression, nausea and itching. Staff caring for the patient post-operatively should be informed of the use of any long-acting intrathecal opioids. Further opioids in the immediate post-operative period should be used with caution and the patient should be monitored for respiratory depression (RR < 10).

General anaesthetic

IV/PR Paracetamol (1g in patients > 50kg; 15mg/kg in patients under 50kg) at the end of the procedure.

PR Diclofenac (50 - 100mg) at the end of the procedure.

IV opioid may be given following delivery of the baby. This avoids transfer of the opioid to the baby. It should be given in small aliquots and the effect on HR, BP and respiration observed. The aim is to make the patient comfortable without causing respiratory depression. For bolus doses, see Table 6.1.1 at the end of this chapter.

Local anaesthetic

Patients who have had a caesarean section under GA will benefit from additional local anaesthetic/regional anaesthetic techniques. Remember that the maximum safe dose of bupivacaine is 2mg/kg, so it may need to be diluted to achieve adequate volume for the bock.

Transverse Abdominis plane blocks can be performed by the surgeon or by the anaesthetist.

Ilioinguinal nerve blocks can be performed by the surgeon or the anaesthetist.

Local anaesthetic infiltration into the wound can provide additional anaesthesia.

Surgical technique

Pfannenstiel incision is less painful than a midline incision.

Post-operative pain management

Pain in the post-operative period can have several causes. It is important to assess pain to allow us to treat it effectively.

The pain is likely to be worst on the first day following surgery, and then gradually improve. Consequently, the patient will need stronger analgesia in the early post-operative period, and this can be reduced over the subsequent days (see Figure 1). But it is important to assess the patient's pain daily, as the analgesia requirements vary between individuals.

Always consider other complications especially if the pain seems unusually severe. For example, vaginal or broad ligament haematomas can cause exceptionally severe pain, frequently unresponsive to normal analgesia. Never ignore severe pain, always look for the reason and manage specific causes. Severe pain is a warning sign!

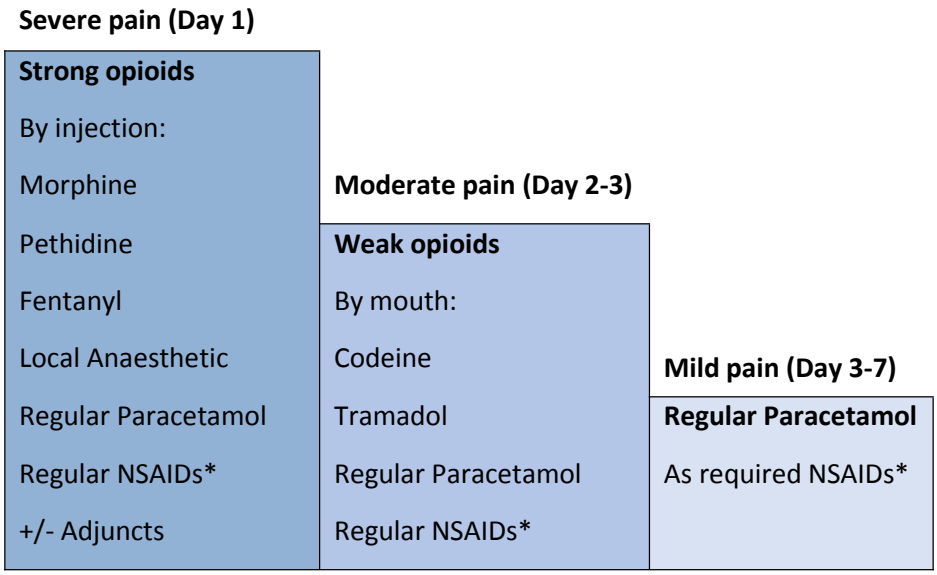


Figure 6.1.1: Post-op analgesia ladder (adapted from WFSA pain ladder)

(*NSAIDs = non-steroidal anti-inflammatory drugs, e.g. diclofenac. Adjuncts include clonidine, ketamine).

Patients receiving strong opioids should have their respiratory rate and SpO2 monitored as these drugs can cause respiratory depression. If the patient has a RR < 8 or is hypoxic, Naloxone can be administered as a 100-400mic dose IV. The Naloxone antidote will also reverse the analgesia effects of the opioid. It is short acting and an IM 400mic dose may be required to prevent ongoing respiratory depression in the case of long-acting opioids such as morphine. Other side effects of opioids include itching, nausea, constipation, ileus, confusion and sleepiness. Small amounts are transmitted in the breastmilk to the baby, and may cause sleepiness.

Paracetamol should be given regularly to patients who have undergone surgery for at least 5 -7 days. It should be avoided in patients with HELLP syndrome with severely deranged liver function as it is hepatotoxic.

NSAIDs such as Ibuprofen or Diclofenac can be given regularly in the first few days following surgery and then as required. They can cause gastritis and renal impairment and should be avoided in patients with severe PET (though they are safe in mild cases), renal impairment and patients with a history of gastric ulceration. If the patient has had a major haemorrhage and difficult haemostasis, they should not be used in the immediate post-operative period as they have anti-platelet effects. Asthma is not an absolute contraindication to NSAID use, as only a small number of patients with asthma have adverse effects. Check with the patient if they have had any problems before.

Adjuncts such as Ketamine or Clonidine can be used if the patient has severe acute post-operative pain that is difficult to control with opioids, paracetamol and NSAIDs. Ketamine can cause delirium and hypertension, it should be avoided in patients with PET. Clonidine can cause sleepiness and hypotension, it should be avoided in shocked patients. Give small aliquots and assess response.

Non-pharmacological methods

Anxiety and stress will increase pain, so providing support, explanation and reassurance to the patient will help her. Other strategies that may benefit include massage, heat or cold and gentle exercise.

Table 6.1.1: Drug doses for post-op pain relief

Drug	IV bolus dose	PO/PR dose	IM dose	Side effects
Opioids				
Fentanyl	10-15 microg			**All opioids:** Respiratory depression, nausea, itching, drowsiness, constipation, confusion, accumulate in renal impairment. **Avoid** Pethidine and Tramadol in patients with epilepsy/on MAOIs
Morphine	2.5 – 5mg	10-20mg 2hrly PO	0.1-0.2mg/kg 4hrly	
Pethidine	25-50mg	50 -100mg 2hrly PO	25-100mg 4hrly	
Codeine	Do not give IV	30-60mg 6hrly PO		
Tramadol	50-100mg 6hrly	50-100mg 6hrly PO		
Paracetamol	1g 6hrly if > 50kg 15mg/kg if < 50kg	1g 6hrly if > 50kg 15mg/kg if < 50kg		**Avoid in HELLP** with severe liver derangement
NSAIDs				
Ibuprofen		200-400mg PO 8hrly		Gastritis, renal failure. **Avoid in severe PET/renal failure/major haemorrhage**
Diclofenac		25–50mg PO/PR 8hrly		
Adjuncts				
Clonidine	150 – 300mic over 5min (can be given 8hrly)			↓BP, ↓HR, sleepiness. Monitor BP and HR
Ketamine	0.125-0.5mg/kg			Delirium, hallucinations, ↑HR, ↑BP. **Avoid in PET**

6.2 Postoperative ward care

Key learning points

- Care for the patient does not stop when she leaves theatre, there is much that should be checked daily
- Psychological and emotional support are as important as caring for physical needs, especially where the outcome has not been good.
- Good post-operative care is key to a good recovery. Midwives, anaesthetists and obstetricians are all involved in providing this care.

The following are all necessary components of care:

- Observations
- Checking for danger signs
- Provision of analgesia
- Infection prevention
- Wound care
- Bladder care
- Thrombo-prophylaxis
- Food and drink
- Support with breastfeeding
- Neonatal care
- Communication with mother and family
- Emotional and psychological support
- Family planning advice

Observations

Once the patient has been discharged from the recovery area and moved to the postnatal ward, it is necessary to continue to record observations. Observations are key to safe patient management. They are objective measurements rather than opinions, and as such give a clear guide as to how the patient is progressing, particularly if used in conjunction with an Early Warning Scoring chart.

If the observations are not within the normal range, the patient's condition may be deteriorating. the frequency of observations should be increased to monitor the effect of action taken following diagnosis and the instigation of treatment.

In addition to vital sign observations, fundal height and lochia should be checked daily. Both of these should decrease consistently. If either increase, there may be a problem with retained products and/or infection and the patient should be reviewed thoroughly.

Finally, any wounds should be checked, whether abdominal or perineal, for signs of infection, haematoma or wound breakdown. In the absence of inspection, signs will be missed.

Table 6.2.1: Recommended frequency for post-operative observations

Observation	Frequency
Pulse	4-hourly for 24 hours then twice daily
Respirations	4-hourly for 24 hours then twice daily
BP	4-hourly for 24 hours then twice daily
Temperature	4-hourly for 24 hours then twice daily
Conscious level	4-hourly for 24 hours then twice daily
Fundal height	Daily
Wound	Daily
Lochia	Daily
Legs (for signs of DVT)	Daily

Analgesia

Remember that the post-caesarean patient has undergone major abdominal surgery and as such requires analgesia. Treatment of pain relieves discomfort but also helps to improve mobility, reduces length of hospital stay and enhances recovery.

A patient in pain will fail to mobilise normally, suffer from sleep and appetite loss, and may be irritable or anxious. They may be tachycardic and sweating.

Assess pain for:

- Site
- Character
- Severity
- Duration
- Cause

Severity of pain should be assessed using a measurement scale

Consider possible causes of post-operative pain

- Abdominal
    - Surgical wound
    - Urinary retention
    - Constipation/ileus
    - Uterine contractions (after pains)
    - Intra-peritoneal haemorrhage
    - Haematoma (vaginal or broad ligament)
    - Infection

- Headache
    - Dural puncture
    - Meningitis
    - Venous thrombosis/intracranial haemorrhage
    - Dehydration
    - Migraine

Always seek for and treat the **cause** of the pain, in addition to treating the pain itself.

Note It is of particular importance to provide adequate analgesia for post-operative patients with sickle cell disease, as a crisis may be precipitated by severe pain.

Infection prevention

Antibiotic prophylaxis is best given between 30 to 60 minutes before the caesarean incision is made but if the degree of urgency is too great, any time prior to starting surgery is beneficial. Prophylactic antibiotics have been found to reduce the incidence of endometritis, wound infection, urinary tract infection and fever by more than half. If there are additional risk factors, such as prolonged membrane rupture, prolonged labour or maternal pyrexia in labour, consider giving a prolonged course of antibiotics.

Wound care should be given in accordance with local protocols but in the absence of such guidance, remove the wound dressing after 24 hours, or earlier if soaked through. Clean the wound gently with sterile saline for the first 48 hours, after which the patient should be encouraged to shower daily. Observe the wound daily for signs of infection e.g. pain, redness or discharge. (Redness may be less visible in women with dark skin).

An infected wound may break down. There may be a discharge of pus from the wound. Any collection should be drained. The wound may need exploration, debridement and packing to allow for healing by secondary intention following dehiscence or exploration

Wound infections should be treated with broad-spectrum antibiotics. It is best to give antibiotics intravenously for the first 48 hours to ensure adequate tissue levels. If it is possible to culture bacteria in the laboratory, a swab should be taken prior to commencing antibiotics. If the infection does not improve or becomes worse after 48 hours, if possible, check the cultures and alter the antibiotics as appropriate. Beware of necrotizing fasciitis, usually caused by Group A streptococcus. This infection, although rare, is increasing in incidence and is potentially lethal. If present, the wound should be opened and debrided widely until healthy tissue is reached. Antibiotic treatment consists of high dose intravenous antibiotics. A combination of Benzyl penicillin, Clindamycin and Gentamycin can be used, unless the patient has a penicillin allergy.

Encourage frequent sanitary pad changes.

Encourage patients to wash their hands before and after using the toilet.

Staff should always wash their hands between attending to patients.

The physical environment should allow for 1-2 metres between beds and be well ventilated. Bathrooms and toilets on the ward should be kept clean.

Wound haematoma

Wound haematoma may present with a tender swollen abdomen. The swelling will usually feel superficial and fixed. If blood loss into the haematoma is large, the patient will show signs of cardiovascular compromise, as evidenced by early warning scores.

Haematomas may be superficial (between the rectus sheath and the skin) or underneath the rectus sheath.

Sub-rectus sheath haematomas usually require re-opening of the wound in theatre for exploration to drain the haematoma and find the source vessel. They may drain into the peritoneal cavity and the loss may be sufficiently heavy to cause shock or severe anaemia. Finding the source vessel is often difficult but attempts should be made to locate and ligate any vessels likely to be responsible. If in doubt as to whether the source has been located, close the wound with a drain in situ to avoid re-accumulation of the haematoma.

Bladder care

Once a patient is mobile following caesarean section, remove the bladder catheter (a minimum of 12 hours after spinal anaesthesia). Encourage mobilization and ask the woman in detail about bladder emptying. It is important to differentiate between good voiding and a small overflow trickle, so ask the patient if she is managing to pass good volumes of urine, much as she usually does, or whether she feels that she cannot empty her bladder well. Feel her abdomen gently to ascertain whether there is a palpable bladder. If so, then ask her to void then palpate again.

If the bladder is still palpable re-catheterise.

It is really important to avoid over-distension of the bladder as this can result in bladder wall denervation and chronic voiding problems.

In the event that the bladder is rested with a catheter for several days and the patient is still unable to void satisfactorily, ideally a referral to a urologist should be made. If this is not possible then the next option would be to insert a supra-pubic catheter, so that the patient can try to void per urethra but the residual can be emptied via the supra-pubic catheter to avoid over-distention. Once residuals are less than 200 mls consistently, the catheter should be removed altogether. If using a supra-pubic catheter is not possible, re-insert a urethral catheter and leave for a further two weeks.

If there has been a bladder injury identified at caesarean necessitating a repair to the bladder wall, the patient should be catheterized for 10 days following surgery, to allow the bladder to rest whilst healing takes place.

Ascertain whether the patient has uncontrollable leakage of urine, particularly after a prolonged labour or a complex caesarean. Uncontrolled leakage is a sign of fistula.

Note If, when conducting a dye test to look for the source of the fistula using a methylene blue installation in the bladder, clear urine is still leaking into the vagina, this is a sign of a ureteric fistula.

Small fistulae may close spontaneously following a prolonged period of catheterisation. If a fistula is suspected, leave the catheter in situ for two weeks.

Beware of urinary tract infections, especially with prolonged catheterization, and treat with appropriate antibiotics.

Thromboprophylaxis

As discussed in the danger signs chapter, there is a need for vigilance regarding deep vein thrombosis and legs should be examined daily to check for unequal swelling. The hospital should have a policy regarding which patients should be offered prophylactic treatment whilst they remain relatively immobile.

Food and drink

Women should be encouraged to drink plenty of water and eat a nutritious diet to facilitate the establishment of breast feeding and augment recovery. Watch for signs of abdominal distension that may signify the onset paralytic ileus or Ogilvie's syndrome (see chapter 2.10).

Breast feeding

Do not assume that women automatically know how to breast feed. Many primiparous women are uncertain as to what to do. Following a caesarean it may be less painful for a woman to breast feed lying on her side with the baby beside her rather than have the baby rest on her abdomen. If she is having difficulties encourage her to try different positions. She may need assistance to ensure that the baby latches on to the breast correctly and staff should provide support to ensure initiation and maintenance of breast feeding. Breast feeding should be initiated within one hour of delivery if at all possible. Encourage skin to skin contact throughout the postnatal period.

Neonatal care

Provide all aspects of essential newborn care. Remember that transient tachypnea of the newborn is common following caesarean and neonates showing signs of respiratory distress may need supplemental oxygen via nasal prongs.

Monitor babies delivered by caesarean for suspected fetal distress for signs of hypoxic ischaemic encephalopathy and refer to a paediatrician if necessary. Remember convulsions in the newborn can be very subtle and may not be manifest by full blown grand-mal convulsions but rather by smaller more localized abnormal movements.

Babies born following prolonged membrane rupture should be monitored for signs of infection, but any baby may develop an infection. Always inspect the baby carefully when examining the mother.

Communication with the mother and her family

Provide opportunities for the mother to ask about her caesarean and ensure she understands why it was done. Provide her with information as to how she might expect to recover and explain what is normal.

Set aside time to discuss plans for future deliveries if she intends to have further pregnancies. For women who must be delivered by caesarean (for example those who have had two or more caesareans or those delivered by classical section) ensure that this is well understood and that the woman is aware not to wait until she goes into labour next time before coming to hospital.

For women suffering from complications, ensure that the problem is clearly explained in addition to plans for management.

Explain any test results and subsequent treatment.

If the baby is in special care provide regular updates as to the condition of the baby.

Emotional and psychological support

Always respect the woman's feelings. Remember she may be very distressed following an emergency procedure. If she is not yet ready to talk, offer to return later if she wishes.

Offer to talk with family members present if she prefers.

After a bad outcome, the woman may prefer to talk to an alternative staff member rather than those involved at the time. If so, respect her wishes and provide another staff member to talk with her.

Ensure follow up is arranged if necessary and check whether the woman is in need of family planning. If so, provide her with family planning counselling prior to discharge.

Family planning

Women should be counselled regarding birth spacing and offered appropriate family planning advice prior to discharge. Following a caesarean section a minimum interval of 18 months is advisable prior to the next delivery.

6.3 Counselling for future deliveries following caesarean section

Key learning points

- Counselling for the future following caesarean is an essential component of good care
- Women need information as to the reason for the intervention following caesarean delivery
- Risk prediction is not precise but successful VBAC carries the least long-term risk

It is very important to set aside time for counselling following caesarean delivery.

Women experience many different thoughts, ideas and emotions following a caesarean delivery, especially if the caesarean was unexpected or occurred in the fraught, difficult circumstances of an emergency delivery.

Bear in mind as you talk to her, that your patient may be confused, disappointed or sad, and she may feel a sense of failure for not having delivered vaginally. Alternatively, she may feel happy and relieved. She may have concerns as to the cost of the procedure and how she and her family will manage to pay and she may be worried about future deliveries or even fearful that she may not be able to have another child.

Your patient will inevitably be keen to understand what is likely to happen the next time that she gives birth, if she plans further pregnancies.

Be especially sensitive when counselling women who have experienced a stillbirth or neonatal death. Ensure that the patient is ready to talk and offer to return later if she is not. She may wish to speak alone or with family members present.

When counselling for future mode of delivery consider the following factors:

- The woman's wishes regarding her future mode of delivery
- How many more children she may desire
- Any specific co-morbidities
- Any specific anaesthetic risks

In addition, always ensure that the woman does understand clearly why a caesarean delivery was necessary.

For some women, vaginal birth after caesarean (VBAC) is absolutely contra-indicated:

- Previous uterine rupture
- Classical caesarean scar
- J or inverted T-shaped uterine incision
- More than 2 previous caesarean sections
- Placenta praevia in the next pregnancy

A woman may ask as to the likelihood of success if she attempts a trial of labour in her next pregnancy.

There is no way of predicting the outcome of labour with certainty, but there are risk factors to take into consideration. However, sometimes even women with many adverse factors will achieve a

vaginal delivery safely and women with no apparent adverse factors will require a repeat emergency caesarean section.

Factors associated with a greater chance of successful VBAC (RCOG 2015):

- Younger age
- Prior vaginal birth, especially prior successful VBAC
- Caesarean for non-recurrent reason
- Spontaneous rather than induced labour

Factors associate with a lower chance of successful VBAC:

- High Body Mass Index (BMI)
- Prior caesarean for failure to progress
- Maternal co-morbidities
- Increased fetal size
- Induced labour
- No previous vaginal birth

Some of these factors cannot be known in advance of the next pregnancy, for example, fetal size. However, you can explain to your patient how these factors will play into the advice you would give her in her next pregnancy regarding mode of delivery.

Always remember that your role is to offer advice rather than to tell the patient what she must do.

Women will often wish to know what the safest option would be for future deliveries.

This is difficult to answer as there is a conflict between what is safest for the mother and what is safest for the baby. Research has found that a repeat caesarean will avert 83 perinatal deaths per 100,000 women but repeat caesarean also results in 9 additional maternal deaths per 100,000 women. (Guise et al 2010).

Overall, the outcomes in order of decreasing safety are:

- Successful trial of labour
- Elective (planned) caesarean
- Emergency caesarean in labour following failed trial of labour

Whilst many women will opt for a trial of labour, for some there will be a preference for an elective caesarean in order to avoid the risk of a failed trial of labour. For such women, it is really important to discuss longer term risks of repeat caesarean, including those of placenta praevia and placenta accreta, and associated life-threatening major haemorrhage. There are also greater risks of stillbirth following caesarean.

In terms of absolute risk, one large population-based study (Thurn et al 2016) reported absolute risks of abnormally invasive placenta (AIP) as follows:

Table 6.3.1: Risk of abnormal placentation

	Risk/10,000
No previous caesarean section	1.6
1 Previous caesarean	10.4
2 previous caesareans	27.5
≥ 3 previous caesareans	88.0
Placenta praevia	417
Placenta praevia and previous caesarean	878

Although absolute risks are low overall, for women with previous caesarean section(s) and a placenta praevia the overall risk of AIP is as high as almost 9%.

It is important that women understand this risk when opting for a caesarean that is not medically indicated, especially in the context of a setting where total fertility rates are high and couples prefer to have larger families.

In addition to this, risks of haemorrhage, infection, operative injury, uterine rupture or dehiscence and hysterectomy all rise with subsequent caesarean section as compared to successful VBAC.

Women need to be given accurate and full information in order to choose whether to deliver again and whether to opt for a trial of labour. Such counselling is time consuming, but necessary if optimal care is to be delivered

References

Guise, J. et al. (2010). Vaginal birth after cesarean: new insights on maternal and neonatal outcomes. Obstet Gynecol, 115(6), pp. 1267-1278.

Thurn, L. et al. (2016). Abnormally invasive placenta – prevalence, risk factors and antenatal suspicion: results from a large population-based pregnancy cohort in the Nordic countries. *BJOG,* 123 (8), pp. 1348-1355.

RCOG. (2015). Birth after previous caesarean birth. Green top guideline 45. Available at: https://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg45/

6.4 Audit in operative obstetrics

Key learning points

- Audit is key to the delivery of care of an appropriate quality
- It is about checking that things already known to be beneficial are actually done
- To be effective, audit requires completion of the audit cycle

Audit is different from research, although both aspire to improve the quality of patient care. With research, a question is being addressed about which there is genuine equipoise. In other words, the research is being conducted because it is not known whether a particular treatment or intervention is more or less beneficial as compared to an alternative, or to doing nothing

Audit is not designed to address whether or not a treatment or intervention is beneficial, it is about measuring the extent to which practices known to be beneficial are actually put into practice. Sometimes we can make an assumption that we are doing everything correctly, only to discover in the process of audit that this is actually far from the reality.

Audit should be undertaken as part of a process of continuous quality improvement. This is known as the "Audit cycle".

The Audit Cycle

1. A standard is set using the best available evidence, preferably from systematic reviews. (For example, a standard might be: 100% of patients undergoing a caesarean section should receive prophylactic antibiotics prior to skin incision)
2. The standard is audited by counting the proportion of patients for whom the standard is achieved (e.g. the proportion of caesarean patients who actually receive antibiotics prior to skin incision)
3. The results of the audit are analysed to determine what if any changes need to be made with the aim of achieving an improvement
4. The change(s) are implemented
5. The audit is repeated to determine whether the changes that were implemented were effective in achieving the desired improvement in adherence to the standard.

Audit cycles need to be repeated periodically even after the standard has been achieved to ensure that quality of care is maintained. Standards also require adjustment as new treatments and interventions of proven benefit come on line.

Audits should not be unduly onerous and a representative audit can be undertaken using a sample number of cases over a defined time period. Using the example above, 50-100 consecutive caesarean cases could be audited.

Designing an audit proforma

The audit proforma is a form on which data is collected. It may be a paper or electronic form. It is often useful to first develop a draft proforma and try it out with a few cases. This may lead to the realisation that other useful data should be included and the proforma can then be revised prior to completion of the main audit.

The sources of the data for collection need to be identified. In the example above, this would probably be the patients' drug charts. This information could be triangulated by using the WHO safe surgical check list for each patient, and/or their anaesthetic charts.

It is important not to exclude patients for whom the data has not been recorded. Good record keeping is intrinsic to patient care and if this data has not been recorded anywhere then this in itself needs to be raised as a concern and changes made. It should go without saying that there is a requirement that all medications given to patients are documented. Therefore, in this example it is important to collect information as to whether the antibiotics were documented as given at the right time (prior to skin incision), at an incorrect time, or not documented as having been given at all.

Depending upon the results of the audit, a plan for improvement should be put in place. In order to achieve improvement, it is often necessary to disseminate information regarding the desired plan in several places and ways.

The results should be presented at a regular departmental audit meeting. The members of the team present should discuss a SMART team plan to improve the outcome as necessary. This might include, for example, the placement of posters in strategic areas reminding staff regarding antibiotic administration and a request for staff in charge to pass on a reminder during ward hand-overs for the next week. If a specific question regarding the administration of antibiotics is not included in the first part of the WHO safe surgical check list then the list should be adapted to include it. Once these and any other measures recommended by the team have been instigated then the audit should be repeated.

If the repeat audit shows that results have improved to meet the standard set, then it is simply necessary when to conduct a repeat audit at a future date. If the standard is still not being met then the team need to consider investigating where the blockage to implementation lies and make further plans for change prior to re-audit.

6.5 Investigating adverse clinical incidents

Key learning points

- Adverse incidents on the facility trigger list should be investigated
- A no-blame culture is key to successful investigation
- Lessons learned should translate into action and improvement
- Improvement should be measurable and verifiable

In all organisations, including health facilities, things go wrong from time to time. In clinical obstetrics, the consequences of adverse events may be severe and long lasting. It is essential that all such events are investigated impartially, and lessons learned, resulting in changes made and safeguards put in place in order to minimise the risk of such events being repeated.

It is useful for facilities to have a "trigger list" of events requiring investigation. This list can be updated and altered as appropriate for each institution and does not preclude cases not covered by the lists.

Suggested incidents triggering investigation

Maternal incidents

- Maternal death
- Major obstetric haemorrhage (2000 mls or more)
- Cases requiring return to theatre
- Eclampsia
- Obstetric hysterectomy
- Anaesthetic complications
- Cases admitted to intensive care
- Failed assisted vaginal deliveries
- 3rd/4th degree tears
- Uterine rupture
- Cases readmitted in the puerperium

Neonatal incidents

- Fresh stillbirth >500 grams
- Neonatal death
- Low Apgar scores <7 at 5 minutes
- Cases of neonatal seizures
- Neonatal trauma
- Unexpected term admissions to Special Care

Organisational issues

- Retained swabs
- Medication errors
- Faulty or missing equipment
- Delay in response to a call
- Hospital acquired infections

Investigating an incident

Each investigation commences with identification of the incident.

- Investigators should be selected. It is advisable to institute a multidisciplinary investigation team or investigators who have not been involved in the case themselves.
- The investigators then go about gathering data concerning the incident. This may take the form of requesting factual statements concerning the events from those involved in the care of the patient. Appropriate guidance should be provided to those making statements as to what is required, but in the main all such statements should provide a factual account only. They should be reassured that the aim of the statements is not to apportion any blame but simply to establish the facts about what exactly happened.
- Other sources of data should be examined such as labour ward logs, staff rosters and existing guidelines.
- The investigating team should compile a chronology of the incident, detailing when things happened and in what order.
- The team will identify problems that occurred in delivering care to the patient and identify contributing factors
- An action plan should then be created with steps to be taken to prevent similar incidents in the future. Action plans should state who is responsible for each action and when the action should have been enacted. Action plans can be audited at a later stage to ensure completion.

Structures to frame investigations have been suggested, including the fishbone analysis structure and the 5 WHYs.

Fishbone analysis

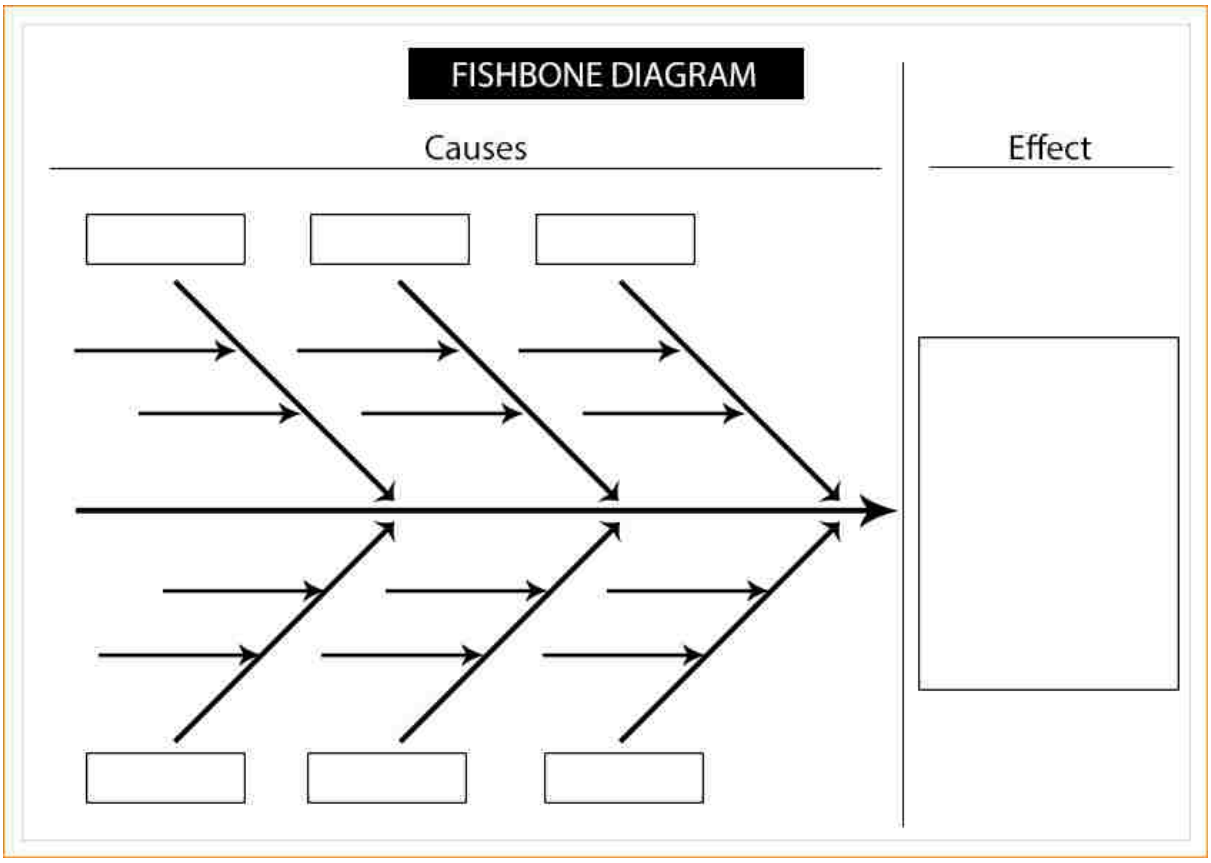


Figure 6.5.1: An example of a fishbone diagram

This model is useful when, as is usually the case, there are multiple contributory factors. Causes can be categorised under various headings, for example, providers, processes, organisational causes and equipment. Under each of these headings (and any others) there will be secondary causes. For example, consider a case where a baby is born asphyxiated and goes on to develop neonatal seizures. Under "providers" it might be that a provider has not been adequately trained in fetal heart monitoring. Under "organisational causes" for the same case, lack of capacity in the form of adequate staffing on the labour ward may be relevant, and under "equipment" there may be insufficient fetal heart monitoring devices such as Pinard's fetoscopes, or batteries to supply Sonicaids. Unless all these factors are considered, appropriate action cannot be taken to reduce future risk.

Considering the 5 whys, it is generally believed that there is frequently a chain of reasons as to why things happen. For example, in the case above, the chain of whys may run like this:

Changes in the fetal heart rate not acted upon:

Why: The midwife not aware of the significance of the changes

Why: She had not attended training regarding fetal monitoring in labour

Why: Training event occurred when she was on night duty and not repeated to capture those who missed it

Why: Trainers assumed that those who attended would cascade the training to those who couldn't attend

Why: Lack of a shared learning and mentorship culture in the organisation

This analysis helps to understand the changes that should be put in place to ensure better dissemination of on the job training.

The general ethos of investigations and root cause analysis should be blame free with an emphasis on learning from mistakes in order to avoid them in future.

However, sometimes evidence will reveal practice that is counter to professional standards, and when this is the case, appropriate disciplinary action must follow. For example, if it was found that a member of staff was found to have been at work under the influence of alcohol causing impaired judgement then they should be suspended from practice pending proof of appropriate therapy. Alternatively, if staff are found not to have provided care because a patient was unable to pay a bribe, then these staff should be subject to disciplinary measures in line with stated unit policy.

Action plans

In the case above, the action plan could include:

Table 6.5.1: An example of an action plan

Action	By whom	By when	Evidenced by
Train all labour ward staff in fetal heart interpretation	Dr X	Within 1 month	Copies of training register
Purchase batteries for Sonicaid	Admin	Within 1 week	Equipment check as per protocol
Review labour ward staffing	Matron	Within 3 month3	Rota shows improved staffing level

Some actions may be easier to achieve than others, for examples, ensuring an adequate supply of batteries for Sonicaids is a much easier fix than finding funds to recruit more labour ward midwives. Nevertheless changes that are necessary to achieve an improved level of patient safety and reduce future risk should always be aspired to and documented.

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