Scottish Core Obstetric Teaching and Training in Emergencies "SCOTTIE" Course Manual

Edited by Brian Magowan and The SCOTTIE Working Group on behalf of the Scottish Multiprofessional Maternity Development Group, 2006

Promoting multiprofessional education and development for maternity care in Scotland

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The Scottish Core Obstetric Teaching and Training in Emergencies (SCOTTIE) Course

The aim of the course is to provide participants with the knowledge and skills to manage emergencies in pregnancy and childbirth. It is suitable for all maternity care professionals working in all care environments in Scotland.

By undertaking this course you should be able to:

- Develop an understanding of the physiological processes that can lead to emergencies in pregnancy and childbirth
- Practice the immediate management of emergencies in a simulated clinical setting.

During the course you will be supported by Instructors who are experienced teachers and who are committed to the principles of the Scottish Multiprofessional Maternity Development (SMMD) Programme - an evolving programme of courses designed to meet the needs of healthcare professionals involved in the delivery of maternity care.

The 'SCOTTIE' Course is one of the skills-based courses developed and rolled out by the SMMD Programme in support of maternity-care professionals across Scotland as recommended in the Report from the Expert Group on Acute Maternity Services (Scottish Executive Health Department, 2002).

Contact details:
SMMD Programme
NHS Education for Scotland
Westport
102 Westport
Edinburgh EH3 9DN
Telephone: 0131 656 3377 / 3378 / 3388

Helene Marshall
Programme Director
helene.marshall@nes.scot.nhs.uk
(0131 656 3378 / 07908 644166)

Hayley Christie
Programme Co-ordinator
hayley.christie@nes.scot.nhs.uk
(0131 656 3377)

Kate Silk
Programme Administrator
Kate.silk@nes.scot.nhs.uk
(0131 656 3388)

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And to the course development group workers:

Alan Mathers	Consultant Obstetrician and Gynaecologist, Glasgow
Andrew Thomson	Clinical Lecturer in Obstetrics and Gynaecology Argyll and Clyde
Anne Findlay	Charge Midwife, Lothian
Anne Matthew	Education and Research Officer, RCM, Scotland
Brian Magowan	Consultant Obstetrician and Gynaecologist, Borders
Catriona Connolly	Consultant Anaesthetist, Tayside
David Evans	Consultant Obstetrician and Gynaecologist, Elgin
Debbie Baxter	Charge Midwife, Lothian
Di Clarke	Practice Development Midwife, Glasgow
Elizabeth Mansion	Scottish Multiprofessional Maternity Development Programme Director, NHS Education Scotland
Gill Allan	Senior Clinical Midwife, Tayside
Graham Stewart	Consultant Paediatrician, Argyll and Clyde
Hilary MacPherson	Consultant Obstetrician and Gynaecologist, Forth Valley
Jaki Lambert	Clinical Midwife Specialist, Mid Argyll
Jenny Boyd	Consultant Obstetrician and Gynaecologist, Fife
John McClure	Consultant Anaesthetist, Lothian
Mary McElligott	Practice Development Nurse/Midwife, Western Isles
Margaret McGuire	Nursing Officer, Women and Children Directorate of Nursing, Midwifery and AHP, Scottish Executive Health Department
Pamela Johnston	Consultant Anaesthetist, Tayside
Rhona Hughes	Consultant Obstetrician and Gynaecologist, Lothian

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“Shall this pitiless and deliberate sacrifice of human life to conditions which are more or less preventable continue, or be arrested?”

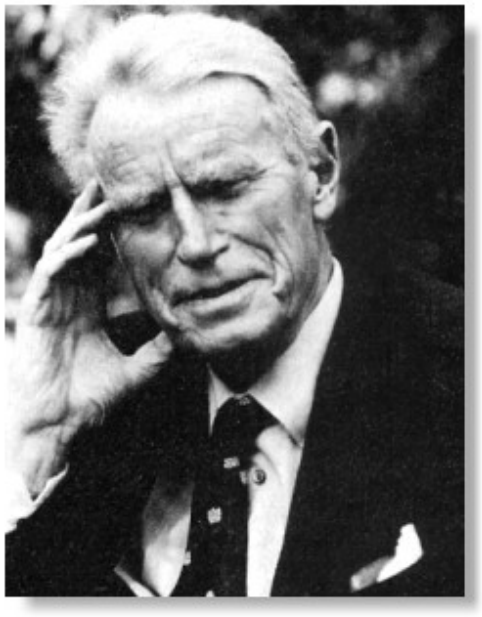
Professor James Young Simpson
(1811–1870)

University of Edinburgh
Pioneer of Obstetric Anaesthesia

“The case for sonar may be dangerously overstated … clinical observation and common sense are still paramount.”

Professor Ian Donald
(1910–1987)

University of Glasgow
Pioneer of Obstetric Ultrasound



Introduction

What is in this manual matters. The guidance here is not about our own personal development or about ticking a box to say that we have been on appropriate study days. In emergency situations, training and experience make the difference between a good outcome and a human tragedy. What is in this manual is about people, the birth of their children, and hopefully the birth of their children's children. It is up to you to make the most of the training.

The participants on the course may have substantially different backgrounds and very different experience. Some may never have delivered a baby (hence the chapter on normal delivery) and may only have to do so if there is no-one else around. Others will have dealt with all the complications described in this manual, and may be looking to consolidate their experience (hence, for example, the details of magnesium sulphate toxicity, references for the B-Lynch suture and infusion details for labetolol).

The Group that developed this manual are very aware that, while some of the recommended practice included here is based on robust research evidence, much is simply based on clinical experience. Different people have different ways of doing things, and different units or regions may have their own guidelines which need to be taken into account as perfectly valid alternatives.

We hope you find the training useful. Once again, it is something that can make a difference, and it is you that will have to live with the consequences whatever the eventual clinical outcome.

Note on accuracy:

While every care has been taken to ensure that the details in this manual are accurate, no responsibility is accepted for errors which may lead to adverse clinical outcomes. Drug doses, in particular, should be checked before administration.

Chapter 1

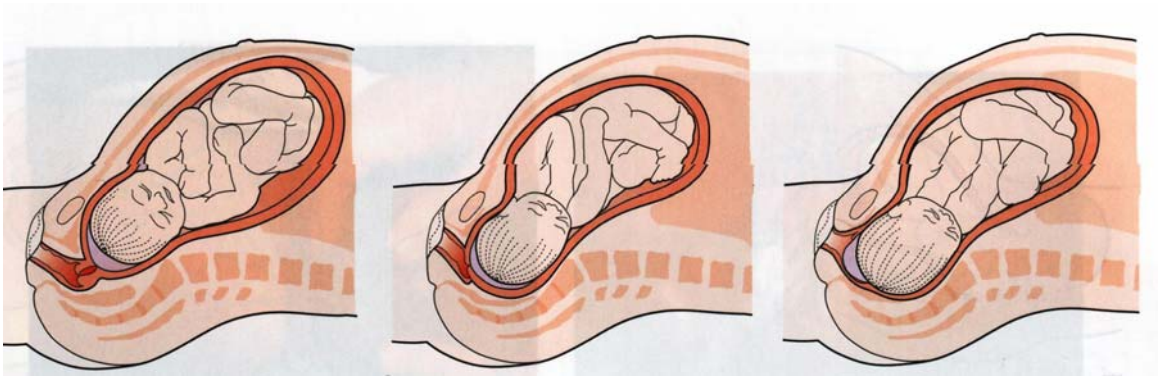
Normal labour

The important thing about normal labour is that it is normal (see *Scottish Normal Labour and Birth Course Manual*). Nonetheless, it is worth summarising the key points for those with limited experience in delivering babies.

The mechanism of labour involves:

- effacement and then dilatation of the cervix to 10 cm, i.e. full dilatation (first stage of labour)
- from full dilatation to expulsion of the baby by uterine contractions and maternal effort (second stage)
- from birth to the delivery of the placenta (third stage).

The position of the head is described according to the position of the occiput (or back of the baby's head) in relation to the mother's pelvis. The flexed head usually enters the inlet of the pelvis in either the right or the left occiputo-transverse (occiputo-lateral) position (Fig. 1a).



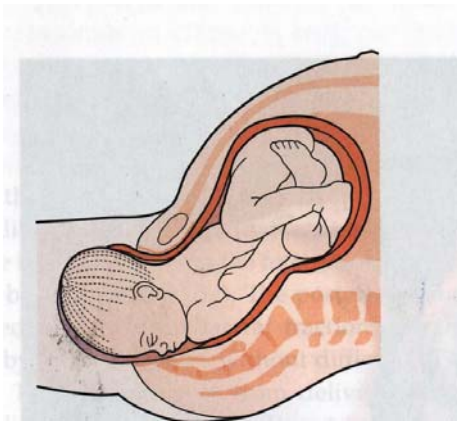
a **b** **c**

Fig. 1 (a, b and c): Normal labour.

As the head descends it reaches the V-shaped pelvic floor at the level of the ischial spines (Fig. 1b). The V-shaped pelvic floor (which runs antero-posteriorly) encourages the head to rotate, usually to the occiputo-anterior position (Fig. 1c, d). The head then descends beyond the ischial spines and extends, until the occiput

escapes under the pubic arch. As the head descends further it distends the vulva until it is eventually delivered (Fig. 1e,f).

d



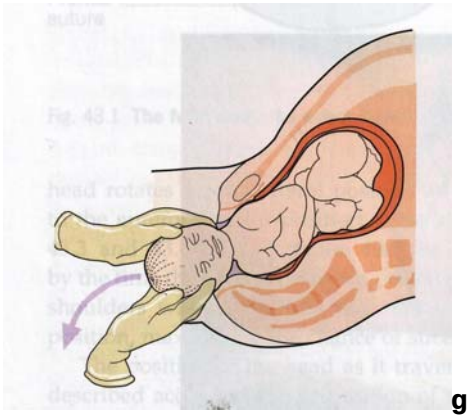
e

f

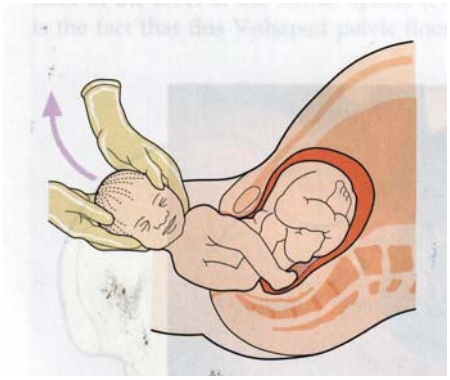
Fig. 1 (d, e and f): Normal labour.

Restitution: When the head is born it rights itself with the shoulders. During the movement of internal rotation the head is slightly twisted because the shoulders do not rotate at that time. The babies neck is untwisted by restitution, the shoulders undergo a similar rotation. The head being free moves at the same time, so internal rotation of the shoulders is accompanied by external rotation of the head. Rotation follows the direction of restitution.

The anterior shoulder can then be delivered by downward traction of the head, so that the lateral downward traction on the fetal trunk allows the shoulder to be freed (Fig. 1g). The posterior shoulder is delivered with upward lateral traction and the rest of the baby usually follows without difficulty (Fig. 1h).



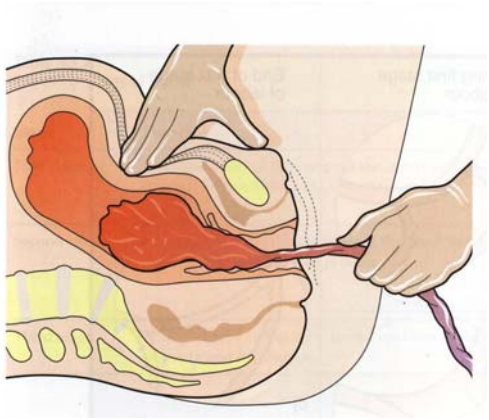
g



h

Fig. 1 (g and h): Normal labour.

The third stage is from the birth of the baby until delivery of the placenta. The uterus contracts, shearing the placenta from the uterine wall, and this separation is often indicated by a small rush of dark blood and a 'lengthening' of the cord. The placenta can then be delivered by gentle cord traction (Fig. 1i) but caution is required to avoid uterine inversion (Chapter 9). See also retained placenta (Chapter 3).



i

Fig. 1 (i): Normal labour.

Summary of the mechanism of labour

- Head at pelvic brim in left or right occiputo-transverse position
- Head descends and engages with flexion.
- Head reaches the pelvic floor and occiput rotates to occiputo-anterior, the occiput escaping under the pubic symphysis.
- Head delivers by extension.
- Descent continues and shoulders rotate into the antero-posterior diameter of the pelvis; the head restitutes (comes into line with the shoulders) at the same time.
- Anterior shoulder delivered by lateral flexion from downward pressure on the baby's head. The posterior shoulder descends below the sacral prominence, and is delivered by lateral flexion upwards

Chapter 2

Cord prolapse

Definition

'Cord presentation' is defined as the presence of the cord between the membranes and the presenting part prior to membrane rupture. "Cord prolapse" refers to the same situation after membrane rupture. The cord can remain in the vagina (occult prolapse) or can prolapse through the vagina to the perineum (Fig. 2a). It is a true obstetric emergency requiring immediate action.

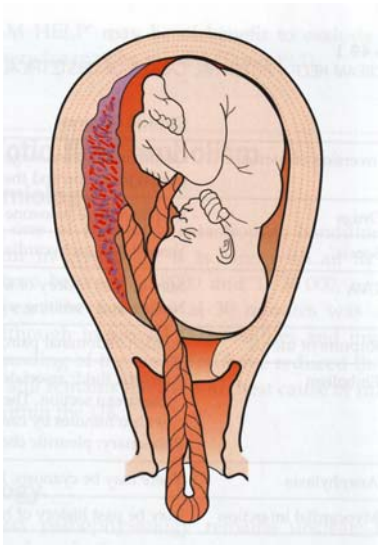


Fig. 2a:

Umbilical cord prolapsing through an incompletely dilated cervix.

In some instances the cord is clearly visible protruding through the vagina, but it may be found in the vagina at an examination, perhaps carried out in response to some CTG abnormality. It is important to routinely exclude cord prolapse digitally following artificial rupture of the membranes, and to check the fetal heart rate after this procedure.

Epidemiology

The incidence of 0.1 - 0.6% is related to presentation (more likely in non-cephalic presentations) and is most likely if the presenting part is high. Any obstetric condition that precludes a close fit between the fetus and the pelvic inlet makes a cord prolapse more likely, particularly abnormal lie, malposition, prematurity and polyhydramnios. Other predisposing factors include Intra Uterine Growth Retardation, multiple pregnancy and artificial rupture of membranes.

The fetal heart rate as assessed clinically, by Doppler or by Cardio Toco Graph (CTG), usually indicates fetal distress in the form of deep decelerations or a single prolonged deceleration.

Management

There are two main insults to the cord which may lead to cessation of fetal blood flow and fetal death. Firstly there is direct compression by the fetal body against the maternal pelvis and secondly there is likely to be cord spasm from exposure to the cool external atmosphere.

Seconds count. If delivering at home and the cervix is fully dilated, commence pushing. Phone an ambulance and the referring hospital. If not fully dilated, keep the cord in the vagina and either push the head up with a hand to keep pressure off the cord or ask the mother to adopt the knee–chest position (Fig. 2b). It will not be possible to keep a hand in the vagina during ambulance transport, and the knee chest position is considered unsafe: the left lateral position is recommended. Also consider filling the bladder to keep the head high using an indwelling catheter and 500ml saline.

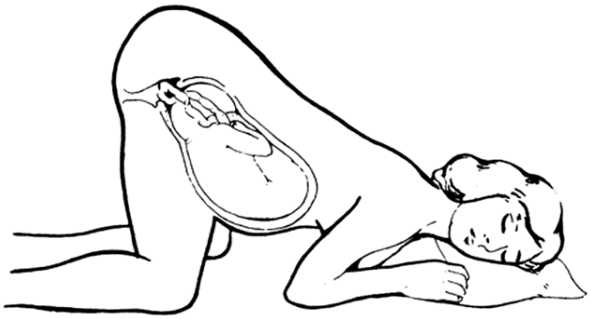


Fig. 2b:

The knee–chest position.

If in hospital and there is any possibility that a fetal heartbeat is still present, the baby should be delivered immediately. If the cervix is fully dilated this should be by forceps or ventouse; if not, then by immediate caesarean section under general anaesthesia.

To protect the cord from occlusion during the transfer to theatre the woman should be placed in the knee–chest position or a hand placed in the vagina to lift the presenting part up off the cord and prevent cord compression. The cord should be kept within the vagina and handled as little as possible to avoid spasm. A tocolytic, eg terbutaline 0.25mg SC, can be given to minimise contractions.

If the cord has prolapsed at home, or silently on the antenatal ward, it is important to establish fetal viability before rushing to unnecessary surgical intervention. The absence of cord pulsation does not necessarily indicate fetal death, particularly if the prolapse is acute, so it is important to check whether the fetal heart is present. This is ideally assessed with ultrasound. If fetal death has occurred the mother should be allowed to labour.

Prognosis

With the increasing use of caesarean section and improvement in neonatal ITU fetal mortality in hospital has been reduced over the years but still remains around 10%. The outcome is likely to be poor if the cord has prolapsed for more than 40 minutes.

Prevention

Do not carry out an Artificial Rupture of Membranes (ARM) if the head is high unless prepared for immediate delivery.

Chapter 3

Haemorrhage

Introduction

Despite the decline in numbers in the UK this triennium (2005-2008), obstetric haemorrhage remains an important cause of maternal deaths. Obstetric haemorrhage is one of the leading causes of maternal mortality worldwide and, even in the more affluent societies with ready access to resuscitation, oxytocics, blood transfusion and surgery, deaths still occur. Haemorrhage may be rapid. It is important to recognise its severity promptly, institute effective therapy ***and keep ahead of the loss***.

A vaginal examination should never be performed in the presence of vaginal bleeding without first excluding placenta praevia - "No PV until no PP".

Definitions

Vaginal bleeding associated with intrauterine pregnancy is divided into the following categories:

- Threatened miscarriage – up to 24 weeks' gestation (not covered in this Chapter).
- Antepartum haemorrhage – from 24 weeks' gestation until the onset of labour.
- Intrapartum haemorrhage – from the onset of labour until the end of the second stage.
- Postpartum haemorrhage – from the third stage of labour until the end of the puerperium.

Haemorrhage - antepartum

Antepartum haemorrhage is classified according to the source of the bleeding: local or placental.

Local causes of bleeding

There may be local bleeding from the vulva, vagina or cervix. Bleeding from the cervix is not uncommon in pregnancy and may be provoked by sexual intercourse. A cervical ectropion is often found, and only very rarely is there a carcinoma. Later in pregnancy a 'show' of mucus along with a small amount of blood may simply herald the onset of labour as the cervix becomes effaced or taken up.

Placental causes of bleeding

- ***Placenta praevia***

This is defined as a placenta encroaching on the lower segment (with the lower segment arbitrarily defined on ultrasound scanning as extending 5 cm from the internal os). Placenta praevia is commoner in older mothers and in those with a previous caesarean section. It is classified either as major or minor, or graded I-IV (Table 3, Fig. 3a). Vaginal examination risks major haemorrhage and should be avoided.

Table 3 Classification of placenta praevia

Minor	I	Encroaches on lower segment
	II	Reaches internal os (marginal)
Major	III	Covers part of os (partial)
	IV	Completely covers the os (complete)

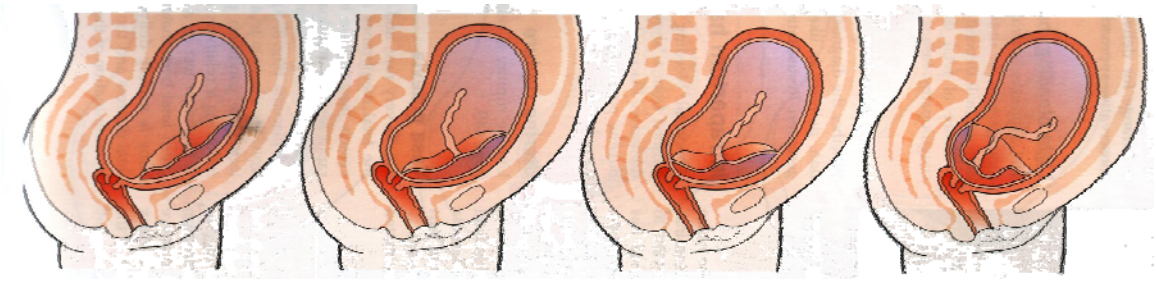


Fig. 3a: Placenta praevia.

It is not possible to avoid haemorrhage in labour with a major placenta praevia, but it may be possible to deliver successfully with a minor degree of praevia. In the assessment of suitability for such a delivery, engagement of the presenting part is probably more important than the actual distance of the placenta from the internal os on ultrasound scan.

A low-lying placenta may be identified in an asymptomatic woman at the time of an ultrasound scan early in pregnancy. As the uterus grows from the lower segment upwards, the placenta appears to move upwards with advancing gestation. Two per cent of those with a low-lying placenta before 24 weeks, 5% of those at 24–29 weeks and 23% of those at 30+ weeks will still have a placenta praevia at term. When a low-lying placenta is detected on ultrasound scanning early in pregnancy, it is reasonable to repeat the scan early in the third trimester and then review the management if the placenta is still low.

The risk of placenta praevia is of a sudden, unpredictable, major haemorrhage and some clinicians advocate hospital admission from 30 to 32 weeks onwards so that facilities for resuscitation and delivery are immediately available. This can be socially difficult for the woman, particularly if she has existing children at home, and immobility in hospital may pre-dispose her to thromboembolic disease. There is therefore a trend towards outpatient management, particularly for those who have had no bleeding, or just light bleeding, and who live close to the hospital. Nonetheless, serious consideration should be given to moving those in remote areas to centres with appropriate facilities. Those who have had heavy bleeds, or who live further away, are usually advised to stay in hospital. Elective delivery is usually planned for 38–39 weeks, but may be earlier if there is a major haemorrhage. Caesarean sections in these patients should be personally supervised or performed by a senior obstetrician and a large blood loss should be anticipated.

If the placenta invades the myometrium it is termed 'placenta accreta' and this markedly increases the chance of severe haemorrhage.

• *Placental abruption*

Placental abruption is defined as retroplacental haemorrhage and usually involves some degree of placental separation. Its management depends on the amount of bleeding, the maturity of the baby and the fetal condition. It is essential to remember, however, that with placental abruption the amount of "revealed" bleeding from the vagina may not reflect the degree of internal retroplacental bleeding and indeed a woman may have considerable internal bleeding without any external loss at all - a "concealed abruption" (Fig. 3b).

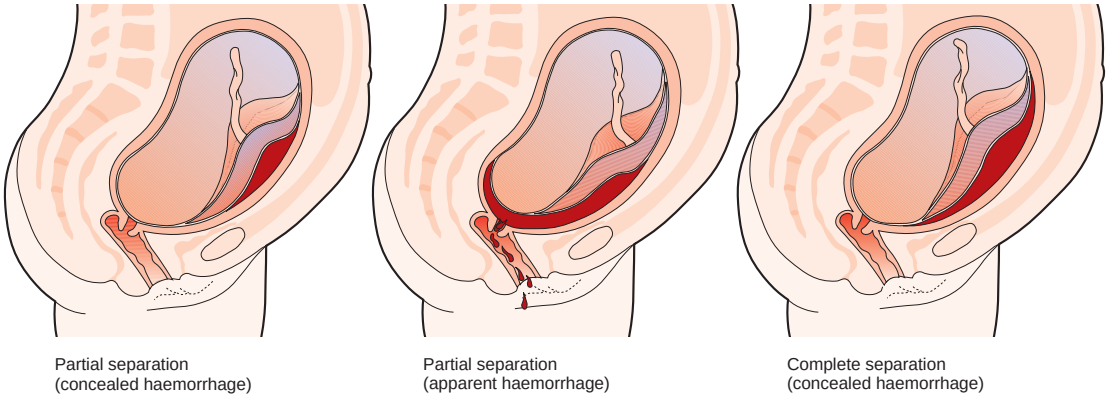


Fig. 3b: Placental abruption.

Light bleeding from the edge of a normally situated placenta does not normally compromise the fetus and can be treated by a short spell of rest with subsequent close supervision of fetal growth and placental function until normal labour.

Major revealed haemorrhage is obvious, and urgent delivery is usually required. A major concealed abruption is inferred from the degree of pain, uterine tenderness and evidence of shock and again urgent delivery may be required. Resuscitation must commence before delivery. The decision between vaginal delivery and caesarean section can be difficult, but depends on the severity of the bleeding, fetal condition and cervical dilatation.

If there is no fetal heartbeat, vaginal delivery is usually indicated as the mother should not be subjected to an unnecessary caesarean section. However, it is very likely that there will have been a major degree of blood loss. Hypovolaemic shock may develop and may progress to multi-system failure if not corrected. In addition, there may also be disseminated intravascular coagulation with depletion of platelets, fibrinogen and other clotting factors. Waiting for vaginal delivery therefore carries risks and caesarean section may occasionally be indicated to minimise these systemic risks. The decision is further complicated by the risks of carrying out an operation in the presence of disseminated intravascular coagulation.

- ***Unknown cause of bleeding***

A specific explanation for the bleeding is often not found.

Initial management

Bleeding can be light, moderate or severe and can occur with or without pain. An attempt should be made to determine the cause of the bleeding. In practice, history and initial examination are carried out simultaneously. It is relevant to ask when the bleeding started, how much blood has been lost and when the baby was last felt to move. Observation will tell if the mother is in pain, which suggests abruption or labour,

and there may be visible blood on her legs, the bed or floor. If she is pale, with low blood pressure and rapid pulse, there is probably hypovolaemic shock. With an abruption the uterus is hard and tender and there may be no discernible fetal heartbeat. When the bleeding has been from a placenta praevia, the uterus is usually soft, the presenting part will be free and the fetal heartbeat is usually present.

Subsequent management

This depends on the estimated severity of haemorrhage.

- ***Light bleeding, with a soft uterus and normal cardiotocography***: An ultrasound scan should be arranged to check the placental site and, providing the placenta is not low lying, a speculum examination should be performed to look for cervical effacement, dilation, an ectropion or a carcinoma. If all is normal it is common practice to admit the woman until the bleeding settles. Many clinicians, however, will not admit the patient if the bleeding is light and there are no other features, particularly if the blood is seen to be coming from an ectropion. Women who are rhesus negative should be given prophylactic Anti-D.

  If there is a placenta praevia and the patient is at more than 37–38 weeks gestation, it is reasonable to arrange for delivery. If less than this gestation a conservative approach may be appropriate.

- ***Light bleeding, but with a hard tender uterus***: The diagnosis is probably a concealed abruption, and management undertaken as above. The route of delivery will depend on a number of factors, again as discussed above. Resuscitation will be required.

- ***Heavy bleeding***: Whether the diagnosis is placenta praevia or an abruption, delivery is likely to be required irrespective of gestation. Resuscitation will again be required.

Haemorrhage - intrapartum

Abnormal bleeding during labour must be distinguished from a "show" that may occur during cervical dilatation. Placental abruption can occur during labour but the possibility of uterine rupture also needs to be considered.

Uterine rupture

Uterine rupture is relatively rare, and is discussed in Chapter 10.

Vasa Praevia

This is very rare, and occurs when cord vessels run in the fetal membranes and cross the internal os. These vessels may rupture in early labour and this leads to rapid fetal exsanguination. The condition presents as severe fetal distress or perinatal death following a relatively small intrapartum haemorrhage.

Haemorrhage - postpartum

Introduction

It is impossible to predict with certainty which patients will have a postpartum haemorrhage, and it is important to appreciate that a major haemorrhage can very rapidly lead to maternal death.

Definitions

There is always some bleeding during the third stage of a normal delivery, usually around 200–300ml.

- A primary postpartum haemorrhage is defined as a blood loss of 500ml or more within 24 hours of the delivery of the baby.
- A secondary postpartum haemorrhage is any significant loss between 24 hours and 6 weeks after the birth.

Primary postpartum haemorrhage

This occurs in around 5% of all deliveries. It is commoner in grand multiparity, multiple pregnancy, those with fibroids and placenta praevia, and in those who have had a long labour. It may also follow an antepartum haemorrhage and is more likely in women with a past history of postpartum haemorrhage.

Causes (the 4 Ts)

- **Tone** (very common) – Normally, contraction of the uterus in the third stage of labour causes compression of intra-myometrial blood vessels and bleeding usually settles. If there is uterine atony this compression does not occur.

- **Tissue** (common) - Atony is more likely if the placenta, or part of the placenta, is retained as its physical presence prevents contraction occurring.

- **Trauma** (sometimes) - Bleeding may come from an episiotomy, a vaginal or cervical laceration, or a rupture in the uterine wall. Lacerations are more common after an instrumental delivery than after a spontaneous one.

- **Thrombin** (rare) - Coagulation problems, particularly Disseminated Intravascular Coagulation (DIC), may be present from a number of different causes.

Clinical presentation

The bleeding is usually obvious but occasionally an atonic uterus can fill up without obvious external loss and the first real sign can be cardiovascular collapse. Another problem is a prolonged undramatic "trickle," the significance of which may not be appreciated. With blood soaked pads and bedding it is easy to underestimate the real loss. The most critical factors are the signs of shock, pallor, clammy skin, rising pulse, falling blood pressure and falling O_2 saturation.

The key questions are:

a) Has the placenta been delivered and is it complete?
b) Is the uterus firmly contracted?
c) If so, is the bleeding as a result of trauma?

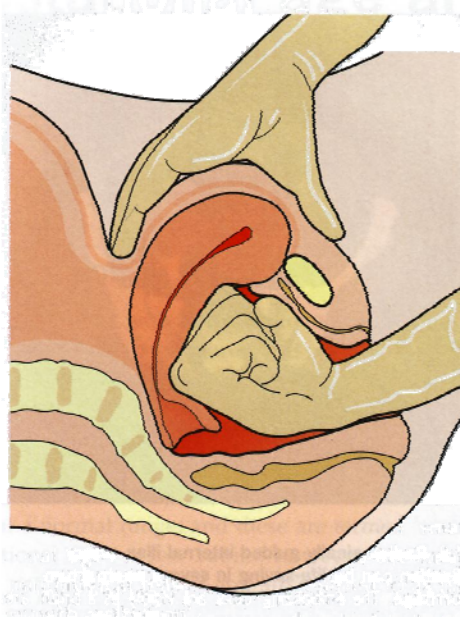
Management

- Call for help.

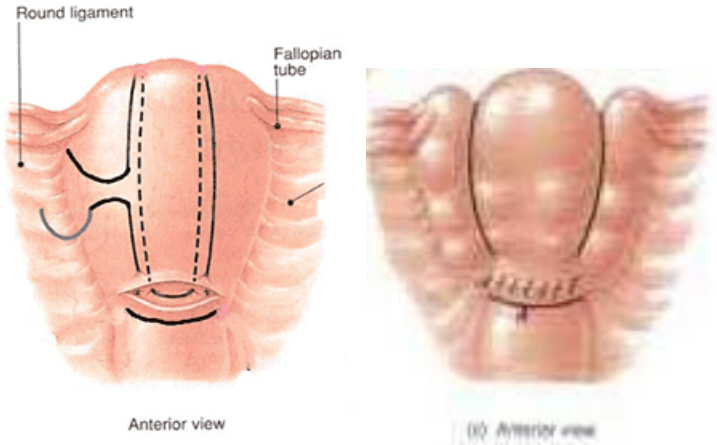
- A controlled reassuring presence is important:
- make a rough but realistic estimate of the loss (excluding amniotic fluid)
- check the pulse, blood pressure and O_2 saturation
- feel the abdomen to assess the size and tone of the uterus
- empty the bladder if full (leave catheter in).

- Rub up a contraction by abdominal massage and consider internal bimanual compression (Fig. 3c). External bimanual abdominal compression is an option, but may be less effective.

Fig. 3c:
Bimanual compression of the uterus.



- Lie the mother flat.
- Give high flow O_2.
- Gain IV access with two Grey Venflons. Take bloods for haemoglobin, haematocrit, platelets, clotting and crossmatch red cell concentrate (the number of units depends on the volume lost, e.g 2-6 units).
- Give Syntocinon 5 -10iu by **slow** IV bolus and then 40iu in 500ml Hartman's solution at 125ml/h (i.e. 10 units/ hour) or faster if required.
- Give crystalloid or colloid (not Dextran) as required.
- Remove the placenta if retained, or any placental tissue if the placenta is incomplete. Try continuous cord traction initially. If unsuccessful a regional block or GA will be required, but midazolam 2–10mg IV may be used if necessary. If there is placenta accreta and there is no bleeding do not attempt any further removal, but leave and manage conservatively.
- Catheterise if not already done so as above.
- Give further oxytocics, e.g.:
  - Syntocinon 5 - 10 iu slow IV
  - Ergometrine 500 μg IM
  - Carboprost (Hemabate) 250μg (=1ml=1 ampoule) IM (**not IV**) or intramyometrial (not licensed) with further doses not less than15 minutes apart up to a max of 8 times. Hemabate is contraindicated with cardiac, pulmonary, renal or hepatic disease. Side-effects include GI upset, particularly diarrhoea, and pyrexia.
  - Misoprostol 800μg PR
- Under GA, check for vaginal or cervical lacerations with general or spinal analgesia ('walk the cervix' with Rampley's sponge-holding forceps). Consider laparotomy.
- Consider a CVP if the clotting is normal.
- Transfuse, ideally with warmed blood under pressure. O-Negative or group-specific uncrossmatched blood may be used if necessary.
- If coagulopathy, give Fresh Frozen Plasma and platelets as required.
- Conservative measures to arrest bleeding from an atonic uterus include:
  - Balloon tamponade with a Rusch balloon, Senstaken-Blakemore tube or Foley catheter.
  - Uterine packing (e.g. with 5 m long, 10 cm wide gauze pack)
- Surgery may be required to control the bleeding.



Consider a B-Lynch Suture (BJOG 1997; 372) or a simpler modification (CurrOp O&G 2001; 127).

- Radiologically directed arterial embolisation is a potentially very useful option if available.

- Ligation of the vessels supplying the uterus can be technically difficult, especially in the presence of a pelvic haematoma.

- Hysterectomy (or subtotal hysterectomy) may eventually be required, especially if there is a non-lower-segment uterine rupture or placenta accreta.

Secondary post partum haemorrhage

This is defined as bleeding between 24 hours and 6 weeks postnatally. It can be due to infection or retained products of conception, rarely to a vulval haematoma, very rarely to caesarean scar dehiscence and only exceptionally to trophoblastic disease. Commonly the cause is unknown. Checks should be made of pulse, blood pressure and temperature, the uterus palpated for tenderness, and an endocervical swab sent for culture.

In practice, the decision is usually between conservative management with antibiotics, or arranging for an evacuation of retained products with antibiotic cover under anaesthesia. Clinical judgement is important, perhaps giving antibiotics in the first instance if the bleeding is not severe, and arranging an evacuation if it does not settle. Ultrasound scans can be unhelpful as many normal women have asymptomatic retained products after entirely normal deliveries and the temptation may be to carry out an unnecessary and potentially hazardous uterine evacuation.

Chapter 4

Hypertensive disease: pre-eclampsia and eclampsia

Introduction

Pre-eclampsia is a multisystem disorder of unknown cause which occurs only in pregnancy. It is a highly variable condition and can present in many different ways. There may be renal problems (proteinuria), coagulopathy, liver dysfunction (see HELLP syndrome, below), pulmonary oedema, CNS problems (eclampsia, haemorrhage) and adverse fetal effects (IUGR, intrauterine death, abruption). Treatment of the mother with antihypertensives masks the sign of hypertension but does not alter the course of the disease; it may, however, allow prolongation of the pregnancy and thereby improve fetal outcome.

Pre-eclampsia and eclampsia: specific recommendations from CEMACE 2011

• Pregnant women with a headache of sufficient severity to seek medical advice, or with new epigastric pain, should have their blood pressure measured and urine tested for protein, as a minimum. Epigastric pain in the second half of pregnancy should be considered to be the result of pre-eclampsia until proven otherwise.
• Any discussion between clinical staff about a woman with pre-eclampsia should include explicit mention of the systolic pressure.
• Severe, life-threatening, hypertension must be treated effectively. Management protocols should recognise the need to avoid very high systolic blood pressures which are associated with an increased risk of intracerebral haemorrhage.
• Systolic blood pressures of 150 mmHg, or above, require effective antihypertensive treatment. If the systolic pressure is very high, >180 mmHg, this is a medical emergency that requires urgent as well as effective antihypertensive treatment.
• Intramuscular oxytocin, not Syntometrine, should be the routine drug for active management of the third stage of labour.
• Women with severe pre-eclampsia need effective team care, based on clear communication and common understanding.There should be early engagement of

intensive care specialists where appropriate. Efforts must be made to re-engage and re-skill GPs who see women with complications during pregnancy.

Definitions

Hypertension complicates 10–15% of all pregnancies and is the commonest medical problem encountered in pregnancy. It is defined as a diastolic pressure greater than 90 mmHg. Definitions of hypertension based on a rise in systolic and diastolic pressures from booking levels have also been used (e.g. systolic rise of 30 mmHg, diastolic rise of 15 mmHg). Severe hypertension is a diastolic pressure >110 mmHg, a systolic pressure >160 mmHg or a mean arterial pressure >125 mmHg. The mean arterial pressure is calculated as either:

- Diastolic BP + ⅓ (Systolic BP – Diastolic BP)
- Systolic BP plus twice the diastolic, divided by 3.

Pre-eclampsia (hypertension, impaired renal function and fluid retention) occurs in 4–10% of women in their first pregnancy.

Eclampsia is the occurrence of convulsions in pregnancy, not due to a primary neurological problem, in a patient with the signs and symptoms of pre-eclampsia. The UK national incidence is down from 4.9 to 2.7 per10,000 pregnancies, with 38% occurring antepartum, 18% intrapartum and 44% postnatal. Of these 38% occur before proteinuria and hypertension have been documented.

Pre-eclampsia risk factors

- age ≥40 years
- primigravida
- previous pre-eclampsia or severe IUGR
- family history on maternal side
- multiple pregnancy
- central obesity
- some medical disorders, including chronic hypertension

Diagnosis

Pre-eclampsia is usually asymptomatic and detected at antenatal review (elevated BP and proteinuria). Symptoms tend to be non-specific, but rapidly progressive oedema, nausea and vomiting, epigastric pain, headache and visual disturbances can occur if severe. On testing, there may be a reduced platelet count; an elevated urate, urea and creatinine; LFT abnormalities; and DIC.

Maternal complications of pre-eclampsia

- DIC/HELLP syndrome (10-20%)
- Pulmonary oedema/aspiration (2-5%)
- Placental abruption (1-4%)
- Acute renal failure (1-5%)
- Eclampsia (<1%)
- Liver failure/rupture/haemorrhage (<1%)
- Stroke (rare but often fatal)
- Death (rare).

Management of severe pre-eclampsia

The aim is to control blood pressure, restrict fluids, consider anticonvulsant therapy with magnesium sulphate, and plan delivery.

1. **Antihypertensive medication:** This should be given when the systolic blood pressure is >150 mmHg or the diastolic BP is >110 mmHg to prevent cerebrovascular and cardiovascular complications. Different clinicians may have different regimens – an example is given below:

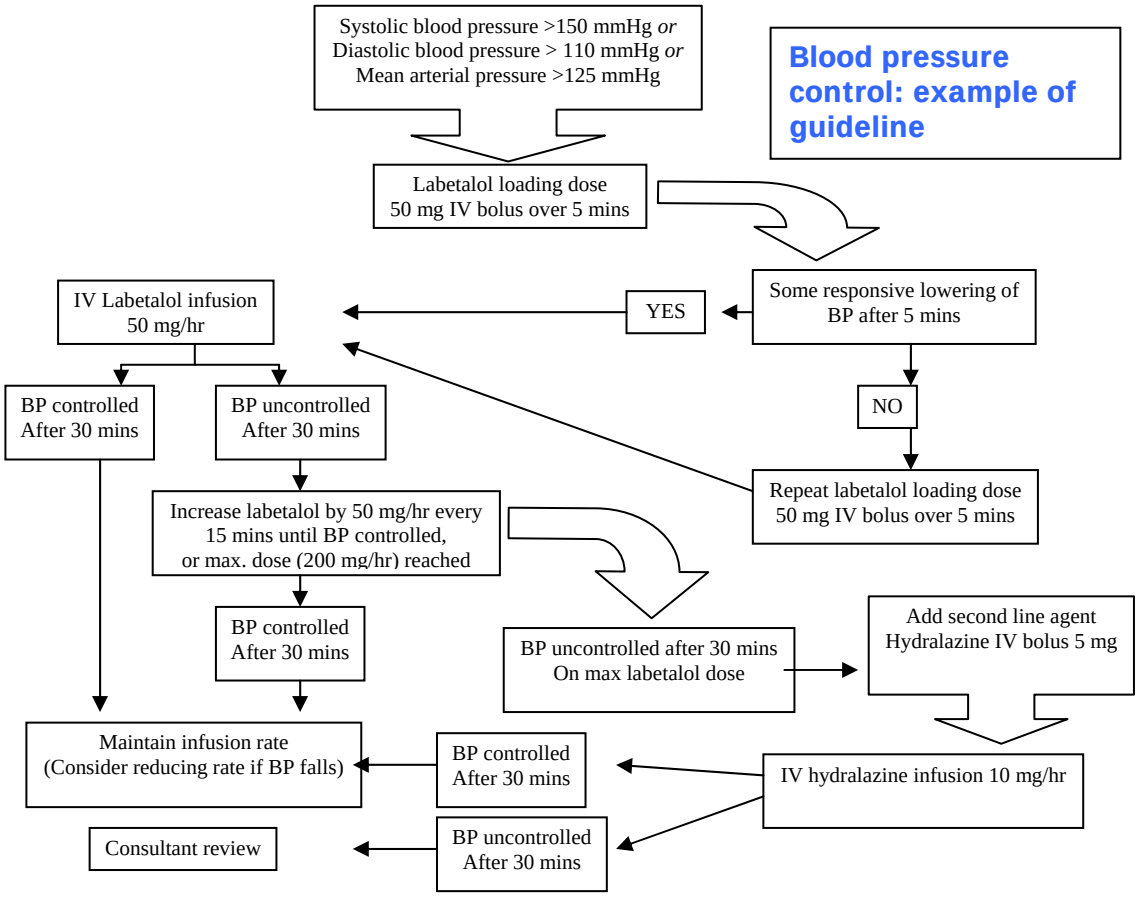


Fig 4.1: Blood pressure control in severe pre-eclampsia and eclampsia.

2. Fluids: Restrict maintenance input to 1 ml/kg/hr, to a maximum of 85 ml/hr (inclusive of all infusions). A urine output (measure by catheter) of at least 100 ml in 4 hours should ideally be achieved. CVP monitoring requires expertise and should be regarded as an adjunct to clinical assessment. Beware of pulmonary oedema.

3. Consider magnesium sulphate therapy: There is now very good evidence supporting the use of anticonvulsants in established eclampsia: magnesium sulphate is known to be significantly more effective than phenytoin or diazepam in preventing further convulsions (Lancet 1995;345:1455). In those with severe pre-eclampsia, magnesium sulphate halves the risk of eclampsia in and probably reduces the risk of maternal death (Lancet 2002, 359, 1877).

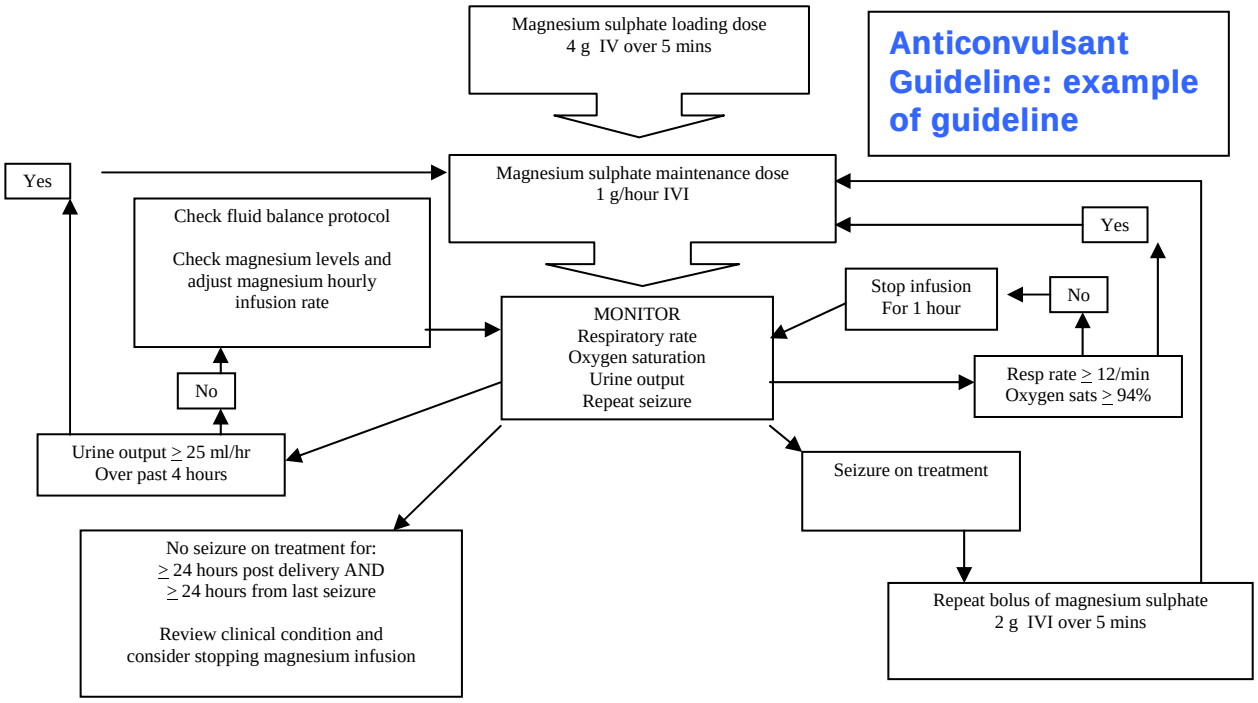


Fig 4.2: Magnesium sulphate therapy in severe pre-eclampsia and eclampsia.

4. Once stable, **delivery can be planned**.

Signs of magnesium toxicity:	Treat by:
• Loss of reflexes • Somnolence • Respiratory depression • Paralysis and cardiac arrest • If antenatal, may be fetal bradycardia and loss of variability on CTG.	• Stopping magnesium sulphate • Consider giving calcium gluconate 1gm IV over 3 minutes.

Management of eclampsia

- Call for help.
- Turn on side to avoid aortocaval compression.
- Ensure adequate airway management if compromised and give high-flow O_2 (e.g. 15 litres/min via reservoir bag).
- Give 4 g $MgSO_4$ over 5–15 minutes (Fig. 4.2).
- Consider urgent delivery if the fit has occurred antenatally.
- Set up a 1 g/h IV infusion of $MgSO_4$ (Fig. 4.2) and manage as for severe pre-eclampsia.
- Paralyse and ventilate if the fits are prolonged or recurrent.
- Arrange monitoring (O_2, BP, ECG, blood glucose, CTG, urine output and signs of magnesium toxicity – see above).

Ergometrine (including syntometrine) should not be used for the third stage (give Syntocinon 10 U IM or IV stat. instead).

HELLP syndrome

HELLP is an acronym for haemolysis, elevated liver enzymes (particularly transaminases) and low platelets. It is probably a variant of pre-eclampsia, affecting 4–12% of those with pre-eclampsia/eclampsia, and is commoner in multigravidae. There may be epigastric pain, nausea, vomiting, and right upper quadrant tenderness. Management is to stabilize coagulation, assess fetal well-being and consider the need for delivery. It is generally considered that delivery is appropriate for moderately severe cases, but may be more conservative (with close monitoring) if mild.

Note: For antenatal prediction and assessment of pre eclampsia see:

PRECOG: http://www.apec.org.uk/pdf/guidelinepublishedvers04.pdf#search='precog'

Chapter 5

Malpresentation: face, brow, breech and transverse lie

Definitions

Lie	The relationship of the long axis of the baby to the long axis of the uterus (e.g. longitudinal, transverse, oblique)
Presentation	The part of the baby coming first (e.g. cephalic, breech)
Position	Which way the baby is facing (e.g. if cephalic and facing posteriorly, the baby is occipito anterior)
Engagement	When the widest diameter of the presenting part is past the pelvic brim
Level	How far down the presenting part is in the pelvis relative to the ischial spines

In the third trimester of pregnancy abdominal examination should aim to define the lie, presentation, and position of the fetus. The lie refers to the long axis of the fetus in relation to the long axis of the uterus. Usually the fetus is longitudinal, but occasionally it may be transverse or oblique. The presentation is that part of the fetus which is at the pelvic brim, in other words the part of the fetus presenting to the pelvic inlet. Normal presentation is the vertex of the fetal head and the word 'malpresentation' describes any non-vertex presentation. This may be of the face, brow, breech or some other part of the body if the lie is oblique or transverse (Fig. 5a).

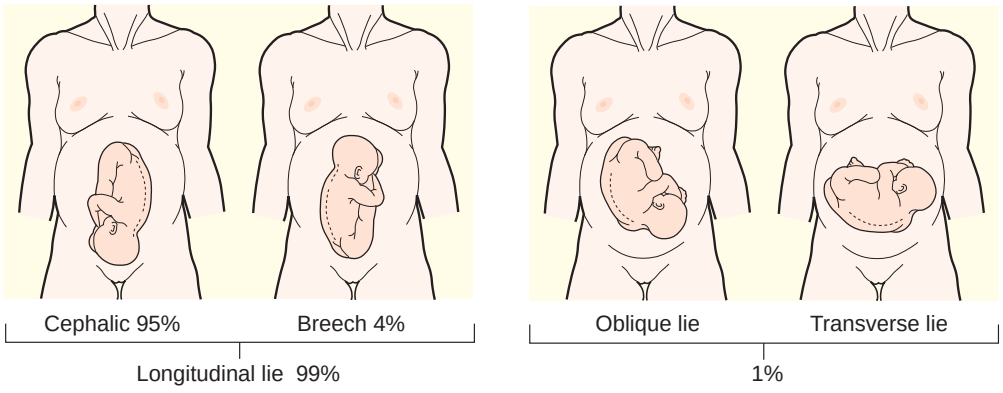


Fig. 5a: Fetal lie at term.

The position of the fetus refers to the way in which the presenting part is positioned in relation to the maternal pelvis. Strictly speaking this refers to any presenting part, but here it will be considered in relation to those fetuses presenting head first (cephalic). As we have seen, the head is usually occiputo-transverse at the pelvic brim and rotates to occiputo-anterior at the pelvic floor. 'Malposition' is when the head, coming vertex first, does not rotate to occiputo-anterior, presenting instead as perisitent occiputo-transverse or occiputo-posterior.

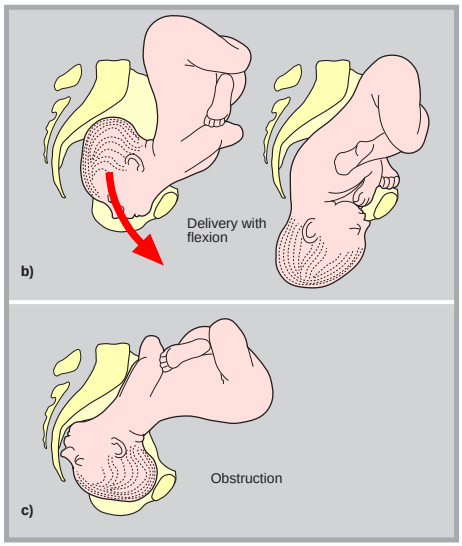
Face presentation

This occurs in about 1:500 births (Fig. 5b). It is associated with anencephaly but this is a rare cause even in an un-screened population. Face presentation is usually only recognised after the onset of labour and, if the face is swollen, it is easy to confuse this presentation with that of a breech. The position of the face is described with reference to the chin using the prefix 'mento-'.

Fig. 5b: Face presentation.

The head enters the pelvic brim in the transverse position. Most rotate to the mento-anterior position and usually deliver without problems (top).

Those that rotate to mento-posterior will obstruct (bottom). A caesarean section is usually required.



Brow presentation

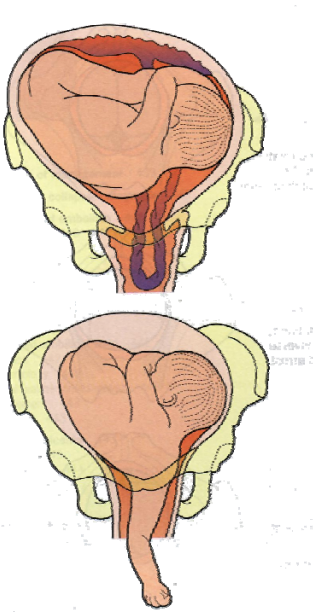
This occurs in only approximately 1:1500 births and is the least favourable for delivery. The supraorbital ridges and the bridge of the nose will be palpable on vaginal examination. The head may flex to become a vertex presentation or extend to a face presentation in early labour. If the brow presentation persists, a caesarean section will be required.

Transverse lie and oblique lie

These are uncommon, occurring in less than 1% of deliveries at term. Usually there is no specific cause but abnormal lie is more common in multiparous women, multiple pregnancies, pre-term labour and polyhydramnios. It may also be associated with placenta praevia, congenital abnormalities of the uterus and lower uterine fibroids.

If transverse lie is identified antenatally a scan should be undertaken to exclude placenta praevia, polyhydramnios, lower uterine fibroids and a pathologically enlarged fetal head. External cephalic version is usually possible (see above), and the mother reviewed a few days later to ensure that the lie is still cephalic. She should be advised to come to hospital if there is any suspicion of early labour as it may still possible to carry out an external cephalic version at that stage providing the membranes are still intact. She should also particularly be advised to present if there is any suspicion of membrane rupture, as there is a risk of cord or arm prolapse (Fig. 5c).

Fig. 5c: Transverse lie is associated with cord prolapse and with arm prolapse.



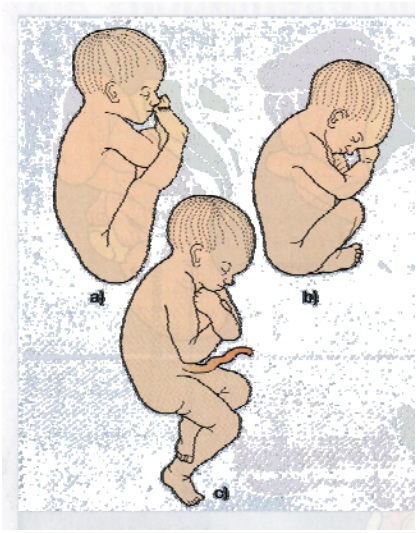
If the lie is transverse in established labour, particularly after membrane rupture, a caesarean section will be required. A vertical uterine incision may be necessary to allow adequate access for delivery.

Breech presentation

Breech presentation describes a fetus presenting bottom-first. The incidence is around 40% at 20 weeks, 25% at 32 weeks and only 3-4 % at term. The chance of a breech presentation turning spontaneously after 38 weeks is less than 4%. Breech presentation is associated with multiple pregnancy, bicornuate uterus, fibroids, placenta praevia, polyhydramnios and oligohydramnios. It may also rarely be associated with fetal anomaly.

Fig. 5d:

At term, 65% of breech presentations are (a) frank (extended) with the remainder being (b) flexed or (c) footling. Footling breech carries a greater risk of cord prolapse.



Mode of delivery

There has been extensive debate about the safest route of delivery for breech presentation - whether it should be vaginal or by caesarean section. The risks of vaginal delivery are small, but include intracranial injury, widespread bruising, damage to internal organs, spinal cord transection, cord prolapse and hypoxia following obstruction of the after-coming head. The risks of caesarean section are largely maternal and related to surgical morbidity and mortality. There is now evidence that planned caesarean section is associated with less perinatal mortality and less serious neonatal morbidity than planned vaginal birth at term. The risks of serious maternal complications are much about the same, partly because planned vaginal delivery often ends with an intra-partum caesarean section and such caesarean sections carry greater risks than planned elective sections. The problem of delivery can be removed if it is possible to turn the baby prior to the onset of labour. This process is called external cephalic version.

External cephalic version

All women with an uncomplicated breech pregnancy at term should be offered external cephalic version (ECV) at 37 weeks' gestation. There is no point in attempting ECV with a significant placenta praevia, as a caesarean section will still be required, and version is also contraindicated with multiple pregnancies and those who's pregnancies have been complicated by an abruption. It is relatively contraindicated in those with pre-eclampsia and fetal growth restriction. There are different techniques – an example is given below.

Procedure

A CTG and ultrasound should be checked. Some obstetricians like the patient to be fasted and prepared for theatre and, although this is usually not necessary, it is reasonable to have access to theatre close at hand. ECV is most likely to be successful when the presenting part is free, the head is easy to palpate and the uterus feels soft.

Ask the mother to lie flat with a 30° lateral tilt. If the uterus is not soft, establish an intravenous infusion of ritodrine at 200 µg/min for 15 minutes or other tocolytic. Applying scanning gel to the abdomen allows easier manipulation and permits scanning during the procedure if required. Disengage the breech with the scan probe or hands, and then attempt to rotate in the direction the baby is facing (i.e. forward roll / somersault). Check the fetal heart every 2 minutes. If unsuccessful return the fetus to breech rather than leave it transverse. Give anti-D 500 IU IM if rhesus negative. The success rate of version ≈ 30% for primigravidae and ≈ 50% for parous women. Continue the CTG for 20 minutes.

Caesarean section for breech presentation

The evidence quoted above considers term pregnancies only. It is probably also advisable to carry out a caesarean section in preterm deliveries, as there is the additional risk of the cervix closing around the neck after delivery of the breech. Whether caesarean section is also appropriate in extreme prematurity is more difficult to assess, as the delivery may still be traumatic for the baby. In this instance, the operation should be performed by an experienced obstetrician.

Vaginal delivery for breech presentation

This may occasionally still be considered appropriate by some clinicians if the estimated fetal weight is <3.8 kg and there is no fetal compromise, pre-eclampsia or placenta praevia. Ideally the onset of labour should be spontaneous, the breech frank or flexed (but not footling) and the liquor volume normal. Those presenting in advanced labour with an engaged breech usually deliver without adverse consequences.

The first stage is managed with caution. The role of epidural is controversial - its use may facilitate manipulation of the fetus, but its presence may inhibit the desire to push - which is important in breech delivery. Augmentation with syntocinon must only be used if disproportion is felt clinically unlikely and even then with caution. There is no contraindication to a fetal 'scalp' electrode being applied to the breech providing care is taken to avoid genital injury.

At full dilatation, the mother can be encouraged to push: the temptation to pull must be resisted. *Ideally the baby should be left alone to delivery itself ('hands off') taking care to ensure the back remains uppermost when advancing*. If there is undue delay, or there are concerns about fetal wellbeing (e.g. movements stopping, baby becoming floppy, no response to stimuli) assisted delivery can be used to encourage a more rapid delivery.

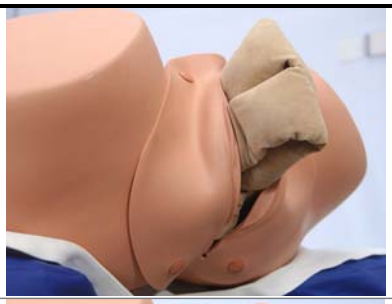
One of the key risks of breech delivery is that pulling may lead the head to extend and therefore become stuck at the pelvic brim. *The importance of maternal effort at this stage, rather than traction from below, cannot be over emphasised – it allows the head to flex and minimises the risk of it becoming stuck at the pelvic brim.*

Should the head of a pre-term breech become entrapped behind an incompletely dilated cervix, it should first be flexed as far as is possible to narrow the presenting diameter. Failing this, the options are then to incise the cervix at the 4 and 8 o'clock positions (risking massive, potentially fatal maternal haemorrhage) or to push the fetus back up and perform a caesarean section (very difficult). Because such interventions are very risky to the mother, it may be preferable to await spontaneous delivery.

The two techniques of 'hands off' vs 'assisted breech' are illustrated overleaf. Note that there is a third technique not discussed here 'breech extraction' for more extreme situations.

Vaginal Breech Delivery (Hands Off)

As the breech descends with pushing, it rotates to the antero-posterior and advances over the perineum. It then rotates with the back uppermost. Any movement of the back posteriorly should be corrected.

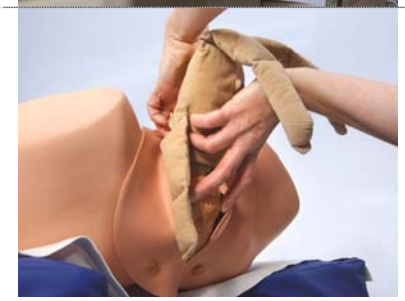
The legs will free themselves as the baby advances, and will hang down.


With pushing, the arms will deliver


The breech should be allowed to hang in order for the head to flex, waiting for the nape of the neck to become visible.

After delivery of the other arm, flexion of the baby's head is encouraged by placing the second and third fingers of the lower hand over the malar bones on the face, pulling them towards you,

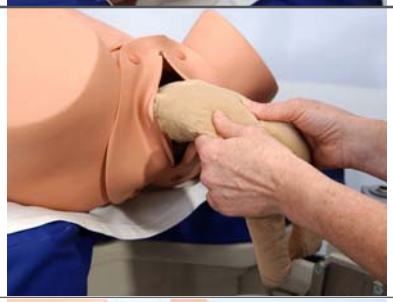
while the second and third fingers of the other hand are used to push the occiput (back) of the head away from you. With maximum flexion, the head can then be delivered. An episiotomy can be used if necessary.



Assisted Vaginal Breech Delivery

The knees can be flexed to deliver the legs.


Once the legs are delivered, it is important to wait for the body to advance further, before holding the bony pelvis firmly as shown.

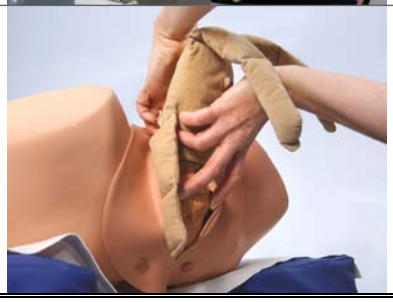



Rotation allows one arm to be freed, flexed and brought down,


while rotation the other way allows the other arm to be similarly delivered.


After delivery of the other arm, flexion of the baby's head is again encouraged by allowing the breech to hang down,


and the head is delivered as for the 'hands off' vaginal breech delivery

Unstable lie

An unstable lie is one that varies from examination to examination. The options are to:

- Manage conservatively, with repeated ECVs as required, and await the spontaneous onset of labour. Should the membranes rupture with the fetus in a non-cephalic presentation there may be a risk of cord prolapse and in-patient management is considered appropriate by some.

- Arrange to turn the baby to cephalic presentation and then induce labour. This is sometimes referred to as a 'stabilising induction'. The disadvantage is that the induction itself is not without risks, and the lie may become unstable again even after the membranes have been ruptured.

- Carry out a caesarean section. This has maternal surgical disadvantages.

Chapter 6

Sepsis

Introduction

Deaths from genital tract sepsis are increasing. CMACE has sent out a briefing on genital tract sepsis from the period 2006-08 stating that sepsis was now the leading cause of direct maternal deaths. Whilst maternal mortality is declining overall, maternal deaths due to sepsis have risen in the recent triennia, particularly those with community acquired Gp A streptococcal infection (GAS). There was a clear seasonal pattern to the deaths, with most occurring between December and April, often preceded by a sore throat or other URTI.

The recommendations from CEMACH on sepsis are:
Maternal tachycardia, constant severe abdominal pain and tenderness are important early features of genital tract sepsis that should prompt urgent medical review.

All maternity units should have guidelines for the investigation and management of genital tract sepsis.

If sepsis is suspected, regular frequent observations should be made and use of the Modified Early Obstetric Warning Score (MEOWS) as recommended by this CEMACE Report is crucial.

High dose broad-spectrum intravenous antibiotic treatment should be started immediately sepsis is suspected, without waiting for microbiology results.

Definitions

Sepsis can be defined as the body's response to an infection. This is mediated by the body's immune system. An infection is caused by micro organisms (usually bacteria) invading the body, and can be limited to a particular body region (e.g. a tooth abscess) or can be widespread in the bloodstream (often called "septicaemia" or "blood poisoning"). The clinical picture of sepsis ranges from uncomplicated sepsis e.g. the common cold, to septic shock with multi-organ dysfunction. Despite optimal care, some patients may not respond to treatment and eventually die of multiple organ failure.

SIRS (Systemic Inflammatory Response Syndrome) - Diagnosed when the patient displays two or more of the following in the absence of infection:

1. Temperature>38 ^{o} Celsius or <36^{o} Celsius
2. Heart Rate > 90 beats per minute
3. Respiratory Rate 20 Breaths per minute
4. White Cell Count(WCC)> 12,000 or <4,000

Uncomplicated Sepsis

Uncomplicated sepsis, such as that caused by 'flu and other viral infections, gastroenteritis, or dental abscesses, is very common and is experienced by millions of people each year. The majority of these people will not need hospital treatment.

Severe Sepsis

Severe sepsis arises when sepsis occurs in combination with problems in one or more of the vital organs, such as the heart, kidneys, lungs, or liver. Because of problems with their vital organs, people with severe sepsis are likely to be very ill and are more likely to die (in 30-35 % of cases) than those with uncomplicated sepsis.

Septic Shock

Patients are defined as having septic shock if they have sepsis plus hypotension despite aggressive fluid resuscitation (typically upwards of 6 litres or 40 ml/kg of crystalloid).

The condition means that the body does not receive enough oxygen to properly function and drugs called vasopressors are used to raise the blood pressure. Signs of systemic hypoperfusion may be either end-organ dysfunction or serum lactate greater than 4 mmol/dL. Other signs include oliguria and altered mental status. Septic shock patients are very ill and need rapid emergency admission to the hospital intensive care unit (ICU). Despite active treatment in the ICU, the death rate is around 50%.

Diagnosis

Diagnosis of any medical condition, including sepsis, is made by obtaining a thorough history, conducting an appropriate examination and performing relevant investigations.

History

Symptoms which may be suggestive of an infective process include fever, productive cough, shortness of breath, pleuritic chest pain, myalgia (muscle pains), abdominal pain, vomiting, diarrhoea, headache, rash, vaginal discharge. Pregnant women who develop community acquired pneumonia may deteriorate rapidly after admission to hospital and should be closely monitored. Risk factors for developing genital tract sepsis, as identified by the confidential enquiry, include the following:

- Obesity
- Impaired glucose tolerance / diabetes
- Impaired immunity
- Anaemia
- Vaginal discharge
- History of pelvic infection
- History of Group B streptococcal infection
- Amniocentesis, and other invasive intrauterine procedures
- Cervical cerclage
- Prolonged spontaneous rupture of the membranes (SROM)
- Vaginal trauma
- Caesarean section
- Wound haematoma
- Retained products of conception post miscarriage or post delivery.
- Immunosupression is an additional risk factor which has not featured in the CEMACH report

Examination

An initial rapid assessment of an ill woman should be made using the ABCDE approach. After life threatening conditions have been effectively dealt with, a systematic examination of the respiratory, cardiovascular, gastrointestinal, urological/gynaecological and neurological systems should be made.
Sepsis may be caused by pneumonia, gastroenteritis, genital/urological tract infection, meningitis- to name a few
Abnormal signs found on examination include pyrexia, agitation/somnolence/confusion, tachypnoea, decreased air entry to an area of lung, crepitations/wheezes, tachycardia, neck stiffness, abdominal tenderness/fetal tachycardia.

Features of severe sepsis include the above and, in addition, may include cold, mottled skin, hypotension, confusion and poor urine output.
Medical staff including anaesthetic and critical care staff should be informed immediately if a pregnant woman shows signs of severe sepsis. Delay in undertaking investigations and starting antibiotics and supportive treatment decreases the chance of survival.

Common symptoms and signs

Symptoms

- Fever
- Diarrhoea
- Vomiting
- Abdominal pain
- Rash (generalised streptococcal maculopapular rash)
- Vaginal discharge, wound infection

Signs

- Tachycardia
- Tachypnoea
- Pyrexia
- Possible elevated white cell count
- Elevated C-Reactive Protein

Investigations

Urinalysis may reveal protein, blood, nitrites and leucocytes indicative of a urinary tract infection (UTI)

Blood Tests – A full blood count (FBC) may reveal an abnormally low or high white cell count (WCC). Elevated serum urea and electrolyte (U&E) may be indicative of renal impairment. Liver function may be impaired, manifesting as abnormal results on liver function tests (LFTs) and/or clotting abnormalities.

Blood Cultures should be taken as soon as possible.

Other investigations which may be warranted include:
Chest X-Ray (if pneumonia is suspected)

VQ scan or spiral CT (pulmonary embolism may produce similar clinical signs to early sepsis)

Abdominal/vaginal ultrasound (to detect an intra-abdominal source of sepsis or retained products of conception)

Lumbar puncture/CT scan of Brain (suspected meningitis)

Features of septicaemic shock

- Tachycardia over 90 beats per min
- Tachypnoea over 20 breaths per min
- Pyrexia over 38° C
- Hypothermia below 35 ° C
- Hypotension Systolic BP 90mm/Hg or below in absence of other causes e.g. bleeding
- Hypoxemia
- Poor peripheral perfusion, mottled skin
- Oliguria
- Metabolic acidosis
- Elevated lactate
- Positive blood cultures
- Abnormal coagulation and bleeding
- Abnormal liver and renal function tests

The organisms that killed the women in the CEMACH report:

The most common pathogens identified among the cases were the *beta-haemolytic streptococcus* - Lancefield Group A (8 cases), *E. coli* (7 cases) and *pseudomonas* (three cases). There were two cases each from *staphylococcus aureus* and *proteus*, and one case each of *beta-haemolytic streptococcus* - Lancefield Group B, *streptococcus pneumoniae*, *citrobacter koserii*, *actinobacter* and *listeria*. Some women had mixed infection with two or more organisms. For one obviously septic woman no pathogen was identified because the tests were not done. Methicillin resistant *staphylococcus aureus (MRSA)* infection developed in three women who had prolonged stays in Critical Care Units, but this was not the eventual cause of their death.

Management

Once the diagnosis of sepsis has been made, treatment should not be delayed. All patients require careful monitoring of cardio-respiratory function. Observations should be made on a MEOWS chart and significant deterioration reported to medical staff. The use of SBAR (see appendix) as a communication tool to relay clinical information in a succinct manner, with repetition if necessary, is highly recommended.
Patients with all severities of sepsis must be seen by a senior doctor. Patients who fall into the severe sepsis/septic shock category must be referred to a senior obstetric anaesthetist or intensivist (depending on local circumstances) for further assessment/treatment. A rapid response guideline explaining how trainee medical staff can obtain Anaesthetic and/or Critical Care advice and assistance should be available in every obstetric and gynaecology unit.

Inotropic support for the circulation may be required at an early stage.

Guiding principles of antimicrobial treatment of genital tract sepsis:

If pelvic sepsis is suspected prompt early treatment with a combination of high-dose broad-spectrum intravenous antibiotics, such as cefuroxime and metronidazole, may be lifesaving. **Do not wait for microbiology results.**

Ensure that serum levels of antibiotics are within the therapeutic range.

The expert advice of a consultant microbiologist should be sought at an early stage.

Microbiology results should be obtained as soon as possible.

If there is no response within 24 - 48 hours or the woman's condition is deteriorating, the antibiotics should be changed and gentamicin or alternative antibiotics added, guided by microbiological advice.

The source of sepsis should be sought and dealt with, if possible and appropriate, for example - by delivery or ultrasound scans to detect retained intrauterine products and evacuation of products if present.

Immediate Management should include the following:

- Inform Medical Staff
- IV access and send blood for FBC, coagulation screen, U&E, LFTs, blood culture and start intravenous fluids
- Administer intravenous broad-spectrum antibiotics immediately after the blood cultures have been taken
- Measure arterial blood gases and lactate
- Treat hypotension and/or elevated lactate (>4mmol/l) with a fluid bolus(20ml/kg crystalloid e.g. Hartmann's)
- Monitor heart rate and pulse oximetry continuously, Non-invasive Blood Pressure every 5 minutes until an intra-arterial line has been placed, after which it should be measured continuously.
- A urinary catheter should be inserted and hourly urine output measured
- Inotropes or vasopressors may be required if there is an inadequate response to the fluid bolus (discuss with anaesthetists/intensivist)
- The patient should be managed in a high dependency environment with suitably trained staff in attendance and appropriate monitoring in place. Additional monitoring, including central venous pressure and intra-arterial monitoring should be discussed with an obstetric anaesthetist/intensivist, according to local availability.

When the blood culture results are available (24 - 48 hours after the start of incubation), antibiotic treatment should be tailored to microbial sensitivities. If in doubt, discuss with the senior microbiologist.

Learning Points from CEMACH Report

Learning Points: In early pregnancy

Care should be taken to ensure that the uterus is empty following a surgical evacuation of the uterus. An ultrasound scan should be performed if there is any doubt.

Screening for infection and antibiotic prophylaxis is recommended in women undergoing surgical evacuation, if there is an increased risk of infection.

Learning Points: Cervical sutures

Although cervical cerclage may be justified in certain situations, it is a potential source or portal of infection.

It is important to monitor such women for signs of infection and to carry out appropriate investigations including vaginal/cervical swabs if any symptoms develop.

Learning points: Sepsis in later pregnancy

Genital tract sepsis must be considered in the differential diagnosis when a woman presents with symptoms suggestive of placental abruption.

Disseminated intravascular coagulation and uterine atony are common in genital tract sepsis and often cause life-threatening postpartum haemorrhage.

Treatment, including delivery, should not be delayed once septicaemia has developed because deterioration can be extremely rapid. Women should be fully informed of the dangers of conservative management.

Learning points: Puerperal sepsis

Any problems noted during a woman's hospital stay should be reported *directly* to her community carers (GP, midwives and health visitors) when she is discharged in order that appropriate follow up visits may be arranged and the significance of developing symptoms recognised.

Early discharge means that some women will develop complications after they return home.

Routine observations of pulse, BP, temperature, respiratory rate, and lochia should be made in all recently delivered women for several days postpartum.

Sepsis is often insidious in onset with a fulminating course. The severity of illness should not be underestimated. Community midwives and GPs need to be vigilant and visit regularly. Early referral to hospital may be life saving.

Sepsis should be considered in all recently delivered women who feel unwell and have pyrexia.

Key Learning Points

Sepsis is a range of clinical syndromes from uncomplicated (e.g. common cold) to severe sepsis with multi-organ dysfunction, which occur as a result of the patient's immune system responding to a threat from an infection.

A high index of suspicion is necessary to detect early deterioration leading to severe sepsis or septic shock.

Senior medical staff, including the obstetric anaesthetist/intensivist, should be informed immediately if a pregnant woman shows signs of severe sepsis. Delay in undertaking investigations and starting antibiotics and supportive treatment decreases the chance of survival.

Immediate management includes appropriate blood tests including blood cultures and early commencement of broad spectrum antibiotics.

Hypotension should be treated aggressively, initially with fluids and introduction of vasopressors, as the clinical picture dictates.

Conclusion

In the past, puerperal sepsis or 'childbed fever' was a leading cause of maternal death and its signs and symptoms were widely known. Antisepsis, antibiotics and changing practice over the years mean that genital tract sepsis has become much less common and death is rare. The fear and respect with which it was held in the past by obstetricians, midwives and patients has disappeared from our collective memory. Action is now required to raise awareness of the signs and symptoms of sepsis and recognition of critical illness among staff in maternity units or in the community, Emergency Departments, and among GPs and health visitors.

The cases highlighted in the CEMACE report 2010 clearly demonstrate that genital tract sepsis is still a problem, that is repeatedly missed and there is often failure to treat women early and aggressively enough. Some of these maternal deaths may have been prevented if the signs and symptoms of sepsis and developing septicaemic shock had been recognised and treated earlier. Nevertheless the clinical picture of life-threatening sepsis often develops very rapidly and in many of the cases the outcome could not have been prevented.

Appendix:

SEPSIS RESUSCITATION BUNDLE taken from the "Surviving Sepsis Campaign"

The goal is to perform all indicated tasks 100% of the time within the first 6 hours of identification of severe sepsis.
The tasks are:
1. Measure **serum lactate**
2. Obtain **blood cultures** prior to antibiotic administration
3. Administer **broad-spectrum antibiotic**, *within 3 hrs of Emergency admission and within 1 hour of non-Emergency admission*
4. In the event of hypotension and/or a serum lactate > 4 mmol/L
a. Deliver an initial minimum of **20 ml/kg of crystalloid** or an equivalent
b. Apply **vasopressors** for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) > 65 mm Hg
5. In the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate > 4 mmol/L
a. Achieve a central venous pressure (CVP) of > 8 mm Hg (CARE IF THE WOMAN IS PRE-ECLAMPTIC)
b. Achieve a central venous oxygen saturation ($ScvO_2$) > 70 % or mixed venous oxygen saturation (SvO_2) > 65 %

Chapter 7

Shoulder dystocia

Shoulder dystocia is one of the most frightening and threatening obstetric emergencies. There is a need to act quickly in order to prevent serious fetal morbidity and mortality.

Definition

The fetal anterior shoulder becomes impacted behind the symphysis pubis, preventing delivery (Fig. 7.1). Clinically shoulder dysctocia is defined as difficulty delivering the shoulders such as to require some obstetric intervention beyond episiotomy and downward traction. Although the incidence overall is around 0.2%, it rises to 0.5% with a fetal weight of over 3.5kg and 10% with a weight of over 4.5kg. Shoulder dystocia accounts for 8% of all intrapartum fetal deaths.

Risk factors

Although risk factors have been identified (Table 7.1) they have only very limited predictive value. Fifty per cent of shoulder dystocias occur in normal size fetuses and 98% of large fetuses do not have dystocia. It is estimated that 3695 elective caesarean sections would have to be performed in non-diabetic mothers with babies estimated to weigh more than 4.5 kg in order to avoid one permanent brachial plexus injury.

Table 7.1 Risk factors for shoulder dystocia

Antepartum	During 1st stage of labour	During 2nd stage of labour
Macrosomia Past history of dystocia	Prolonged 1st stage Secondary arrest >8cm	Difficulty delivering chin
Diabetes	Mid-cavity arrest	
Post Dates	Forceps / Ventouse delivery	
Obese mother	High head	
High parity		
Short stature		
Abnormal pelvic anatomy		

Clinical features

The baby's head is often delivered as far as the chin and the fetal body is in the pelvis. The umbilical cord is trapped and occluded between the fetal trunk and the maternal pelvis leading to rapid fetal hypoxia and death. The pH drops by an estimated 0.04 per minute and it therefore takes around seven minutes for the pH of a previously un-compromised fetus to fall below 7.00. Despite this it is estimated that 50% of deaths occur within 5 minutes.

Another problem is that of brachial plexus damage as a result of excessive downward traction of the head during attempts at delivery. It is possible to damage nerve roots between Cervical 5-6 (Erb's palsy) or Cervical 7 and Thoracic 1 (Klumpke's Palsy).

While the main concern about shoulder dystocia relates to the fetus, there may also be the maternal complications of genital tract trauma and postpartum haemorrhage secondary to uterine atony. Uterine rupture is rare.

Management

This is an obstetric emergency where, again, seconds count. The aim is to disimpact the anterior shoulder and allow the fetus to be delivered.

The mnemonic 'HELPERR' is useful to guide the clinician through a set of detailed manoeuvres in a calm logical way. Each manoeuvre is attempted for a maximum of 30 seconds before moving to the next (Table 7.2).

Table 7.2 Shoulder dystocia

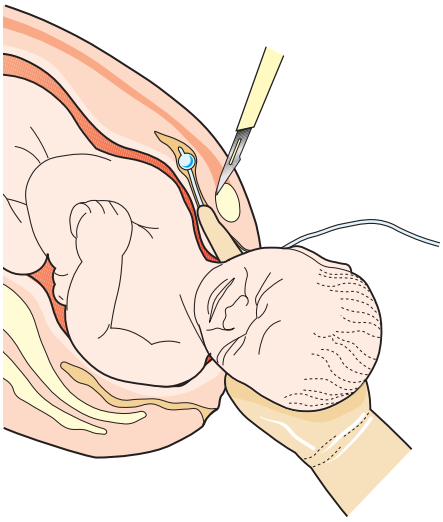
H	**Help**				
E	**Evaluate** for epis'				
L	**Legs** to McRoberts position				
P	**Pressure** suprapubic				
E	**Enter** (Wood's & reverse Wood's)				
R	**Remove** the posterior arm				
R	**Roll** over				

H	As with all obstetric emergencies the first response is to urgently bleep the emergency team. While waiting, use whatever help is available, including the birth partner.
E	This allows room for imminent internal manoeuvres and reduces the frequency of vaginal lacerations.
L	Known as McRoberts manoeuvre. With one midwife to each leg, the mother's legs are flexed hard against her abdomen and at the same slightly abducted outwards. This straightens the sacrum relative to the lumbar vertebrae and rotates the symphysis towards the maternal head, allowing the baby's shoulder to pass under by continuous traction on its head. This manoeuvre may be successful in 40–60% of cases. Attempt deliver for 30 seconds before trying next manoeuvre (applies to each new manoeuvre below)
P	With the legs in the McRoberts position, suprapubic pressure is applied to posterior aspect of the anterior fetal shoulder at an angle of 45 degrees towards the fetal chest in an attempt to rotate the shoulder into the oblique and also to reduce the bisacromial diameter. This is used in conjunction with continuing head traction. If constant pressure fails, a rocking movement may be tried.
E	The Woods screw manoeuvre (or Rubin II). The attendant's hand enters the vagina at the 5 or 7 o'clock position. The middle and index fingers are placed on the posterior aspect of the anterior shoulder and an attempt is made to rotate the shoulder forwards. If this fails, those fingers are kept static and the index and middle finger of the other hand are placed on to the anterior aspect of the posterior shoulder. Both sets of fingers are again used to attempt rotation. If this fails the Reverse Woods Screw Manoeuvre is attempted. The fingers on the posterior shoulder are withdrawn completely. The fingers on the anterior shoulder slide down the fetal back to the posterior aspect of the posterior shoulder and rotation is attempted again.
R	The hand of the operator is passed into the hollow of the sacrum, the fetal elbow identified, the forearm flexed and then delivered by sweeping it across the fetal chest and face. Fractures of the humerus are not uncommon with this manoeuvre.
R	It is possible to displace the anterior shoulder during the act of turning the mother over into the all fours position. If not, an attempt can be made to deliver the posterior shoulder first, i.e. the shoulder nearest the ceiling. It is possible to try all the above manoeuvres (except suprapubic pressure) again in this new position.

If all else fails there are three 'last resort' measures. These are described in brief:

1. Symphysiotomy: the symphyseal joint is split with a scalpel, thereby increasing the pelvic diameters (Fig. 7.1) – consider 1% lidocaine if no epidural.
2. The anterior clavicle of the fetus is deliberately fractured to reduce the bisacromial distance.
3. The Zavanelli Manoeuvre. This involves replacing the head with flexion and rotation, and then delivering by caesarean section.

Fig 7.1: Symphysiotomy



Shoulder dystocia remains an extremely serious, unpredictable and relatively rare event. Fetal survival and neurological normality are proportional to the speed of successful resolution.

Chapter 8

Twins

The perinatal mortality in twin pregnancies is four or five times higher than for singleton pregnancies, largely related to preterm delivery (40% deliver before 37 weeks compared with 6% in singletons). A smaller proportion of this mortality is from complications specifically related to monochorionic twins (i.e. twins that are identical and share the same placenta).

Even allowing for these factors, current data suggest that there is an extra risk of perinatal morbidity and mortality among second twins born at term, usually from intrapartum anoxia following cephalic vaginal delivery of the first twin. Planned caesarean section could theoretically avoid some of these risks but direct evidence of a protective effect is not currently available (although there is some evidence that it may decrease the risk of low 5-minute Apgar score, particularly if twin 1 is breech). At present, 60% of twins are delivered by caesarean section in the United Kingdom.

Presentations for delivery at term may be:

- Cephalic/Cephalic (40%)
- Cephalic /Breech (40%)
- Breech/ Cephalic (10%)
- Other, e.g. transverse (10%).

It is common practice at 38-40 weeks to induce labour in those who are suitable for vaginal delivery, and to carry out a caesarean section at 38–39 weeks in those who are not. Some controversy exists about mode of delivery if twin 2 is in a non-cephalic position but in up to 20% of cases, depending on gestation, the presentation of twin 2 may change once the first twin is delivered. Most current reviews would suggest that vaginal delivery should be attempted if twin 1 is cephalic irrespective of the lie and presentation of twin 2 providing the estimated fetal weight is > 2000g.

Caesarean section is also usually carried out if twin 1 is non-cephalic, or if the twins are mono-amniotic, or if there is significant growth discordance. If the labour is very pre-term (<34 weeks), many clinicians would also consider delivery by caesarean section. Triplets and higher order multiples are probably best delivered by caesarean section.

Management of twin delivery

Two midwives, an experienced obstetrician and two people experienced in neonatal resuscitation should ideally be present for delivery. It is useful to have an anaesthetist available should problems arise and to prepare a syntocinon infusion in case uterine activity falls away after delivery of the first twin (there is no literature on the rate of infusion, but starting at 3mU/min increasing in 10-30min to 6mU/min is considered acceptable by many). IV access is useful.

The first stage of labour is managed as for singleton pregnancies and care should be taken to ensure that *both* twins are being monitored with the cardiotocography rather than simply one twin twice. Although some feel this is best achieved by monitoring the first twin with a fetal scalp electrode and the second abdominally it is probably more useful to scan in early labour, confirm the lie of each twin and note the position of each heartbeat to enable reliable abdominal monitoring of both. An epidural may be very useful in assisting the delivery of a second twin if it is non-cephalic though, as noted above, a small proportion of second twins that start labour in cephalic presentation will not be cephalic after the first twin delivers.

After delivery of the first twin it is important to check the presentation of the second twin: if it is transverse, attempt to turn the baby head first by external palpation (i.e an external cephalic version). Providing the baby is in longitudinal lie (i.e. either cephalic or breech) and the CTG is normal there is probably little urgency in managing the second delivery. The contractions are often less frequent after the first delivery and it may be worth starting the syntocinon infusion as above. The presenting part (head or breech) can then be allowed to descend into the pelvis with contractions *before* rupturing the second sac so that the chance of cord prolapse is minimised. After membrane rupture, the presenting part will usually descend more rapidly for delivery to take place.

If the second twin is transverse and external cephalic (or podalic) version is not possible, the option is to perform an internal podalic version or to carry out a caesarean section. This decision will depend on the experience of the operator and the facilities available. For the internal podalic version a hand should be inserted into the vagina and through the cervix to find at least one, and ideally two, feet through the intact membranes (this is painful and may be impossible without an epidural). The feet can then be pulled downwards and out of the vagina, with the rest of the baby being delivered as for a breech presentation. Internal podalic version is most straightforward when the baby has its back to the uterine fundus (as the legs are close to the cervix), but it can be very difficult to access the feet if the baby has its back downwards.

If the second twin is lying longitudinally and the cardiotocograph is not reassuring, it may be necessary to rupture the second sac earlier than preferred to encourage delivery. This carries a high risk of cord proplase but may be justifiable depending on the cardiotocograph trace providing that facilities are available for urgent caesarean section if problems occur.

As twin delivery carries an increased incidence of PPH, it is important to manage the third stage actively:

- Administer syntometrine 1 ml IM, or 10 iu syntocinon IV (if syntometrine contraindicated).
- Deliver the placenta.
- Commence infusion of syntocinon (e.g. 40 iu in 500ml Hartmann's at 125ml/her i.e. 10 iu per hour) to minimise the risk of uterine atony.
- Consider misoprostol 800 µg PR.

Points to note

- ECV vs. internal podalic version. Studies comparing ECV with internal podalic version and breech extraction of the second twin have found that the risk of emergency caesarean was higher in the ECV group (38% vs. 3%) compared with the breech extraction group. The risk of fetal distress was also higher in the ECV group (18% vs. 1%).

- Theatre may well be the safest place to perform twin deliveries.

- Time interval between twins. Traditional teaching holds that the perinatal morbidity and mortality are increased when the interval between the deliveries of twins exceeds 15 minutes. This, however, was based on data collected before continuous fetal monitoring. It has been demonstrated by many authors that delivery outcome is not made any worse when the interval exceeds even 30 minutes, provided that continuous monitoring is employed and there is no evidence of fetal compromise.

- Previous caesarean section. There is limited evidence exists about this situation, but scar dehiscence rates are reported to be 0–3%.

Chapter 9

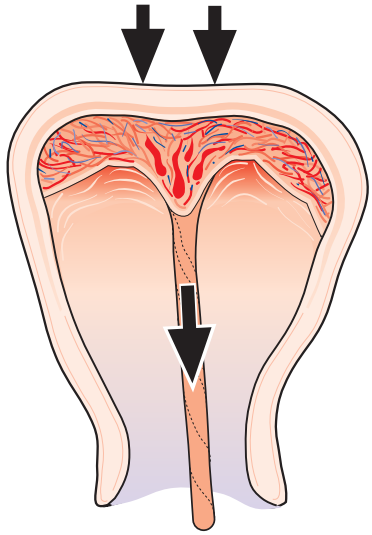
Uterine inversion

Definition

Uterine inversion is rare occurring in 1/2000–1/20000 pregnancies but, as it may lead to rapid maternal death, it is an extremely significant third stage complication. The uterus may undergo varying degrees of inversion and, in its extreme form, the fundus may pass through the cervix such that the whole uterus is turned completely inside out (Fig. 9a). As there is a rich vagal supply to the cervix the inversion leads to profound vasovagal shock, and this may be exacerbated by massive postpartum haemorrhage secondary to uterine atony.

Fig. 9a: Traction on the cord pulls the fundus down through the cervix, effectively turning the uterus inside out. It is more likely with:

- Previous history of uterine inversion
- Fundal placenta implantation
- Uterine atony
- Improper management of the third stage.



Clinical presentation

With complete inversion, the uterus will appear as a bluish–grey mass protruding from the vagina, and in extreme cases there may also be vaginal inversion. The placenta remains attached in about 50% of cases. If the inversion is partial the only obvious sign may be that of profound shock out of proportion to any blood loss. The diagnosis will require a vaginal examination. Rarely, the presentation is sudden death following neurogenic shock.

Management

Ninety per cent of patients will have immediate life-threatening haemorrhage. In order to minimise vasovagally induced shock and minimise the haemorrhage it is imperative to replace the uterus as quickly as is practicable. Immediate resuscitation is also required and should involve all available obstetric and anaesthetic help. No attempt should be made to separate the placenta as this may exacerbate the haemorrhage.

One method of reduction is to grasp the uterine fundus with the fingers directed towards the posterior fornix and replace the uterus back into the vagina, pushing the fundus towards the umbilicus and allowing the uterine ligaments to pull the uterus back into position (Fig. 9b). Alternatively the centre of the uterus may be indented with three or four fingers and only the centre of the fundus pushed up until it re-inverts. Once re-inversion has occurred, the hand inside the uterus should maintain pressure on the fundus until oxytocics have been given in order to maintain a contracted uterine state and prevent recurrence.

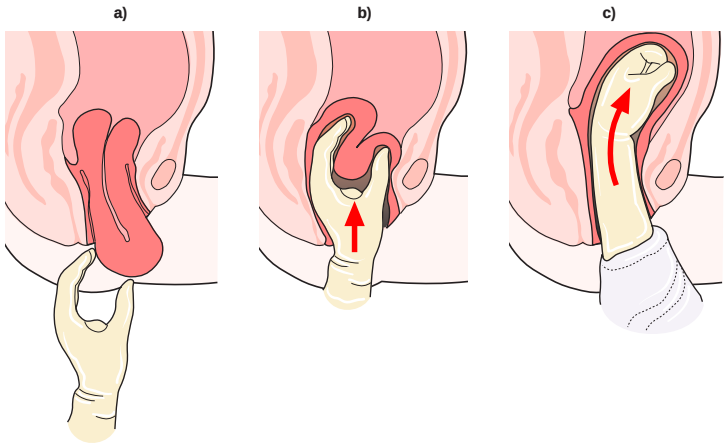


Fig. 9b: Manual reduction of uterine inversion.

Should these methods fail O'Sullivan's technique should be employed. This involves passing 2 litres of warmed fluid into the vagina using either a ventouse cup or anaesthetic gas tubing. The resulting vaginal distension, especially at the vault, is extremely effective at allowing the uterus to return to the normal position. If successful, the fluid should be allowed to drain and oxytocics given as above. Should all of these attempts fail, a laparotomy is required to aid re-inversion. An incision may be required at the rim of the inversion. Hysterectomy is an option.

Chapter 10

Uterine rupture

Loss of the integrity of the wall of the uterus may occur either suddenly or more gradually during the progress of labour. The uterine cavity may communicate directly with the peritoneal cavity or be separated from the peritoneal cavity by the visceral peritoneum of the uterus (incomplete uterine rupture or uterine dehiscence).

A complete uterine rupture often results in fetal death, and may lead to maternal death from massive intra-abdominal haemorrhage.

Epidemiology

This obstetric emergency is rare in multiparous women who have had previous vaginal deliveries and is virtually unheard of in primigravida. It does, however, complicate approximately 0.5% of deliveries in those who have had a previous caesarean section, with the rupture occurring at the site of the caesarean section incision. This risk markedly increases when oxytocics, such as prostaglandins or oxytocin, are used, and it is assumed that the consequent powerful contractions place a greater strain on the scar. The risk of rupture is increased yet again if the previous caesarean section was 'classical' rather than 'lower segment' (i.e. midline rather than low transverse) and up to a third of pregnancies with classical incisions may be complicated by rupture even several weeks before term. Most obstetricians would offer those with a midline scar an elective caesarean section.

Pathology

With complete *rupture*, the fetus may be extruded into the abdominal cavity. As the rupture can extend laterally into the uterine arteries or broad ligament plexus of veins there is often severe haemorrhage. Much less commonly, rupture may occur following direct abdominal trauma, for example a road traffic accident.

In scar *dehiscence*, the fetal membranes remain intact. Occasionally these are found incidentally at caesarean section carried out for other clinical reasons.

Risk factors

There are many risk factors which increase the risk of uterine rupture (Table 10a), and most of the intra-partum causes are the consequence of increased force being applied to the uterine muscle.

Table 10a Risk factors associated with uterine rupture

Antepartum	Intrapartum
• Certain congenital malformations of uterus • External trauma • Classical caesarean section • Lower segment caesarean section • Previous uterine trauma / surgery • External cephalic version	• Induction with previous caesarean • Oxytocin in the multiparous mother • Precipitate delivery • Obstructed labour • Forceps, especially Kielland's • Shoulder dystocia • Breech extraction • Difficult manual removal of placenta

Clinical features

The most common sign of uterine rupture is that of fetal distress identified by the CTG. This occurs in 70%. Other features include vaginal bleeding (4%), abdominal pain (8%), and easily palpable fetal parts per abdomen. Occasionally the fetal head is felt to have risen higher on vaginal examination. Dehiscence or rupture may occasionally be identified at a vaginal examination for postpartum haemorrhage. In severe instances there may be cardiovascular collapse.

Management

If uterine rupture is suspected the initial drill of summoning immediate help and resuscitation is followed by an immediate emergency laparotomy to deliver the baby. At the time of laparotomy it may be possible to repair the defect, especially if this is simple dehiscence of a previous caesarean section scar. If there is massive haemorrhage (more likely if the rupture is complete), or if it does not involve a previous scar, or has led to extension of a scar, an emergency hysterectomy may be required. Most cases of uterine rupture are not identified at the time of rupture and only become apparent at caesarean section for fetal distress.

Prognosis

With complete rupture and expulsion of the fetus into the abdominal cavity the perinatal mortality rate approaches 75%. If untreated, most women would die from haemorrhage and infection.

Chapter 11

ABCDE

Introduction

The CEMACE Report: Saving Mothers' Lives 2010 has highlighted again the adverse maternal outcomes resulting from failure to recognise the sick woman during the early stages of critical illness. Critically ill patients suffer from tissue hypoxia as the end result of a pathological insult e.g. hypertensive disorders of pregnancy, major haemorrhage, chest infection, sepsis.

MEOWS

Following the CEMACH recommendations published in Dec 2007 maternity hospitals have now introduced modified early obstetric warning scores (MEOWS) to help early detection and trigger treatment of the few cases of critical illness which develop unexpectedly in healthy young women in maternity wards.

ABCDE Assessments

The resuscitation Council recommends using the ABCDE assessment strategy to help early recognition of the critically ill pregnant woman.

Aim

- To keep patient alive.
- Buy time
- Call for expert help
- Deliver specific treatment.

Hallmarks of ABCDE

- Assess and treat top life-saving priorities before moving on to the next assessment.
- Repeat regularly assessing effects of treatment.
- Simple bedside clinical assessments.
- Can be used by all staff simultaneously.

ABCDE APPROACH

A = AIRWAY

If awake:
- Assess for patent airway:
- Ability to speak
- Noisy breathing (e.g. snoring) is a sign of an obstructed airway
- Foreign body – choking and or coughing.

If unconscious/drowsy:
- Head tilt, chin lift
- Jaw thrust.

Look for chest/abdominal movement.

Listen for breath sounds.

Feel for breath.

B = BREATHING

Assessment for adequate breathing:

Effort of Breathing:

Respiratory Rate	Normal is 15–20/minute
Added noises	Inspiratory stridor (upper airway obstruction) Expiratory wheeze (lower airways obstruction, e.g. asthma, foreign body)
Position adopted	For example, sitting upright and leaning forwards
Use of accessory muscles	

Efficacy of Breathing:
- Chest expansion
- Auscultation
- Pulse oximetry.

Effects of respiratory inadequacy on other organs:

Heart	Tachycardia
Skin	Pale and then cyanosis
Brain	Increasing somnolence and/or agitation.

C = CIRCULATION

Assessment of Circulation:

Heart rate	Tachycardia in haemorrhage
Pulse volume	Small volume in haemorrhage
Capillary refill	➢ 2 seconds in shock
Blood pressure	Hypotension is a LATE sign (will have lost> 40% blood volume)
Other organs	Lungs – tachypnoea Skin - pale, cold, sweaty, mottled. Can feel line of coldness on legs and arms for peripheral perfusion Brain - Agitation then somnolence Kidneys – Oliguria then anuria

D = DISABILITY

Assessment of Disability

Review ABC and initiate treatment, excluding hypoxia and hypotension

Examine reaction of pupils to light, their size and equality.

Assess conscious level using AVPU score

Take bedside glucose measurement

A = Alert	Awake and able to speak
V = Vocal	Responds to vocal stimuli
P = Pain	Responds to painful stimuli
U = Unresponsive	Unresponsive to all stimuli

E = EXPOSURE

Examine woman fully, visually, whilst maintaining her dignity and temperature.

Reference http://www.resus.org.uk/

ABCDE assessment example scenario

This example is provided to demonstrate what is expected in the ABCDE workshop.

Situation:
You are the midwife in charge of the antenatal ward and your patient at 19/52 weeks gestation has reported increasing lower abdominal pain and noted to be flushed and lethargic this morning.

Background:
She was admitted yesterday for observation of abdominal pain and flu-like symptoms over the last 1-2 weeks, attending Maternity assessment on several occasions but previously settling spontaneously. No urinary symptoms. MSSU'S checked all negative. Another one away yesterday on admission. WCC 18,500 and CRP 75

Assessment:

A Speaking normally but sleepy

B Resp rate 25/min
O2 Sat 97%on air

C Heart rate 115/min, volume normal
BP 110 70
Warm and well perfused
CRT <3 sec

D AVPU = alert
Blood glucose normal

E Temp 38.8
Generalised flushing
No rashes.
Tender lower abdomen
No PV loss

Recommendations:
- request medical review
- IV access + repeat bloods FBC, CRP, U+E, LFT'S blood cultures
- For Commence IV fluids.
- For IV antibiotics.

Obstetric Registrar attends 20 mins later.
You point out that patient looks less well now.
O2 sat alarming and you change probe to another finger.

Repeat assessments by Obstetric registrar and you:

A sleepy replying to questions about abdominal pain.

B Resp 32/min
O2 Sat 88% on air Give 15 l/min O2 via non re-breathing mask
O2 sat 98% on O2
Auscultation AE to all zones nil added.

C Heart rate 125/min
Pulse bounding 110/min and regular
NIPB 105/60
CRT 5 sec
Legs warm to touch and flushed

- IV access established, FBC U+E's and LFT CRP Group and save
- taken IV fluids commenced fluids commenced 500 mls fast + 125/hour. Crystalloid.

D AVPU = verbal

E No rashes generalised flushing
Temp 38.5
Lower abdominal tenderness on palpation.
No guarding
No PV discharge.

Impression:

Intrauterine sepsis / pelvic collection

- Blood cultures taken and IV antibiotics administered
- For Ultrasound scan to exclude pelvic collection.
- Transfer to HDU on L/S
- Call obstetric consultant.

Transfer to HDU on labour suite via Ultrasound scan which excludes pelvic collection but suggests intrauterine infection.

On admission to HDU consultant obstetrician and anaesthetist review

Assessments repeated remains stable for next 2 hours. Plan for delivery.

Consultant anaesthetist informed.
Blood results: FBC HB 110
WCC 3.5
Platelets 85,000
ABG show a compensated metabolic acidosis.
(PaO2 95mmHg, PaCO2 3.8mmhg, H^+ 45 nanomoles/litre Bicarbonate 18 mmoles /litre.)
Coag sent.
Sat monitor alarming.

Repeat assessments:

A very sleepy but replying to questions in short sentences.

B
Resp 38/min
O2 sat 94% on 15l/min
AE to all zones with insp creps at bases
Prepare for intubation and ventilation.

C
Pulse 135/min small volume
BP = 95/40
CRT >5secs
Oliguric
Mottled appearance of legs and up to waist.
Gelofusine 1 l stat for ionotropes

D barely responding to speech = V/P

E
Temp 39.5
Pink and flushed from waist up but blue and mottled from waist down
Purulent vaginal discharge noted.

Impression:

Septic shock: For resuscitation / intubate and ventilate transfer to theatre for delivery CVP and Arterial lines sited.

Chapter 12

Maternal resuscitation

As resuscitation after cardiac arrest is rarely required in pregnancy, the details may be unfamiliar. If any section of this manual deserves special attention, it must surely be this one.

Differences from non-pregnant

There are differences from a non-pregnant person:

- The aorta and vena cava are compressed by the gravid uterus, impeding venous return and reducing cardiac output.
- There is an increased risk of aspiration of stomach contents due to relaxation of the oesophageal gastric junction (progesterone effect) and the pressure of the uterus.
- Difficult intubation is more common in the pregnant than the non-pregnant patient (1:300 vs 1:3000).
- Chemical pneumonitis more likely than in the non-pregnant owing to the decreased pH of the stomach contents and the increased chance of inhaling the contents because of the changes outlined above.

It is therefore important, in the early stages of resuscitation, to:

- Tilt patient on a firm surface to the left by 15–30% angle (reduces aortocaval compression and increases potential cardiac output by 25%).
- Apply cricoid pressure and intubate early to avoid aspiration of gastric contents, and to facilitate oxygenation.
- Involve a senior anaesthetist and obstetrician immediately or as early as possible (to facilitate intubation and early caesarean section).

Emergency perimortem caesarean section

It is essential to perform a caesarean section early. The decision for perimortem caesarean section (CS) should be made by 4 minutes and the delivery by 5 minutes (the '4-minute rule'). The perimortem CS should be performed there and then, where the cardiac arrest occurs. It requires minimal equipment because in the absence of maternal circulation, bleeding will be minimal. Only surgical gloves and a scalpel are required. If maternal resuscitation is successful once the baby is delivered then the mother will begin to bleed, sterile packs will be required and she should be transferred to theatre for further surgery. Perimortem CS is primarily to save the life of the mother and forms part of the resuscitation technique. It makes CPR more efficient by:

- Increasing venous return
- Improving ease of ventilation
- Allowing CPR to be carried out in the supine position
- Reducing oxygen requirement after delivery.

Table 11.1 Causes of cardiac arrest

4 Hs	4 Ts
Hypoxia Hypovolaemia Hypo/hyperkalaemia Hypothermia	Thromboembolism Toxic (including local anaesthesia) Tamponade Tension pneumothorax
Also consider:	
Eclampsia (including magnesium toxicity) Amniotic fluid embolus	

Other causes (anaesthesia)

- If cardiac arrest is due to accidental intravenous bupivacaine, prolonged CPR will be required because the bupivacaine prevents effective defibrillation for about 45 minutes after injection. Accidental intravenous injection of bupivacaine can occur after ANY epidural top-up. In the event of a woman becoming unconscious/hypotensive after a top-up, intravenous injection must be borne in mind as a potential cause of collapse.
  Prolonged resuscitation may be necessary; it may be appropriate to consider other options such as treatment with lipid emulsion.
  Remember
  - Continue CPR throughout treatment
  - Recovery from LA-induced cardiac arrest may take>1 hour

- If the cardiac arrest is due to total spinal anaesthesia this will make chest compression *less* effective because of blockade of the sympathetic nervous system. Larger doses of adrenaline may be required during the resuscitation if the patient has a total sympathetic block.

Basic Life Support

The rescuer must ensure a safe environment, shake the patient's shoulders gently and ask loudly if they are all right. If no response, they should call for assistance and return to the patient. A pregnant woman should be tilted about 15–30º to the left to minimize compression of the inferior vena cava. A pillow or rolled up towel placed under the right hip is useful if a firm wedge is not available.

- **Airway**

A hand should be placed on the patient's forehead and the head gently tilted back (providing cervical spine injury is not suspected). At the same time, with the fingertips under the point of the patient's chin, the chin should be lifted to open the airway. A jaw thrust may also be required to open the airway: this is done by placing the little fingers behind the angles of the jaw and moving the jaw anteriorly. This action displaces the tongue from the pharynx.

If there is airway difficulty, turn the patient on to her back with a slight tilt to the left and then open the airway again as described. Head tilt should be avoided if injury to the neck is suspected. Jaw thrust is the manoeuvre of choice under these circumstances.

- **Breathing**

Breathing should be assessed for ten seconds by looking for chest movements, listening for breath sounds and feeling for the movement of air. If the patient is not breathing despite an open airway, chest compressions should be started.

- **Circulation**

Start chest compression as follows:

- Kneel by the side of the mother.
- Place the heel of one hand in the centre of her chest.
- Place the heel of your other hand on top of the first hand.
- Interlock the fingers of your hands and ensure that pressure is not applied over her ribs. Do not apply any pressure over the upper abdomen or the bottom end of the bony sternum (breastbone).
- Position yourself vertically above the mother's chest and, with your arms straight, press down on the sternum 5-6 cm.
- After each compression, release all the pressure on the chest without losing contact between your hands and the sternum. Repeat at a rate of about 100

times a minute (a little less than two compressions a second). Compression and release should take an equal amount of time.

Then combine chest compression with rescue breaths:

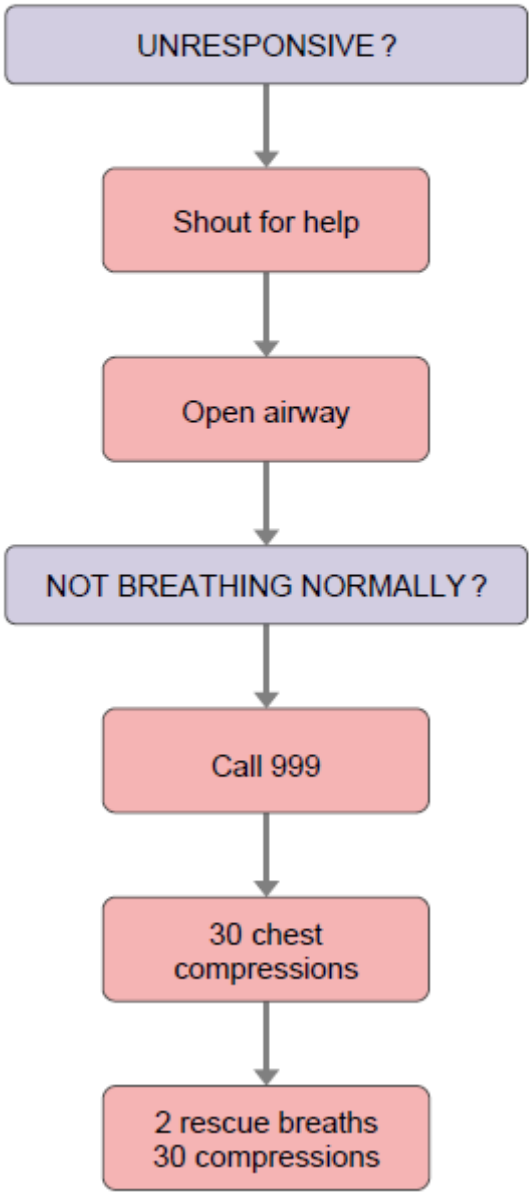
- After 30 compressions open the airway using head tilt and chin lift.
- Pinch the soft part of the mother's nose closed, using the index finger and thumb of your hand on his forehead. Allow her mouth to open, but maintain chin lift.
- Take a normal breath and place your lips around her mouth, making sure that you have a good seal (an appropriate bag and airway is preferable if available).
- Blow steadily into her mouth whilst watching for her chest to rise; take about one second to make the chest rise as in normal breathing; this is an effective rescue breath.
- Maintaining head tilt and chin lift, take your mouth away and watch for the chest to fall as air comes out.
- Take another normal breath and blow into her mouth once more to give a total of two effective rescue breaths. Then return your hands without delay to the correct position on the sternum and give a further 30 chest compressions.
- Continue with chest compressions and rescue breaths in a ratio of 30:2.
- Stop to recheck only if she starts to show signs of regaining consciousness, such as coughing, opening eyes, speaking, or moving purposely AND starts to breathe normally; otherwise do not interrupt resuscitation.

Two-person CPR is preferred if there are two rescuers, maintaining a ratio of two breaths to 30 compressions. If your rescue breaths do not make the chest rise as in normal breathing, then before your next attempt:

- Check the mouth and remove any visible obstruction.
- Recheck that there is adequate head tilt and chin lift.
- Do not attempt more than two breaths each time before returning to chest compressions.

While the technique of mouth-to-mouth resuscitation has been described here it would be expected that, in a clinical setting, a bag/valve/mask apparatus would be available, and it would be most unusual to carry out mouth-to-mouth in such circumstances.

Adult Basic Life Support



In House Resuscitation

The in-hospital algorithm should be used by the healthcare professional responding to an in-hospital cardiac arrest and may also be applicable to healthcare professionals in other clinical settings.

After in-hospital cardiac arrest the division between basic life support (BLS) and advance life support (ALS) is arbitrary; in practice, the resuscitation process is a continuum.

Advanced Life Support

Basic life support (2 breaths to 30 compressions) should continue until the advanced life support arrives. If an automated external defibrillator (AED) is available, attach, analyse rhythm and defibrillate as indicated. The most frequent initial rhythm in cardiac arrest is ventricular fibrillation (VF). The chances of successful defibrillation diminish with time from the onset of cardiac arrest - i.e. early defibrillation saves lives. The AED facilitates early defibrillation by lesser-trained personnel, as it performs rhythm analysis, gives information by voice or visual display and the delivery of the shock is then activated manually. If using a manual defibrillator, place defibrillator gel pads on patient's chest, one below the right clavicle and one over the cardiac apex, taking care to avoid breast tissue. Place defibrillator paddles firmly on gel pads.

If defibrillation is indicated it is your responsibility to ensure that it is carried out safely. This is achieved by ensuring that nobody is touching the patient or the trolley/bed. You must visibly check head, sides and feet and give a clear instruction to all present to "STAND CLEAR - DEFIBRILLATING" before pressing the discharge button. Failure to ensure safety of rescuers may result in ventricular fibrillation in a rescuer.

Treatment of VF/VT

- Attempt defibrillation by giving one shock of 150–200J biphasic or 360 monophasic.
- Immediately resume chest compressions and ventilation (30:2) *without checking rhythm or pulse* and continue CPR for 2 minutes, IV access should be carried out and the airway secured with intubation. Once intubated, the patient is ventilated at 12-14 breaths per minute and chest compressions are performed at 100/minute. After 2 minutes CPR, check the rhythm.

If VF/VT persists:

- Give a second shock of 150–360J biphasic (360 monophasic).
- Resume CPR immediately and continue for 2 minutes.
- Check the rhythm on the monitor.

If VF/VT persists, adrenaline 1 mg is given once chest compressions have restarted after the third shock and then every 3-5 min (during alternate cycles of CPR). This subtle change in the timing of adrenaline administration is to separate the timing of drug delivery from attempted defibrillation. It is hoped that this will result in more efficient shockdelivery and less interruption in chest compressions.
Amiodarone 300 mg is also given after the third shock.

Reversible causes of cardiac arrest are considered and treated as necessary.

Sodium bicarbonate **is rarely used and** should only be given to patients with severe acidosis (pH less than 7.1 base excess less than -10).

Non-shockable Rhythms

If VF/VT can be positively excluded, the patient will be in asystole or has pulseless electrical activity (PEA): defibrillation is not indicated. PEA occurs when the rhythm strip on the ECG monitor is compatible with a cardiac output, for example sinus rhythm. In the presence of asystole or PEA, look for other reversible causes of cardiac arrest. It is useful to discuss these out loud by excluding in turn the 4 Ts, the 4 Hs and eclampsia/amniotic fluid embolism.

Treatment for PEA:

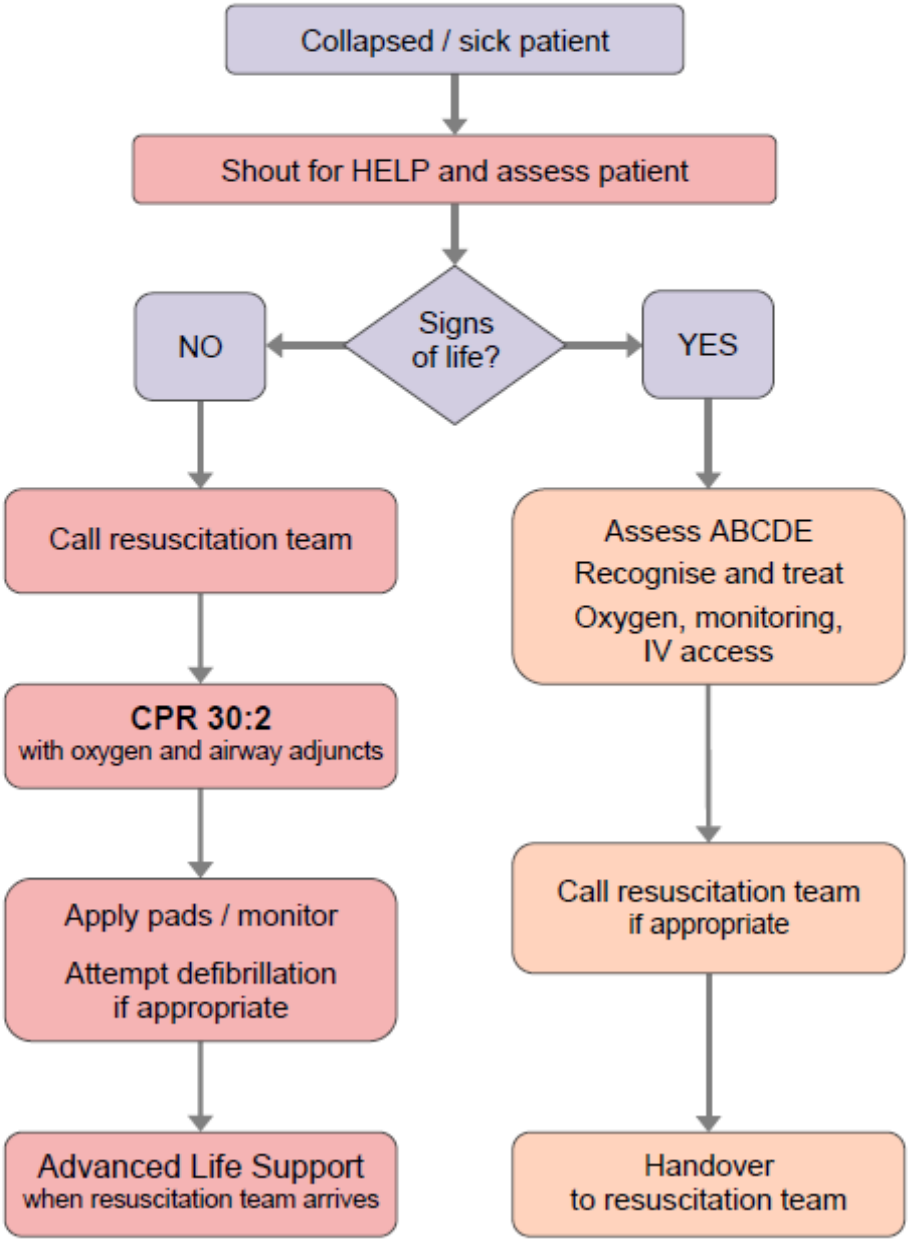
- Start CPR 30:2.
- Give 1mg adrenaline as soon as IV access is achieved.
- Continue CPR until the airway has been secured then continue compressions without stopping for ventilation.
- Recheck the rhythm after 2 minutes.
- If organised electrical activity is seen, check for pulse.
- If pulse **present** – post-resuscitation care.
- If pulse is **absent** continue CPR.
- Recheck rhythm after 2 minutes.
- Give further adrenaline 1mg every 3–5 minutes.

If VF/VT at the rhythm check, move to the shockable rhythm algorithm

2010 Resuscitation Guidelines

Resuscitation Council (UK)

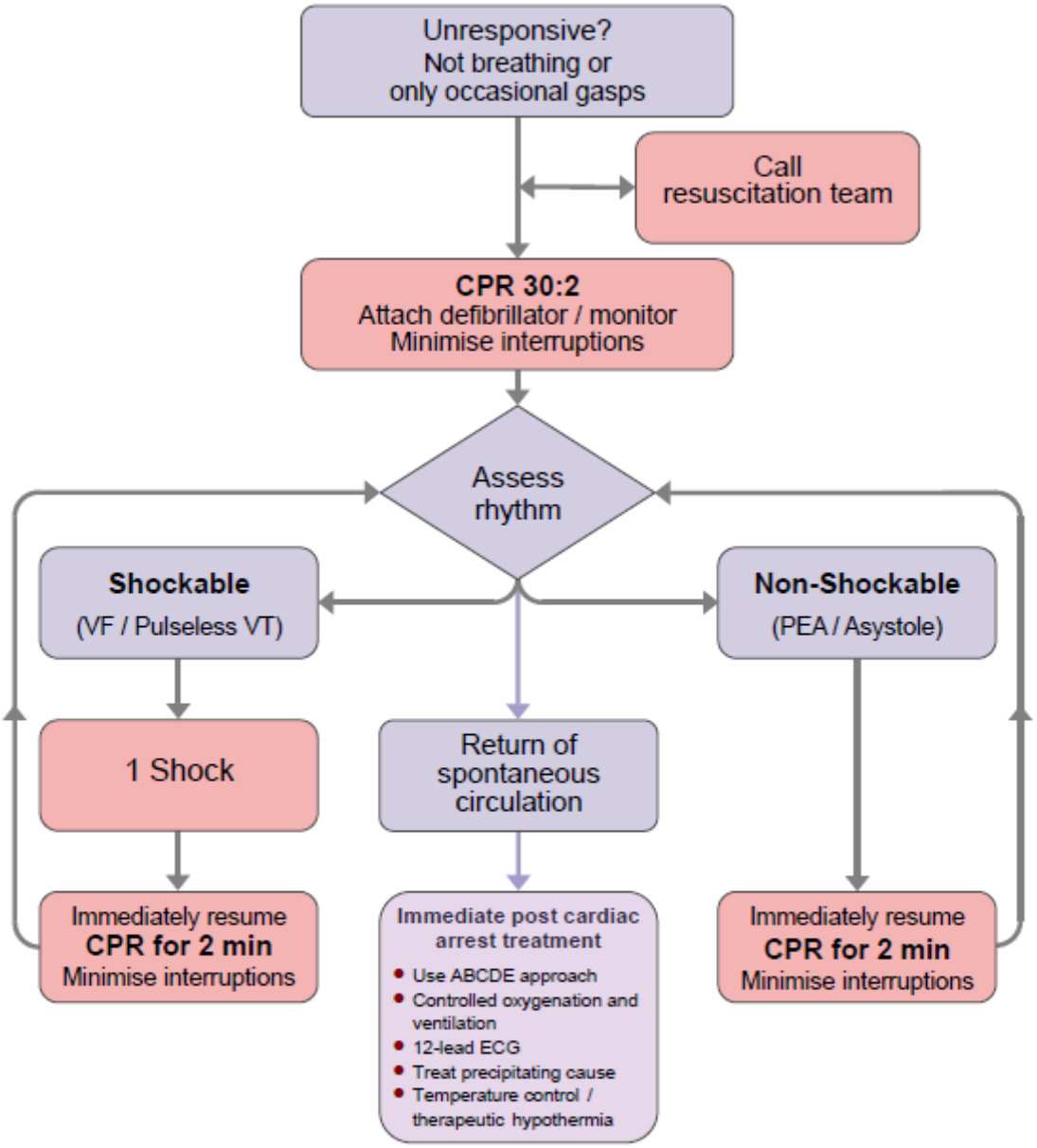
In-hospital Resuscitation



2010 Resuscitation Guidelines

Resuscitation Council (UK)

Adult Advanced Life Support



During CPR

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Correct reversible causes

Reversible Causes

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/metabolic
- Hypothermia
- Thrombosis - coronary or pulmonary
- Tamponade - cardiac
- Toxins
- Tension pneumothorax

Specific pregnancy-related conditions

DVT and pulmonary embolism

Venous pulmonary thromboembolism is one of the commonest direct causes of maternal mortality in the UK. Over 40% of these occur antenatally, often in the first trimester.

Lower limb deep venous thromboses (DVTs), which pre-disposes to pulmonary emboli, are more common. Over 80% of DVTs in pregnancy are left sided and, unlike the non-pregnant population, more than 70% are high (ileofemoral). Risk factors include obesity, age >35 years, high parity, previous thromboembolism, immobility, pre-eclampsia, varicose veins, congenital or acquired thrombophilia, intercurrent infection and caesarean section (particularly emergency caesarean section).

Diagnosis of DVT

DVT may be asymptomatic but, in addition to the traditional symptoms and signs, it may also present with lower abdominal pain. It is essential to make a definitive diagnosis if possible. Duplex Doppler ultrasound is particularly useful for identifying femoral vein thromboses, although iliac veins are less easily seen and are particularly difficult to visualise in the presence of obesity. Ultrasound is safe and should be the first-line investigation. Venography is better, but has the disadvantage of radiation exposure, and should probably only be carried out if the Doppler scan gives equivocal results or is not available. Breast-feeding following contrast injection is considered safe.

Diagnosis of pulmonary embolism

Pleuritic chest pain, breathlessness, cough and haemoptysis are the major symptoms. There may also be pyrexia. These symptoms may be mild, or associated with collapse and cardiopulmonary arrest (see basic and advanced life support above). An ECG is frequently normal and the CXR is often normal. Arterial blood gas measurements may show hyperventilation ($PCO_2 < 4.5$ kPa) and decreased O_2 exchange (e.g. $PO_2 < 8$ kPa). A CT scan of the pulmonary artery or VQ scan is required. Pregnancy is not a contraindication to these investigations: the risk associated with isotope scanning is small compared to the risk of the mother losing her life if a pulmonary thrombo embolism is undiagnosed and untreated.

Management of DVT or pulmonary embolism

Start treatment as soon as clinical suspicion arises: do not wait for a definitive diagnosis. Check a baseline coagulation screen and platelets. Instead of traditional heparin 5000 IU IV over 5 minutes followed by a 1000-2000 IU/hr IV infusion with checking of the APTT after 6 hours it is becoming common practice to use low-molecular-weight heparin as in Table 11.2. Low molecular weight heparin is probably safe, because the patient is less likely to receive an overdose. However, the

anticoagulant effect of low molecular weight heparin cannot be checked by laboratory measurement of coagulation in the way that a heparin infusion can.

For further see http://www.rcog.org.uk/guidelines

Table 11.2 Low molecular weight dose for therapeutic anticoagulation based on early pregnancy weight

Table 1. Calculation of initial doses of drugs by early pregnancy weight

Initial dose	Early pregnancy weight (kg)			
	< 50	50–69	70–89	> 90
Enoxaparin	40 mg bd	60 mg bd	80 mg bd	100 mg bd
Dalteparin	5000 iu bd	6000 iu bd	8000 iu bd	10,000 iu bd
Tinzaparin	175 units/kg once daily (all weights)			

bd = twice daily

Amniotic fluid embolus

Amniotic fluid suddenly enters the mother's circulation and precipitates circulatory collapse. This is one of the most catastrophic conditions that can occur in pregnancy. It is rare, with an incidence somewhere between 1: 8000 and 1: 30000, and until recent years the mortality at 30 minutes was around 85 %. Although improved ITU facilities and improved understanding of the condition have reduced this mortality, it still remains a high cause of maternal death in the UK.

Amniotic fluid embolism can occur at any time in pregnancy but it most commonly occurs in labour (70%), after vaginal delivery (11%), and following caesarean section (19%). The following risk factors have been identified:

- Multiparity
- Abruption
- Intrauterine death
- Precipitate labour
- Suction termination of pregnancy
- Medical termination of pregnancy
- Abdominal trauma
- External cephalic version
- Amniocentesis.

Clinical features

The clinical picture usually develops almost instantaneously and the diagnosis must be considered in all collapsed obstetric patients. The mother may demonstrate some or all of the signs and symptoms listed in Table 11.3, but classically a woman in late

stages of labour or immediately postpartum starts to gasp for air, starts fitting and may have a cardiac arrest. There is often a profound disseminated intra-vascular coagulopathy with massive haemorrhage, coma and death. There is inevitable fetal distress.

Table 11.3 Symptoms and signs of amniotic fluid embolus

Symptoms	Signs
• Chills	• Cyanosis
• Shivering	• Hypotension
• Sweating	• Bronchospasm
• Anxiety	• Tachypnoea
• Coughing	• Tachycardia
	• Arrhythmias
	• Myocardial infarction
	• Seizures
	• Disseminated intra-vascular coagulopathy

Management

This is primarily supportive and should be aggressive. There is, however, no evidence that any specific type of intervention significantly improves maternal prognosis. Initial therapy is aimed at supporting cardiac output and management of the coagulopathy. If the woman is undelivered, immediate delivery - either vaginally or by caesarean section - may be appropriate providing the mother can be stabilised.

In addition to **basic and advanced life support**, therapy includes:

1. Calling for help (senior obstetrician, anaesthetist and haematologist).
2. Aggressive fluid replacement.
3. Maintenance of cardiac output with early inotropic support (ephedrine, metaraminol, infusions of dopamine/adrenaline/noradrenaline).
4. Treatment of anaphylaxis with adrenaline, salbutamol, aminophylline and hydrocortisone.
5. Treatment of DIC with fresh frozen plasma +/- cryoprecipitate +/- platelets as indicated by lab results and advised by haematologist.
6. Treatment of haemorrhage (as in Chapter 3).
7. Early transfer to ITU for central monitoring, respiratory support and other therapy as appropriate.

Prognosis

The outcome for the baby is poor with a perinatal mortality rate of approximately 60% with most survivors usually suffering neurological impairment. Maternal outcome in mothers who have suffered a cardiac arrest is complicated by the fact that many are left with serious neurological impairment.

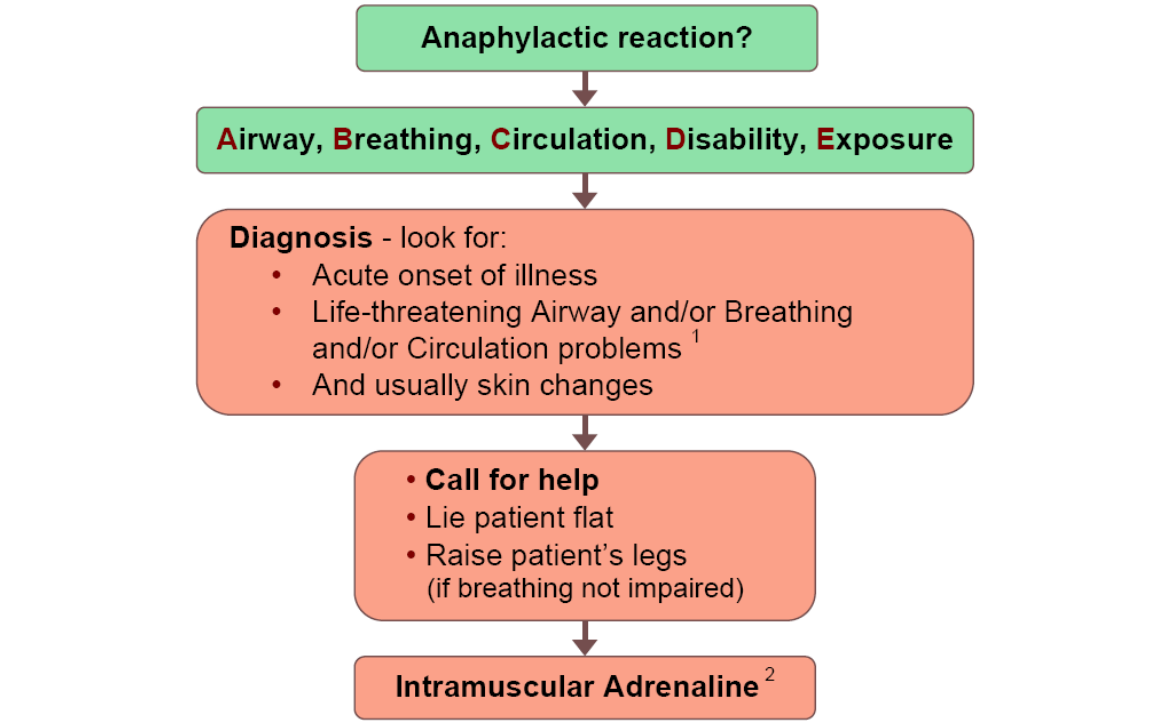
Anaphylaxis – Initial management

1. Stop administration of drug (s) likely to have caused the anaphylaxis.
2. Call for help.
3. Maintain airway: give 100% oxygen.
4 Lay patient flat with feet elevated, and left lateral tilt if ante-partum.
5. If you are in a hospital setting give adrenaline 50–100 micrograms intravenously over 1 minute has been recommended (0.5–1 ml of 1:10,000) for hypotension, with titration of further doses as required. Adrenaline should be used for a rapidly deteriorating blood pressure. **N.B. intravenous adrenaline should be reserved for use in a monitored environment by those familiar with its use. (i.e. senior anaesthetists) In a patient with cardiovascular collapse, 0.5–1 mg (5–10 ml of 1: 10,000) may be required intravenously, in divided doses by titration.** Other professionals not familiar with IV adrenaline note that this may be given intramuscularly in a dose of 0.5–1 mg (0.5–1 ml of 1:1,000) and may be repeated every 5 minutes according to the arterial pressure and pulse until improvement occurs.
6. Start intravascular volume expansion with suitable crystalloid or colloid.
7. Take a blood sample for mast cell tryptase at 15 minutes, 1 hour and 24 hours after the inset of symptoms. Clearly, the priority is to resuscitate the mother and save her life, and it may not be possible to obtain blood samples in certain circumstances.
8. Give 100mg hydrocortisone. Consider specific treatment of bronchospasm with salbutamol and aminophylline.

Adrenaline 1:10,000 may be available from pharmacy in preloaded syringes. Alternatively dilute a 1mg (1ml 0f 1:1,000) ampoule by 10 by adding 9mls of 0.9% saline in a ten ml syringe.

Resuscitation Council (UK)

Anaphylactic reactions – Initial treatment



1 Life-threatening problems:

Airway:	swelling, hoarseness, stridor
Breathing:	rapid breathing, wheeze, fatigue, cyanosis, SpO_2 < 92%, confusion
Circulation:	pale, clammy, low blood pressure, faintness, drowsy/coma

2 Intramuscular Adrenaline

IM doses of 1:1000 adrenaline (repeat after 5 min if no better)

• Adult	500 micrograms IM (0.5 mL)
• Child more than 12 years:	500 micrograms IM (0.5 mL)
• Child 6 -12 years:	300 micrograms IM (0.3 mL)
• Child less than 6 years:	150 micrograms IM (0.15 mL)

For further measures, see: http://www.resus.org.uk/pages/reaction.pdf

Chapter 13

Neonatal resuscitation

Normal physiology

Occlusion of the cord in utero, or clamping of the cord after delivery, leads to acute hypoxia. The latter is thought to be the major stimulant for a baby to start respiration. Physical stimuli such as cold air, rubbing, or physical discomfort may also provoke respiratory efforts. If the baby fails to start breathing, the baby's oxygen concentration falls further, the baby loses consciousness and enters 'primary apnoea.'

After 5 or 10 minutes of primary apnoea spinal centres, which are normally suppressed by higher centres, begin to cause shuddering of the baby's body at a rate of approximately 12/ minute (agonal gasps). Once this gasping stops, the baby enters 'secondary' (or 'terminal') apnoea and without intervention the outcome is death.

The only way to tell whether a non-breathing newborn infant is in primary or secondary apnoea is by assessment of its response to resuscitation. If in primary apnoea, nearly all will start breathing within a few breaths; if secondary, the baby will usually gasp for some time before starting regular respiration. In reality, however, both are initially managed clinically in the same way.

Practical aspects of neonatal resuscitation

Most babies born in primary apnoea will resuscitate themselves within 60–90 seconds given a clear airway. The basic approach to all resuscitation is therefore airway, breathing and circulation but there are a number of additions which will be considered in more detail in the following paragraphs:

Get help.

Start the clock.

Dry, wrap and keep the baby warm

Assess colour, tone, respirations and heart rate

Commence resuscitation:

- **Airway**
- **Breathing (lung inflation and ventilation)**
- **Circulation**
- **Drugs**

Dry, wrap and keep the baby warm

Dry the baby off immediately and then wrap in a warm dry towel. A naked wet baby can still become hypothermic despite a warm room, especially if there is a draught. Cold babies have an increased oxygen consumption and are more likely to become hypoglycaemic and acidotic. They also have an increased mortality. If this is not addressed at the beginning of resuscitation it is often forgotten. Most of the heat loss is by evaporation - hence the need to dry the baby and then to wrap the baby in a dry towel. Babies also have a large surface area-to-weight ratio: heat can be lost very quickly.

Assessment

The APGAR score was proposed as a tool for evaluating a baby's condition at birth. Although the score, calculated at one and five minutes, may be of some use retrospectively, it is almost always recorded subjectively and retrospectively; it is not usually therefore used to guide resuscitation.

	0	1	2
Colour	White	Blue	Pink
Tone	None (unconscious)	Poor	Good
Heart Rate	<60 bpm	<100 bpm	>100 bpm
Respiration	None	Gasping	Good, crying
Response to simulation	None	Minimal	Vigorous

Acute assessment will categorise the baby into one of the three following colour groups:

1. **Pink, regular respirations, heart rate fast (>100 bpm).** These are healthy babies and they should be kept warm and given to their mothers.

2. **Blue, irregular or inadequate respirations, heart rate slow (<100 bpm).** If gentle stimulation does not induce effective breathing, the airway should be opened. If the baby responds then no further resuscitation is needed. If not, progress to lung inflation.

3. **Blue or white, apnoeic, heart rate slow (<60 bpm).** Whether an apnoeic baby is in primary or secondary apnoea the initial management is the same:

    - Open the airway, and look to see whether the chest is rising or falling.
    - A reassessment of any heart-rate response then directs further resuscitation.

Reassess heart rate and respiration every 30 seconds. Depending upon the assessment, resuscitation follows: airway, breathing and circulation, with the use of drugs in a few severe cases.

Airway

Position the baby with the head in the neutral position (i.e. the face is parallel to the ceiling). Overextension may collapse the newborn baby's pharyngeal airway just as will flexion. Beware the large, often moulded, occiput.

Too flexed | Neutral (correct position) | Too extended

Fig 12a: Head position.

A folded towel placed under the neck and shoulders may help to maintain the airway in a neutral position (Fig. 12a) and a jaw thrust may be needed to bring the tongue forward and open the airway, especially if the baby is floppy.

Suction of the airways with a soft catheter should only be carried out under direct vision of the cords.

Meconium

Meconium-stained liquor in various guises is relatively common. Fortunately, though, meconium aspiration is a rare event and often occurs in utero before delivery. If the baby is vigorous, no specific action (other than drying and wrapping the baby) is needed. If the baby is not vigorous, inspect the oropharynx with a laryngoscope and aspirate any particulate meconium seen using a wide bore catheter.

If the baby is not breathing and you have the skill, intubate the baby with an endotracheal tube (ideally with a meconium aspirator attached) and use this to suck out the trachea. If you are unable to intubate, call for assistance from someone who has the skill. While waiting for them to arrive, suck out the oropharynx with a wide bore suction catheter, as above, and then provide intermittent positive pressure ventilation.

Breathing

The first five breaths should be inflation breaths. These should be two- to three-second sustained breaths using a continuous gas supply (air), a pressure-limiting device, and a mask. If no such system is available then a 500 ml self-inflating bag and a blow-off valve set at 30-40 cm H_20 pressure can be used. Use a transparent, soft reformable mask big enough to cover the nose and mouth of the baby. The use of oxygen probably carries no benefit over air in term babies.


Mask too small


Correct mask size


Mask too large

The chest may not move during the first one to three breaths as fluid is displaced. Once the chest is inflated reassess the heart rate. Assess air entry by chest movement not by auscultation. In fluid filled lungs, breath sounds may be heard without lung inflation. *If the heart rate responds it is safe to assume that the chest has been inflated successfully.*

A Guedel airway may be used to help maintain the airway. It should be inserted under direct vision with a laryngoscope as shown. The correct size of airway should reach from the middle of the chin to the angle of the jaw. The correct way to support the mask is also illustrated.

Correct size of Guedel airway

Insertion with a laryngoscope

Keeping a seal with the mask

Once the chest is inflated, ventilation is continued at a rate of 30-40 ventilations per minute. Continue to reassess that the airway is clear and that the chest is inflating.

Circulation

If the heart rate remains slow (less than 60 bpm) once the lungs are inflated, cardiac compressions must be started. The most efficient way of doing this in the neonate is to encircle the chest with both hands, so that the fingers lie behind the baby and the thumbs are apposed on the sternum just below the inter-nipple line (Fig. 12b). Compress the chest briskly to one third of its diameter. Current advice is to perform three compressions for each inflation of the chest.

Fig 12b: Two-hand technique for cardiac compressions.

The purpose of cardiac compression is to move a small amount of oxygenated blood or drugs to the coronary arteries in order to initiate cardiac recovery. There is therefore no point in cardiac compression before the lungs have been inflated. Similarly, compressions are ineffective unless interposed breaths are of good quality and inflate the chest. The emphasis must be upon good-quality breaths followed by effective compressions. Once the heart rate is above 60 bpm and rising, cardiac compression can be discontinued.

Drugs

If, after adequate lung inflation and cardiac compression, the heart rate has not responded, drug therapy should be considered. The most common reason for failure of the heart rate to respond, however, is failure to achieve lung inflation. Airway and breathing must be reassessed as adequate before proceeding to drug therapy. Venous access will be required via an umbilical venous line, as drugs should be given centrally. The outcome is poor if drugs are required for resuscitation.

- **Epinephrine (adrenaline).** In the presence of profound unresponsive bradycardia or circulatory standstill, 10 micrograms/kg (0.1 ml/kg 1:10 000) epinephrine may be given via an umbilical line of intravenously. Further doses of 10–30 micrograms/kg (0.1–0.3 ml 1:10 000) may be tried at three- to five-minute intervals if there is no response. For this drug, the endotracheal route is acceptable but effectiveness is unproven in resuscitation at birth.

- **Dextrose.** Hypoglycaemia is a potential problem for all stressed or asphyxiated babies. It is treated by using a slow bolus of 2.5 ml/kg of 10% dextrose intravenously and then providing a secure intravenous dextrose infusion at a rate of 100 ml/kg/day 10% dextrose. Reagent strips are not reliable in neonates when reading less than 5 mmol/l.

- **Volume.** Very occasionally, hypovolaemia may be present because of known or suspected blood loss (antepartum haemorrhage, placenta or vasa praevia, unclamped cord) or be secondary to loss of vascular tone following asphyxia. Volume expansion with 10-20 ml/kg of normal saline may be appropriate. If blood loss is acute and severe, non-crossmatched O-negative blood should be given immediately. However, most newborn or neonatal resuscitations do not require fluid unless there has been known blood loss or septicaemic shock.

- **Naloxone.** This is not a drug of resuscitation. Occasionally, a baby who has been effectively resuscitated and is pink, with a heart rate over 100 bpm, may not breathe because of the effects of maternal opiates. If respiratory depressant effects are suspected the baby can be given naloxone intramuscularly (200 micrograms in a full-term baby). *The effect will only last a few minutes therefore the bay will require close observation.*

Response to resuscitation

Often, the first indication of success will be an increase in heart rate. Recovery of respiratory drive may be delayed. Babies in terminal apnoea will tend to gasp first as they recover before starting normal respirations. Those who were in primary apnoea are likely to start with irregular but more normal breaths, which may commence at any stage of resuscitation.

Tracheal intubation

Most babies can be adequately resuscitated using a mask and research suggests that if this is applied correctly, only 1 in 500 babies actually needs intubation. However, endotracheal intubation remains the gold standard in airway management. It is especially useful in prolonged resuscitations, preterm babies and cases of meconium aspiration. It should be considered if mask ventilation has failed, although the most common reason for failure with mask inflation is poor positioning of the head with consequent failure to open the airway.

A normal full-term newborn usually needs a 3.5mm endotracheal tube, but 3.0mm and 2.5mm tubes should also be available.

Preterm babies

The more preterm a baby is, the less likely it is to establish adequate respirations. Preterm babies (less than 32 weeks) are also likely to be deficient in surfactant. The effort required to breathe is greater and yet the muscles are less developed. One must anticipate that babies born before 32 weeks may need help to establish prompt aeration and ventilation.

Preterm babies are more likely to get cold (higher surface area to mass ratio) and more likely to be hypoglycaemic (fewer glycogen stores). The temperature of very pre-term babies can be maintained if they are immediately placed in a plastic bag (without drying) under a radiant heater on the resuscitaire, leaving the face exposed and covering the head with a hat.

Action in the event of poor initial response to resuscitation after five inflation breaths

- Is the baby in the neutral position?
- Is there a good seal on the mask?
- Do you need jaw thrust?
- Check for airway obstruction?
- Consider Guedel airway?

- Is mask ventilation effective? Observe the chest wall movement and consider endotracheal intubation.

- Is the endotracheal tube in the trachea or right main bronchus? Auscultate both axillae and observe movement.

- Does the baby have a pneumothorax? This occurs spontaneously in up to 1% of newborns but those needing action in the delivery unit are exceptionally rare. Auscultate the chest for asymmetry of breath sounds. A cold light source can be

used to transilluminate the chest – a pneumothorax may show as a hyper-illuminating area.

If a tension pneumothorax is thought to be present clinically, a 21-gauge butterfly needle should be inserted through the second intercostal space in the mid-clavicular line. Alternatively, a 22-gauge cannula connected to a three-way tap may be used. Remember that you may well cause a pneumothorax during this procedure.

- Does the baby remain cyanosed despite breathing with a good heart rate? There may be a congenital heart malformation, which may be duct-dependent, or there may be persistent pulmonary hypertension of the newborn.

- Is there severe anaemia or hypovolaemia? In the face of large blood loss, 10 ml/kg 0-negative blood or a volume expander should be given.

Therapeutic hypothermia

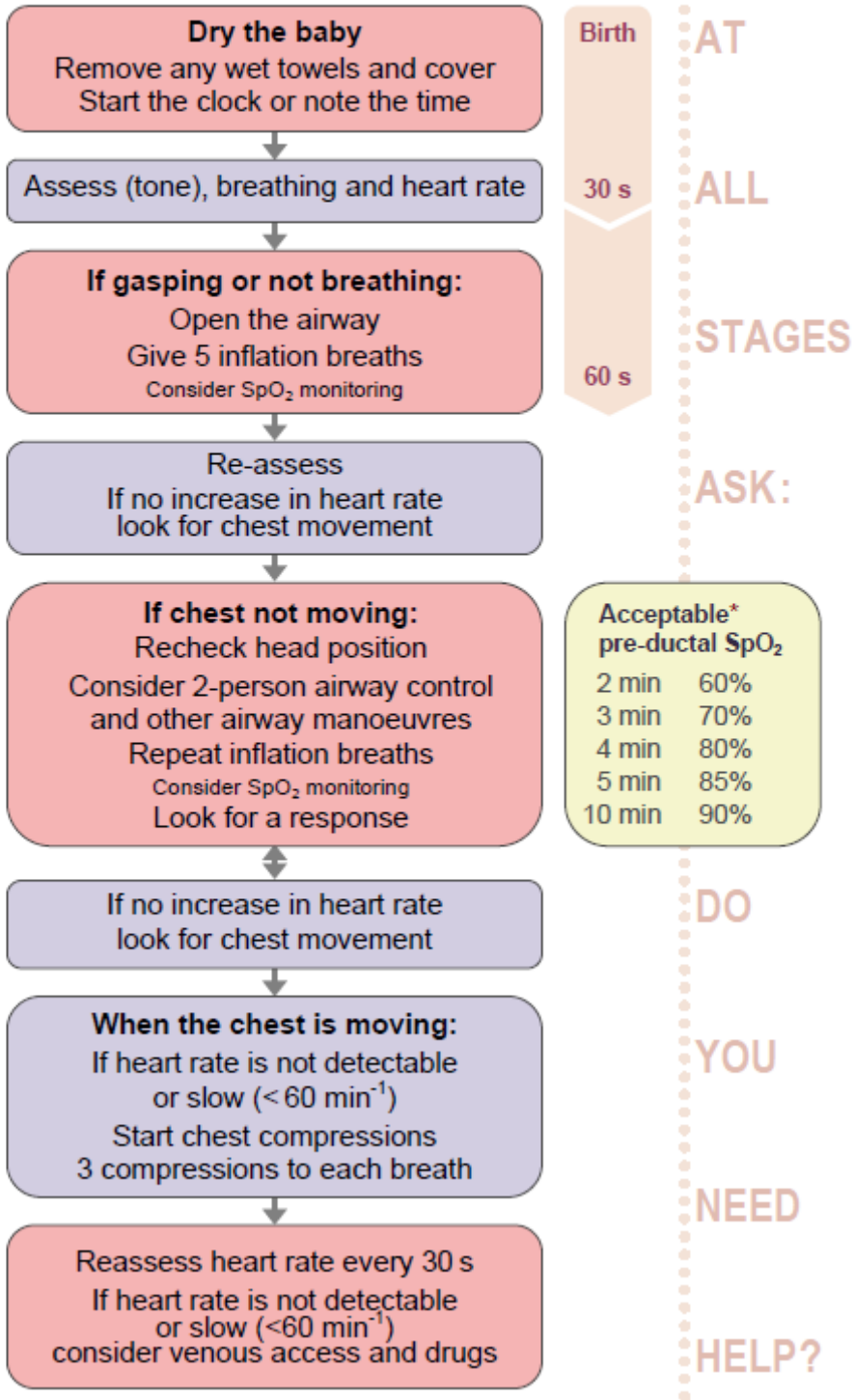
Term or near-term infants, with evolving moderate to severe hypoxic-ischaemic encephalopathy, should be treated with therapeutic hypothermia. Whole body cooling and selective head cooling are both appropriate strategies. Cooling should be initiated and conducted under clearly-defined protocols with treatment in neonatal intensive care facilities and the capabilities for multidisciplinary care. Treatment should commence within 6 h, continue for 72 h and re-warm over at least 4 h.

Discontinuation of resuscitation

Such a decision should be taken be taken by a senior member of the team, ideally a consultant. This means that help must have been called. The outcome for a baby with no cardiac output after 15 minutes of effective full resuscitation is likely to be very poor.

Resuscitation Council (UK)

Newborn Life Support



Chapter 14

Stabilisation and transfer

Introduction

In an ideal world there would be no need for obstetric and perinatal transfers. Risk assessment would have identified those who were at increased risk of complications in advance, and they would have been transferred to a more specialist centre for management. Risk assessment in obstetrics is, however, imprecise and it is well recognised that the majority of adverse outcomes will occur in women with no previously identified risk factors.

It follows that unpredictable events such as antepartum haemorrhage, pre-term labour and unexpected problems during labour will occur in "low risk" women who have been booked for birth in Community Midwifery Units (CMU), or even at home. It is therefore mandatory that all professionals undertaking ante-natal and intrapartum care are capable of recognising these complications, are able to stabilise the maternal or fetal condition prior to transfer, and can arrange transport to an appropriate receiving unit as efficiently and safely as possible.

A generation ago an obstetric "flying squad" might have been available to go out to peripheral units to render assistance, but current and future staffing levels in Scottish Maternity Units effectively preclude this solution. Rural practitioners now have to rely on their own resources.

Transfers may be considered as follows:

- Home to Community Midwifery Unit (CMU)
- CMU to Consultant Led Unit (CLU)
- CLU to Central Referral Centre
- Neonatal transfer from hospital to referral centre.

Depending on the clinical situation, it may be appropriate to transfer directly from home to CLU rather than to a CMU. Appropriate assessment and stabilisation should take place before onward transfer from a CLU to a central referral centre. The degree of stabilisation and pre-treatment required will depend on the transfer distance, weather conditions and the mode of transport.

Principles of safe perinatal transfer

- The safest transport incubator for an "at risk" baby is its mother's uterus.
- The worst possible place to be born is in a transfer vehicle.
- It is not safe to transfer a mother with uncontrolled haemorrhage or uncontrolled hypertension

With these principles in mind, it follows that transfer always carries some risk: the judgement is always whether the benefits of the transfer justify the risk.

Maternal risk status may alter and it is important to have a sensible antenatal booking policy with continuous risk assessment throughout the pregnancy. Events such as these, however, are unpredictable by their very nature, and place of delivery may well be determined by the mother's wishes which may not necessarily accord with risk assessment.

The most appropriate vehicle for perinatal transfer is usually road ambulance, but within Scotland there are areas where aeroplanes, helicopters and waterborne transport are available. The Scottish Ambulance Service is usually best placed to advise on the most appropriate form of transport.

When planning a transfer it is essential that accurate information about the problem be shared *at the highest professional level possible*. It is self evident that the professional in the most difficult situation is the one who is dealing with the problem alongside the pregnant woman in the periphery. It is essential that this professional should not be belittled and made to feel incompetent by well-resourced professionals working in the comfort of a central referral unit further up the line. Unless you have been in their position, and most CLU staff have not, it is impossible to fully understand the other person's vulnerability.

Maternal conditions requiring transfer

Transfer may be arranged in non-emergency situations like inadequate analgesia, or a stable retained placenta. Guidance is given below for emergency situations, but should be interpreted in the light of local guidelines and direct advice from on call staff.

Table 13a Conditions for safe maternal transfer

Antepartum haemorrhage	• No active bleeding. Haemodynamically stable • IV access • Steroids given if < 36 weeks • Midwife and Paramedic in attendance for transfer
Severe pre-eclampsia or eclampsia	• IV access • Controlled blood pressure: systolic should be below 160mmHg • Stop / prevent convulsions: Magnesium Sulphate loading dose given and infusion commenced (Chapter 4) • Steroids given if < 36 weeks • Midwife and paramedic in attendance for transfer
Failure to progress in labour or maternal distress: *First Stage*	• Anticipate if possible – use of partogram and action lines • Adequate analgesia for transfer • Midwife escort
Second Stage	• Usually caused by persistent occiputo-posterior position • Manage as above
Third stage	• Safe for transfer: Home to CLU, CMU to CLU if not bleeding and haemodynamically stable. IV access required.
Postpartum haemorrhage (see also Chapter 3)	• Should be managed at locus if possible • IV access – Midwife / Paramedic / Emergency Doctor • Resuscitate with available fluids. • Arrest haemorrhage • Syntometrine / Syntocinon. • Oral Misoprostol • IM or Intrauterine Carboprost • Transfer to appropriate receiving unit as required

Transfers in the fetal interest: pre-term labour

Threatened and established pre-term labour is probably the commonest indication for perinatal transfer between obstetric units of all levels. Despite many years of research, pre-term labour remains unpredictable and difficult to manage. Nonetheless, there is Level 1 evidence to show that tocolytics are effective in delaying the onset of labour in the short term and Level 1 evidence to show that there is considerable fetal benefit from completing a course of steroids when labour occurs below 36 weeks.

It may be necessary to choose between receiving units, depending on the degree of prematurity, with a central referral centre being desirable for an anticipated very low birth weight infant. For example, it would be sensible for a CMU to transfer a preterm labour at 28 weeks to a central referral centre rather than a local CLU. In most cases, however, staged transfer with continuing stabilisation and onward progression through the clinical network may be appropriate.

Pre-term labour will often be threatened rather than established. The midwife is best placed to decide on the need for transfer, and will usually err on the side of caution. If the membranes have ruptured, then the presumption is that labour will follow and onward transfer will be required. The first professional in the chain with appropriate facilities should administer Betamethasone intramuscularly (or other steroid specified in local guideline).

If contractions are present tocolysis should be commenced and uterine activity stabilised before transfer. The most effective preparation licensed for tocolysis and available is Atosiban, given as a loading dose followed by IV infusion. Other effective agents are available but their use may be limited by licensing restrictions or by potential adverse effects. Decisions should again be directed by local guidelines.

It is a matter for fine judgement as to when the transfer should take place, as embarking on a long transfer in poor weather conditions with uncontrolled contractions may lead to delivery en route. On the other hand, delaying to attempt control of contractions may result in missing the window of opportunity for transfer. The decision to depart will usually depend on degree of cervical dilatation, and the facilities available at the locus. In a CLU, it may be preferable to wait for tocolysis to take effect as the cervix might close down enough to allow a safe transfer.

The appropriate professionals to accompany the transfer will usually be an experienced midwife and a paramedic. If the transfer is a long one to a central referral centre, it may be wise to identify CLUs en route for diversions in the event of changing circumstances.

It is rarely sensible to deploy scarce paediatric resources to accompany or follow such a transfer. If they are likely to be required en route, the transfer should not take place. Guidance is summarised below:

Table 13b Conditions for safe transfer for fetal reasons

Preterm labour	• Threatened or established – midwife to decide need for transfer – err on the side of caution! • Membranes intact or ruptured? • Start Steroids – Betamethasone IM • Start tocolysis – Atosiban followed by IV infusion • Check cervix before departure – DO NOT leave if delivery likely en route. • Midwife and paramedic escort.
Pre-labour premature rupture Of membranes	• Start Betamethasone if < 36 weeks • Start Antibiotics – Erythromycin preferred • May not need tocolytics • Avoid routine vaginal examination. Cord prolapse or presentation is effectively excluded by a normal fetal heart rate.
Cord prolapse	• Rare before labour, except with breech presentation or transverse lie. Always accompanied by abnormal fetal heart rate. • Transfer with appropriate precautions to prevent cord compression (Chapter 2).
Unexpected mal-presentation	• Unexpected breech most common. Could it be a face presentation? Mento-anterior face will usually not cause dystocia. • All other mal-presentations in labour – transfer if time/distance permit. • Consider emergency tocolysis with locally preferred agent (e.g. Terbutaline, or Atosiban if transfer > 30 mins)
Fetal distress in labour	• Exclude cord presentation / prolapse • Discuss with senior obstetrician in receiving unit – may not be enough time for transfer. • Consider emergency tocolysis as above

Conclusion

Obstetric and perinatal problems should, wherever possible, be anticipated and avoided by planning the place of delivery and the arrangements for transfer through a regional managed clinical network. Despite our best endeavours, however, complications will continue to occur and will test the competence of midwifery and obstetric staff at all levels.

The safety of mother and child is always paramount, and transfer should only be undertaken when the maternal condition is stable and delivery en route is considered unlikely.

Neonatal transfer is beyond the scope of this chapter and an effective neonatal retrieval service already exists within Scotland.

Appendix A

Fetal assessment

Although this manual is predominantly about the management of emergency situations, it is recognised that many emergency problems arise because of inadequate fetal assessment. It is therefore worth considering fetal assessment further in this context.

Assuming a baby survives the early period of its development (i.e. the fertilised egg is genetically normal, the cells divide, the embryo appears and all the organs develop in the correct structural shape), the baby is still entirely dependent on its mother for nutrition, oxygen and protection. It can therefore be:

- Starved, leading to intra uterine growth restriction (IUGR)
- Poisoned, for example by medicines, smoking, alcohol or drug misuse
- Infected, for example cytomegalovirus, rubella, or varicella zoster
- Or rendered hypoxic and potentially developmentally impaired

Although we can sometimes diagnose developmental problems, there is very little we can do to improve the baby's development while still in the womb. Our main clinical skills are therefore in deciding whether the baby is compromised (usually from IUGR) and therefore better delivered than left any longer inside the womb. This is more difficult than it sounds and we risk either un-necessary premature delivery, and the loss of the baby through prematurity, or failure to recognise the seriousness of a baby's situation until it is too late to be saved.

As we usually monitor 'high risk' mothers very closely it is often easy to pick up fetal compromise. Identifying problems, however, is much more difficult in low risk mothers (as we are usually not expecting problems and we are reliant on very imperfect screening tools). As part of routine antenatal care, for example, we usually enquire about fetal movements and check abdominal palpation to assess fetal growth. As noted before, these have limited ability to pick up problems. If difficulties are identified, ultrasound assessment of growth, wellbeing and Doppler can then be used for further investigation. These assessment tools will also be considered briefly below. First, it is important to appreciate the difference between intra uterine growth restriction (IUGR) and small for gestational age (SGA).

Intrauterine growth restriction vs small for gestational age

"Small for gestational age" (SGA) describes the baby whose birth weight is below the centile for a specified gestation, the most commonly used threshold being the 10th centile. By definition, 10% of babies are small for gestational age. The term "intrauterine growth restriction" (IUGR) describes 'a fetus which fails to reach its genetic growth potential' and while it is often less than the 10th centile, it may not necessarily be so. In practice it may be difficult to differentiate the SGA and IUGR antenatally, but it is clear that it is the intrauterine growth restriction group which carry a risk of chronic hypoxia, intrapartum asphyxia, neonatal hypoglycaemia, long-term neurological impairment and perinatal death. It is therefore important to try and identify babies with IUGR at an early stage to enable more intensive monitoring or delivery. Those who are truly just SGA usually need no specific intervention.

History

A history may give some pointers towards the possibility of a small baby, particularly if there has been a previous small baby, an antepartum haemorrhage or decreased fetal movements. The diagnosis should also be considered in any mother with signs of pre-eclampsia. Usually, however, small babies are identified following routine clinical or ultrasound examination.

Clinical examination

Estimation of fetal weight from clinical examination is notoriously difficult. The fundus reaches the umbilicus by around 20-24 weeks and the xiphisternum by approximately 36 weeks. Some clinicians try to gain an impression of the fetal weight from bimanual abdominal palpation, while others prefer using a tape measure. After 20 weeks gestation the height of the uterus, measured from the uterine fundus to the symphysis pubis in centimetres, is approximately equal to the gestation in weeks. This provides a simple screening test, but with diverse claims in its ability to identify small babies (30-80%).

Fetal movement monitoring

A starved fetus will attempt to conserve energy by becoming less active. Most women experience a decrease in fetal movements as they approach term but any sudden change in the pattern of movements may be of significance. The true value of movement counting, however, is unclear and a number of studies have failed to demonstrate any benefit from using this technique.

Fetal cardiotocography

The fetal cardiotocography (CTG) gives an indication of fetal well-being at a particular moment but has little longer term value. The *routine* use of antenatal cardiotocography is not associated with an improved perinatal outcome.
For more detail see http://www.nice.org.uk/Guidance/CG55

Ultrasound examination

Ultrasound is a more accurate method of assessing the fetal size. Measurements can be made of the fetal head, the abdominal circumference and the femur length, and various equations have been used to estimate fetal weight from these. For practical purposes it is reasonable to consider the abdominal circumference alone, as measurements below the 10th centile have an approximately 80% sensitivity in the prediction of small for gestational age neonates in high risk pregnancies. There is no evidence that routine ultrasound screening is of value in low risk women.

Biophysical profile

This ultrasound test may take a long time to carry out and the predictive value for identifying growth restriction is low. As most babies with an abnormal biophysical score also have abnormal umbilical artery Doppler flow, it seems more appropriate to rely on Doppler studies. Furthermore, Doppler abnormalities probably precede abnormalities in the biophysical profile. Measuring liquor volume alone may be more straightforward.

Doppler ultrasound

Doppler ultrasound of the umbilical artery is used as an assessment of placental vascular resistance further "downstream". A normal waveform suggests that a SGA fetus is constitutionally small rather than growth restricted as a result of impaired placental function. Reduction or loss of end diastolic flow identifies a fetus at high risk of hypoxia, and absent end diastolic flow has been shown to be a useful discriminator between those growth restricted babies at high risk of perinatal death and those at a lower risk.

Overall strategy

First consider whether this is likely to be IUGR or just SGA. Those fetuses which have been measured serially and whose growth is falling away from the original centiles are, by definition, in the IUGR group. Ultrasound measurements, however, have a significant inherent inaccuracy that sometimes makes this distinction difficult. A detailed scan is warranted to look for any evidence of structural or chromosomal abnormality which makes IUGR more likely than SGA. A normal structural scan, however, does not prove the absence of IUGR, and it is then necessary to check other parameters fetal well-being (as described above) to gain an overall impression.

In practice, some fetuses less than the 10th centile require close observation and whether they have IUGR or are SGA only becomes apparent in retrospect. In others, evidence of compromise will be apparent. Figure A1a illustrates the probable sequence of events in fetal decompensation. As umbilical Doppler abnormalities are the first to appear, it is logical to use Doppler in the initial assessment. Thereafter, the optimal surveillance strategy in fetuses with absent or reduced end diastolic flow is unclear but some form of frequent monitoring with CTGs, biophysical profile and further Doppler studies seems appropriate. The timing of the delivery will be decided by weighing up the risks of leaving the baby in utero against the risks of prematurity, but delivery is likely to be appropriate if the CTG becomes pathological (decelerations or reduced variability), the biophysical profile becomes abnormal or there is absent or reversed end diastolic flow.

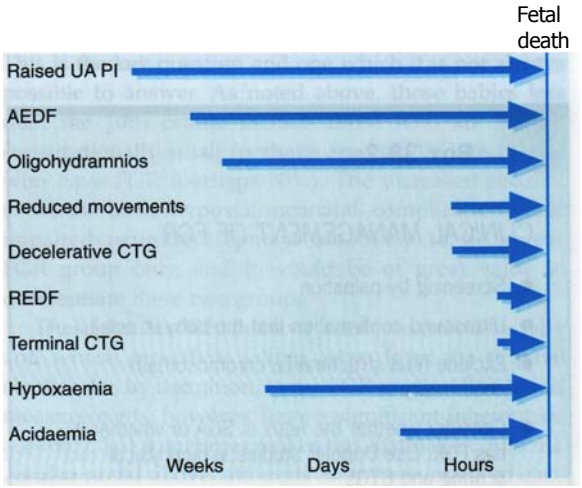


Fig. A1a The 'decompensation cascade' of fetal growth restriction. Absent end diastolic flow (AEDF) is a relatively early sign of hypoxaemia, with reduced fetal movements, cardiotocographic abnormalities (CTG) and reversed end diastolic flow (REDF) late features.

Summary of the clinical management of IUGR

- Screening by palpation.
- Ultrasound confirmation that the baby is small.
- Exclude fetal structural (+/- chromosomal) abnormality.
- Consider whether the fetus is SGA or whether it has IUGR.
- Monitor with Doppler studies, biophysical scoring and CTGs as appropriate.
- Consider steroids if preterm.
- Deliver if problems, depending on gestation.

Appendix B

Psychiatric problems

The most common disorders presenting in pregnancy are depression, anxiety and various specific phobias. Ten to fifteen per cent of new mothers will develop a depressive illness, of whom around forty per cent will be suffering from a severe depressive illness. The risk of such a severe episode occurring is increased markedly in the postnatal period compared to the non-pregnant population, at around 5 times for depression and over 300 times for psychosis (although the latter accounts for fewer mothers overall).

One of the most important risk factors is a previous history of serious mental illness, either following childbirth or at other times, they are at an increased risk of developing a postpartum onset illness, even if they have been well during pregnancy and for many years previously. In 2006 suicide was the commonest overall cause of maternal death in the UK. In the last two Triennial Report in this number has reduced but still a major factor in Indirect Deaths. Half of these mothers had had a previous history of serious mental illness, one quarter related to their previous childbirth. While some of these occurred antenatally, the majority were post natal and attention here is therefore focussed on this time.

The postnatal blues and highs

Around 60% of women suffer a transient mood disturbance (the 'blues'), characteristically beginning on day 5 and lasting a day or two. This is a mood disturbance rather than a mood illness, which may have a hormonal basis and is unrelated to obstetric or cultural factors. There is emotional lability, tearfulness, sadness, sleep disturbance, poor concentration, restlessness and headaches. The mother may feel vulnerable and/or rejected, and may show undue concern for the baby. Treatment is with reassurance. Antenatal preparation may be of help. 'Highs,' sometimes accompanied by irritability, can also occur.

Postnatal depression

The prevalence at 6 months postnatal is around 10%, with a peak incidence of onset around 5 weeks. In two-thirds, the illness is self-limiting; in one-third it may be sustained or severe. There are the usual features of depression, but particularly increased irritability, tiredness, decreased libido, guilt, inability to cope with the baby, undue anxiety over the baby's health, and a feeling that they are not a good mother. It is more likely in those who have had adverse life events shortly before or during pregnancy, those who lack a supportive primary relationship, those in marital conflict and those ambivalent to motherhood.

There may be a link to obstetric factors (more likely following caesarean section, baby admitted to special care nursery, or difficult labour), and there is a clear association with post natal depression and those who have a past history of depression. Treatment depends on severity, circumstances and patient preferences, but includes brief psychotherapy, supportive psychotherapy, counselling and antidepressants. The outcome is generally good.

Puerperal psychosis

There is an incidence of 1:500 to 1:800 deliveries, generally beginning in the first 2 weeks. There are psychotic symptoms with prominent confusion, perplexity and disturbance. The mother may be suspicious, sometimes denying the pregnancy and baby. Thereafter the features resemble those of manic-depressive psychosis with marked mood disturbance, delusions and hallucinations. It is associated with a past history of psychosis: a previous history of puerperal psychosis or bipolar disorder raises the risk to between 1 in 4 and 1 in 2). The risk is also increased in those who have a caesarean section, develop an infection or suffer a perinatal death. There is a small risk of suicide (<5%) and infanticide (<5%).

Mother and baby should be admitted to hospital, ideally to a mother and baby unit for treatment with anti-psychotic medication. The prognosis is good for the incident episode, particularly if treatment is prompt and the family is supportive. Of those who become pregnant again, 20% will develop another puerperal psychosis. Overall, 50% will have another psychotic episode at some time in their life.

Suicide

The suicide profile and suicide method are different in the puerperium than for the general female population. The most common, but by no means exclusive, profile of a woman in Scotland at risk of suicide is being white and older, in her second or subsequent pregnancy, married and living in comfortable circumstances. She is likely to have a previous history of mental illness and contact with psychiatric services, is probably currently being treated, and who has a baby under three months of age. The suicide is more likely to be violent.

Psychiatric deaths: specific recommendations from CMACE 2010

• As has been recommended before, but re-emphasised here, all women should be asked at their antenatal booking visit about a previous history of psychiatric disorder as well as their current mental health. Women with a previous history of serious affective disorder or other psychoses should be referred in pregnancy for psychiatric assessment and management even if they are well. A minimum requirement for management should be regular monitoring and support for at least 3 months following delivery.
• Psychiatric services should have priority care pathways for pregnant and postpartum women. These will include a lowered threshold for referral and intervention, including admission and a rapid response time, for women in late pregnancy and the first 6 weeks following delivery. Care by multiple psychiatric teams should be avoided. Risk assessments of pregnant or postpartum women should be modified to take account of risk associated with previous history, the distinctive clinical picture of perinatal disorders and the violent method of suicide.
• All mental health trusts should have specialised community perinatal mental teams to care for pregnant and postpartum women. These should be closely integrated with regional mother and baby units so that all women requiring psychiatric admission in late pregnancy and the postpartum period can be admitted together with their infants.
• Caution needs to be exercised when diagnosing psychiatric disorder if the only symptoms are either unexplained physical symptoms or distress and agitation. This is particularly so when the woman has no prior psychiatric history or when she does not speak English or comes from an ethnic minority.
Introduction and background

For further information:

The confidential enquiry into maternal deaths	http://www.rcog.org.uk/our-profession/research-services/statistics
SIGN guideline on post partum depression	http://www.sign.ac.uk/pdf/qrg60.pdf
NICE guideline on depression	http://guidance.nice.org.uk/CG45

Appendix C

Communication

Good communication is vital for patient safety. With care and attention to detail it can be done very well but with carelessness it can be as fatal as any direct clinical error. Communication will be considered here in terms of communication with the patient, and between professionals themselves. Finally, there are some notes to aid the breaking of bad news.

Communication between the professional and the patient

It is often worth checking what patients consider might be wrong and how those beliefs have affected them: they have often had much more time to think about it than you will have and they are often right.

Research suggests that, in many consultations, only half of the patient's concerns are elicited. Communication is important: establishing eye contact at the start, and maintaining this at regular intervals, is essential to show interest. Patients should be encouraged to be exact about the sequence in which their problems occurred, and active empathic listening (i.e. responding to cues) helps to clarify concerns. A short time taking an accurate focussed history will often clarify the diagnosis much more quickly than a large number of scans and tests. It can also be helpful to summarise information to show the patient that they have been heard, and to give them an opportunity to correct any misunderstandings.

Treatment options should be discussed as fully as time allows, although this may be limited in an emergency situation. If there is urgency, be brief, concise and very specific.

Communication between professionals themselves

If you think you ought to be communicating with someone directly, then you probably should be doing so. If it is not possible to speak to someone face to face (always the ideal) a short phone call can say more than a long letter. In an emergency, phoning the most senior person available may the most helpful. Essential phone numbers should be clearly displayed, and clear simple lines of referral are important.

Good communication

- Helps to clarify basis of problems accurately and early.
- Helps families understand the problems, investigations and treatment.
- Lessens distress and vulnerability.
- Leads to greater satisfaction with care.
- Leads to greater job satisfaction for the professional

Documentation

Accurate note keeping may be challenging in an emergency. The use of a scribe can help, and it may be useful to familiarise potential scribes with the documentation during 'fire drills'.

It is also important to keep a note of significant conversations with the mother or with colleagues, whether face to face or over the phone.

Breaking bad news

Emotions are often running high on both sides. The following points may be helpful:

S	**Setting**	• Privacy • Involve significant others • Body language • Eye contact • Listening mode – silence, repetition, affirmation • Preparation – notes, awareness of family unit • If problems anticipated – consider most appropriate 'practitioner' and timing.
P	**Perception**	• Before you tell, ask. • Use open questions – what, when, how, where, why. • Identify any concerns/worries/fears. • Invite participation.
I	**Invitation**	• How much information do they want? • How involved do they want to be? • Do they want to stay, be phoned with every change? • Who are the key family members?
K	**Knowledge**	• Give information in small chunks. • Clarify understanding at all stages. • Tailor rate of information giving to family present. • Avoid technical scientific language. • Remember pauses.
E	**Empathy**	• Listen for and identify the emotion – anxiety, fear, anger, self blame. • Identify the cause or source. • Show the person you have identified both the emotion and the cause: o This has obviously come as a complete shock … o You seem quite angry? … o Clearly this is very distressing … o You haven't done anything wrong … • Do not withhold information because of your own discomfort.
S	**Strategy and summary**	• Check frequently during consultation that you and the family are 'at the same place'. • Summarise the next steps. • Offer and be available for ongoing questions/issues/support. • Offer written information if appropriate.

Buckman R 1994 How to break bad news. London, Pan Books

Appendix D

Domestic violence

Domestic violence threatens the health, emotional wellbeing and lives of women and their families. All women should be seen at least once on their own during the antenatal period to allow for disclosure of these issues. Asking *every* woman about these issues lessens the stigma and educates everyone to the extent of this problem.

Domestic violence is defined as the intentional abuse inflicted on one partner by another in an intimate relationship. The abuse can be physical, psychological or sexual. It can occur within the context of a heterosexual or homosexual relationship and need not occur in the home. Women are more likely to be victims in heterosexual relationships (90%). Domestic violence affects all social classes, all ethnic groups, occurs in any part of the world and affects all age groups.

- One in three women experiences domestic violence at some point in their lives.
- One in ten women will have experienced domestic violence in the past year.
- Over one million domestic violence incidents are recorded by the police each year.
- 30% of domestic violence starts in pregnancy.
- 40% of women who are murdered are killed by a current or ex-partner.
- Domestic violence is more common than violence in the street or in a pub.

To outsiders, it seems almost bizarre that anyone would want to stay in a violent relationship. Women, however, all too often do. The reasons for staying are multiple:

Fear	If she leaves she or her family will experience more violence or possibly be killed.
Financial	Control of her resources by her abuser.
Family	Pressures to stay with the abuser.
Father	Wanting a father figure for her children.
Faith	That she places in a religious doctrine.
Forgiveness	Because the abuser is often contrite.
Fatigue	From living under high and constant stress and erosion of self-esteem.

The incidence of domestic violence in pregnancy is reported as being between 1 and 20%. It often begins or escalates during pregnancy though, in some cases, domestic violence commences in the puerperium. The risk of moderate to severe violence appears to be greatest in the postpartum period. Women subjected to violence are at increased risk of miscarriage, premature labour, placental abruption, low-birthweight infants, fetal injury and intrauterine fetal death. Often, as a result of the violence, women are fifteen times more likely to misuse alcohol, nine times more likely to misuse drugs, three times more likely to be clinically depressed and five times more likely to attempt suicide.

Recognising domestic violence in pregnancy

Classically, injuries toward the pregnant abdomen, genitals and breasts are seen in pregnancy. However, the injuries can be multiple affecting any part of the woman's body.

Women who are being abused often book late and may be poor attenders. Their partners may not give them enough money to get to the hospital. Alternatively, they may attend repeatedly with trivial symptoms and appear reluctant to be discharged home. If the partner accompanies the woman, he may be constantly present and not allow the opportunity for private discussion. The woman may seem reluctant to speak in front of her partner, or to contradict him.

Any signs of violence on the woman's body will be minimised. As with child abuse, the mechanism of injury often does not fit with the injury itself. There may be untended injuries of different age or the late presentation of injuries. A history of behavioural problems or abuse in the children may be indicative. Often the patient will give a history of psychiatric illness.

Diagnosing domestic violence

As domestic violence often begins or escalates during pregnancy it is essential that we, as health care professionals, routinely ask women whether they are subject to domestic violence. As the prevalence of violence is greater than that of most other complications of pregnancy, such as pre-eclampsia or gestational diabetes mellitus, standard questions should be included in the same way as we would ask about medical disorders, smoking or alcohol use. Questions should be asked in a non-judgmental, respectful, supportive manner. Obstetricians and midwives should be aware of what help is available should a woman request help.

Questions that may allow a woman to disclose that she is subject to violence:

- I have noticed you have a number of bruises. Did someone hit you?
- You seemed frightened by your partner. Has he ever hurt you?
- You mention that your partner loses his temper with the children. Does he ever with you?
- How does your partner act when drinking or on drugs?

Other strategies, such as questionnaires in the women's toilets, may help those women whose husbands are constantly by their sides. Community midwives visiting women at home may have the privacy to discuss such sensitive issues. The provision of interpreters is essential - it is not acceptable to rely on family members to act as interpreters, as this does not allow free dialogue to occur.

Conclusion

Domestic violence is a major health and social problem in pregnancy. It represents a serious threat to the physical and emotional health of women and their children. All health professionals have an obligation to identify cases of domestic violence and provide support and help to the victims

Abbreviations

AED	Automated external defibrillator
AEDF	Absent end diastolic flow
APTT	Activated partial thromboplastin time
ARM	Artificial rupture of membranes
BP	Blood pressure
CLU	Consultant led unit
CMU	Community midwifery unit
CNS	Central nervous system
CPR	Cardiopulmonary resuscitation
CT	Computerised tomography
CTG	Cardiotocography
CVP	Central venous pressure
CXR	Chest X-ray
DIC	Disseminated intravascular coagulation
DVT	Deep venous thrombosis
ECG	Electrocardiogram
ECV	External cephalic version
HELLP	Haemolysis, elevated liver enzymes and low platelets
IM	Intramuscular
ITU	Intensive care unit
IUGR	Intra uterine growth restriction
IV	Intravenous
LFT	Liver function tests
$MgSO_4$	Magnesium sulphate
O_2	Oxygen
PE	Pulmonary embolus
PEA	Pulseless electrical activity
PO	Per os (orally)
PP	Placenta praevia
PPH	Post partum haemorrhage
PR	Per rectum
PV	Per vaginam
QID	Quarter in die (four times a day)
REDF	Reversed end diastolic flow
SCOTTIE	Scottish Core Obstetrics Teaching Training In Emergencies
SGA	Small for gestational age
SMMDP	Scottish Multiprofessional Maternity Development Programme
TID	Ter in die (three times a day)
VF	Ventricular fibrillation
VQ	Ventilation perfusion
VT	Ventricular tachycardia