accompanied by chest pain, without development of coagulopathy.

- **Air embolism**: may follow ruptured uterus, pressurised IV infusion or Caesarean section. The distinguishing feature in air embolism is pre-cordial water-wheel murmur. There is no coagulopathy.

- **Septic shock**: unlikely in the absence of evidence of preceding infection and pyrexia.

- **Anaphylactic shock**: there is no coagulopathy.

- **Eclampsia**: usually preceded or accompanied by hypertension and proteinuria.

- **Toxic reaction to anaesthetic or local anaesthetic agents**: there is no coagulopathy.

- **Acute left heart failure**: usually more insidious onset. There is no coagulopathy.

- **Cerebral haemorrhage**: no cyanosis or hypotension. There is no coagulopathy.

- **Massive obstetric haemorrhage**: the history may help. Beware concealed abruption. Uterine atony may be a feature of both. Hypoxaemia in massive obstetric haemorrhage is less pronounced than in amniotic fluid embolism.

- **Aspiration of gastric contents**: usually occurs in an unconscious patient, or during induction of or emergence from general anaesthesia. There is no coagulopathy.

### Management

Management is supportive, and aims to correct hypoxaemia, shock and coagulopathy and its consequences.

- Give 100% inspired oxygen by face mask and reservoir.
- If the patient is unconscious (P or U on the AVPU scale), intubation and assisted ventilation (if available) are needed.
- High positive end-expiratory pressure (PEEP) should be avoided.
- Two large-bore cannulae (16G) IV should be sited.
- Urgently cross-match blood, ideally at least 6 units of group-specific blood with retrospective cross-matching (if available) should be ordered. Check clotting factors (or clotting time) and platelets. Blood needs to be sent for a full blood count, clotting, fibrinogen and fibrinogen degradation product (FDP) levels (if available) immediately, and frequent repeated estimations of haematological parameters are required (if available).

- Cardiac arrest is managed according to protocols (see Section 1.13).

- If the woman is in labour, immediate delivery is required, by Caesarean section (under general anaesthetic) if vaginal delivery is not imminent. In cardiac arrest, if a cardiac output cannot be restored immediately, cardiac massage and ventilation should continue and Caesarean section should be performed.

- Circulatory support depends on the causes of decreased cardiac output. The available haemodynamic data indicate that high left heart filling pressures, reflecting a failing left ventricle, are a feature of the condition. In patients who survive the initial haemodynamic collapse, there is a high risk of secondary pulmonary oedema (70%). Inotropic support, ideally guided by monitoring of the central venous pressure (CVP), may be life-saving.

- If massive obstetric haemorrhage occurs, large volumes of fresh blood and blood products may be required.

- Monitoring of cardiac filling pressures may help to prevent fluid overload and pulmonary oedema.

- Place an arterial line if possible.

- Correct coagulopathy with fresh blood, platelets, fresh-frozen plasma and cryoprecipitate (rich in fibrinogen) if available.

- Massive haemorrhage may be due not only to coagulopathy, but also to coexisting uterine atony. Oxytocic drugs will be needed. Uterine tamponade may reduce blood loss while the coagulopathy is corrected.

- Patients who survive are at high risk for heart failure, ARDS and DIC. If the patient is sustaining a cardiac arrest, there is a high risk of neurological injury. As in other cardiac arrests associated with pregnancy, delivery may improve the success of resuscitation.

### Outcome

The outcome is poor, even when optimum treatment and monitoring is available, so it is important to exclude other possible and treatable causes of collapse, including anaphylaxis, pulmonary embolism, haemorrhage, sepsis, myocardial infarction, eclampsia, intracranial haemorrhage, hypoglycaemia and drug toxicity (e.g. magnesium, local anaesthetics).

The outcome depends on the facilities for cardiorespiratory support and the ability to manage the DIC with blood and blood products.

## 2.6 Complications that require hospital care

### 2.6.A Ovarian cysts in pregnancy

Ovarian cysts in pregnancy may cause abdominal pain due to torsion or rupture. Laparotomy is required if torsion of an ovarian cyst is suspected. If the findings at laparotomy are suggestive of malignancy (i.e. solid areas in the tumour, growth extending outside the cyst wall), the specimen should be sent for immediate histological examination if
available and the woman should be referred to a tertiary care centre for evaluation and management.

Corpus luteum cysts are common and normal in the first trimester. They should not be removed surgically, as the corpus luteum will disappear as pregnancy progresses.

**Asymptomatic ovarian cysts**

If, on ultrasound, the cyst is found to be more than 10 cm in diameter, observe by regular ultrasound examinations for growth or complications. If there is torsion this will produce pain and the cyst will need to be surgically removed.

Surgery will pose a significant risk of miscarriage and premature delivery. In the case of a torted cyst, the resulting necrosis and infection will themselves place the women and fetus at risk of acute complications and therefore prompt intervention is unavoidable.

Malignancy is difficult to diagnose even where access to advanced imaging such as MRI is available, and therefore a decision to operate on the basis of suspected malignancy is not advised in low resource settings, unless the index of suspicion is very high. If this is considered then it should take in to account the gestation of the pregnancy, the risk of pregnancy loss/prematurity, and the treatment available to the mother following delivery.

If the cyst is less than 10 cm in diameter and remains so on ultrasound examination, it will usually regress on its own and does not require treatment.

### 2.6.B Reduced fetal movements, intrauterine death and stillbirth

**BOX 2.6.B.1 Minimum standards**

- Pinard’s stethoscope.
- Doppler device for fetal heart rate monitoring.
- Ultrasound scan.
- Misoprostol and oxytocin or ergometrine.
- Fresh blood for transfusion.

#### General management

Check for fetal heart sounds, and if they are present, measure the fetal heart rate.

If the fetal heart cannot be detected with a Pinard’s stethoscope, Doppler device or ultrasound scan, refer to Table 2.6.B.1 below.

#### Diagnosis

**TABLE 2.6.B.1 Diagnosis of reduced fetal movements**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
<th>Investigation</th>
<th>Diagnosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased or absent fetal</td>
<td>Shock in the mother</td>
<td>Pinard’s stethoscope, Doppler device or ultrasound scan</td>
<td>Placental abruption</td>
<td>Deliver the baby as soon as possible (see below) by Caesarean section if there are signs of fetal life</td>
</tr>
<tr>
<td>movements</td>
<td>Tense and/or tender uterus</td>
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<tr>
<td>Bleeding (but may not be</td>
<td>Fetal distress or absent fetal heart sounds</td>
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<td>external)</td>
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<tr>
<td>Collapse</td>
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<td>Severe constant abdominal pain</td>
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<tr>
<td>Decreased or absent fetal</td>
<td>Shock in the mother</td>
<td>Pinard’s stethoscope, Doppler device or ultrasound scan</td>
<td>Ruptured uterus</td>
<td>Treat shock when the mother is stable perform laparotomy</td>
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<tr>
<td>movements</td>
<td>Diffuse uterine tenderness with easily</td>
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<td>Major risk factors</td>
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<td>previous Caesarean</td>
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<tr>
<td>Decreased or absent fetal</td>
<td>Abnormal fetal heart rate (&lt; 100 beats/</td>
<td>Pinard’s stethoscope, Doppler device or ultrasound scan</td>
<td>Fetal asphyxia</td>
<td>Deliver the baby as soon as possible (see below) by Caesarean section if there are signs of fetal life</td>
</tr>
<tr>
<td>movements</td>
<td>minute or &gt; 180 beats/minute)</td>
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<tr>
<td>Decreased or absent fetal</td>
<td>Synphysis-fundal height decreases</td>
<td>Pinard’s stethoscope, Doppler device or ultrasound scan</td>
<td>Fetal death</td>
<td>Deliver baby as soon as possible (see below)</td>
</tr>
<tr>
<td>movements</td>
<td>Absent fetal heart rate</td>
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<tr>
<td></td>
<td>if membranes are ruptured, meconium</td>
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<td>staining of liquor</td>
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<td>Full blood count in mother</td>
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<td>Clotting screen, including measurement of</td>
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<td>platelet count in mother</td>
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<tr>
<td>Absent fetal movements</td>
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</table>
Fetal death in the absence of an abruption
Fetal death in utero (IUFD) may be the result of fetal asphyxia from placental failure, fetal infection, cord accident or congenital anomalies. Where syphilis is prevalent, a large proportion of fetal deaths are due to this disease.

Fetal death can be confirmed by abdominal ultrasound with confidence if there is a lack of fetal heart activity.

If fetal death in utero is diagnosed, inform the woman or girl and her family and discuss the options for management with them.

Common causes are infection (especially malaria and chorioamnionitis), abruption, and placental insufficiency. In the case of intrapartum IUFD, fetal hypoxaeemia, often, but not always, associated with a prolonged obstructed labour or malposition, may be to blame. In the laboring patient uterine rupture must also be considered.

The following investigations should be performed as a minimum: blood group and cross match, Hb, malaria RDT +/- malaria smear and urine analysis to assess for urinary infection and pre-eclampsia. Syphilis is also common in some settings and may cause IUFD and premature labour.

If a clotting test shows failure of a clot to form after 7 minutes, or a soft clot that breaks down easily, suspect coagulopathy. Obtain fresh blood for transfusion and give broad-spectrum IV antibiotics, including metronidazole.

Expectant management
Explain to the mother that in 90% of cases the fetus is spontaneously expelled within 1 month of diagnosis. However, most mothers and their families will request delivery as soon as possible.

In addition, expectant management carries with it the risk of infection and DIC both of which complicate management and risk the mother's life. If this approach is used, it should be possible to monitor the patient for complications and there should be access to prompt and comprehensive treatment if they occur.

If IUFD is diagnosed in a laboring woman, then once she has been assessed and treated for potential causes as above the labour can be allowed to continue with the usual monitoring. It is important to actively assess for life-threatening causes such as abruption and rupture.

Active management
If there is no evidence of active labour and no indication for urgent delivery by Caesarean section, induction of labour with misoprostol is an effective way of inducing labour. As is the case for mid-trimester miscarriage, mifepristone, where available, can be helpful in shortening the length of time it takes for misoprostol to work. This is especially the case where there is no evidence of labour, the cervix is unfavourable and the patient is primiparous.

The following drug regime is recommended for women with an IUFD of 26 weeks’ gestation or more (see below for women with a previous Caesarean section and Section 2.5.D.i) for management of miscarriage before 26 weeks’ gestation):

- Mifepristone 200mg orally stat (omit if not available). Wait for 36 to 48 hours after giving this drug – shorten if any clinical concerns arise during this interval
- misoprostol 50 micrograms orally or vaginally every 4 hours to a total of 5 doses
- If delivery has not occurred by the fifth dose of misoprostol, the patient should be reviewed by a doctor. Subsequent options for management include continued use of misoprostol (usually after a period of ‘rest’ for 12 to 24 hours), or use of oxytocin.

For women with an IUFD at term (37 weeks and over) an alternative is to use the same induction of labour protocol as described previously (Section 2.3 ‘Managing labour and delivery’), for women with a live fetus, i.e. 25 micrograms of misoprostol every 2 hours.

Note: The evidence base for the optimum dose of misoprostol to be used in this scenario is poor, and it is recognised that higher doses of 100 micrograms or more every 4 to 6 hours, have historically been used. Recent evidence suggests that lower doses may be as efficacious, and it is with this in mind, as well as concerns about optimising safety, that the above dose has been recommended.

Further research is needed into the optimal regimen, especially in resource poor settings.

Women who have undergone a previous caesarean section
In women with a previous Caesarean section, previous uterine surgery, or in grand multiparae, there is a risk of dehiscence/rupture in labour that is likely to be increased with the use of misoprostol, and therefore its use should be avoided. Vaginal delivery is still the preferred mode of delivery if the fetus is dead, but care must be taken to minimise the risk as much as possible.

If the cervix is favourable (Bishop score 6 or more) and ARM possible, then especially in women who have delivered previously, ARM alone will often result in delivery over the following 24 hours. If labour does not become established following ARM, then oxytocin can be titrated, using the usual protocol to augment/induce the labour.

If the cervix is unfavourable, then the oxytocin infusion may be started with intact membranes, and continued until the cervix becomes favourable for ARM (usually < 5 hours). Oxytocin use is associated with a lower risk of dehiscence/rupture than induction with misoprostol, but still increases the risk as compared with spontaneous labour. Close monitoring of the infusion, to prevent hyperstimulation, and of the patient for signs of any complication, is therefore essential.

Alternatively, the cervix can be ‘ripened’ with a Foley balloon catheter as previously described. ARM may then be performed, and oxytocin used as above if necessary.

Whichever method is used, all women with risk factors for rupture/dehiscence must be identified and monitored carefully with this complication in mind. Early recognition is the key to preventing maternal morbidity and mortality.

The membranes should be kept intact for as long as possible to prevent infection. However, they may be ruptured if it is necessary to achieve delivery. Vaginal assessments should be performed in a sterile manner and as infrequently as possible. If the membranes have been ruptured for more than 18 hours, treat the patient with prophylactic antibiotics (ampicillin 2 grams IV stat followed by 1 gram every 6 hours). If there are signs of infection (fever and/or foul-smelling vaginal discharge), give antibiotics as described for endometritis (see Section 2.5.G).

Oxytocin
Although misoprostol is recommended as the first-line induction agent in the case of IUFD where there are no risk factors
for dehiscence/rupture, Oxytocin may be used if misoprostol is not available or proves ineffective. It may also be used where the risk of rupture is high (as discussed above), and a titratable and short-acting agent is therefore preferred. In practice oxytocin is more effective following rupture of the membranes, although of course it is preferable to keep these intact as long as possible to avoid infection. As a minimum, rupturing the membranes before the cervix becomes favourable (Bishop score > 6), should be avoided.

Try not to use oxytocin within 8 hours of using misoprostol.

Avoid Caesarean section if possible, except for unavoidable obstetric reasons such as transverse lie, suspected uterine rupture or major abruption.

Fetal death in the presence of an abruption
Adopt the active management approach described above.

Stillbirth
Introduction
Between 2.08 and 3.79 million stillbirths occur each year worldwide. Of these, 98% occur in low- and middle-income countries and 55% occur in rural families in sub-Saharan Africa or South Asia where facilities for giving birth are much poorer than in urban areas (less skilled birth attendants and comprehensive emergency obstetric care). Around 45% of stillbirths occur during birth (intra-partum). The global average rate is 19 in 1000 births, the rate in low-resource settings is 25 in 1000 births, and the rate in well-resourced settings is < 5 in 1000 births. Most stillbirths are not registered and the body is disposed of without any recognition or rituals such as naming, funeral services, or even the mother holding or dressing her baby. In some cultural settings there is a belief that sinning by the mother or evil spirits are responsible for the stillbirth, and the dead baby may be seen as a taboo object. Families affected may be subjected to stigma and marginalisation. Some healthcare workers believe that few stillbirths are preventable, and that these babies were just ‘not meant to live’. There is considerable suffering involved for the family, and mothers frequently become depressed or anxious after a stillbirth, with similar emotions to those experienced after the death of a child.

Definitions of stillbirth
An early stillbirth is defined by the International Classification of Diseases as a birth weight of ≥ 500 grams or, if this measurement is missing, ≥ 22 completed weeks of gestation or, if this is missing, a body length of ≥ 25 cm.

The World Health Organization defines stillbirth as a birth weight of ≥ 1000 grams or, if this measurement is missing, ≥ 28 completed weeks of gestation or, if this is missing, a body length of ≥ 35 cm.

Causes of stillbirth
The major causes, which are the same as the causes of maternal and neonatal mortality, are as follows:

- complications of childbirth
- maternal infections in pregnancy (e.g. syphilis)
- medical disorders of pregnancy (especially pre-eclampsia or hypertension)
- maternal under-nutrition and fetal intrauterine growth retardation
- congenital abnormalities.

Prevention
The most important issues in low-resource situations are to increase the number of skilled birth attendants who can manage antenatal and intra-partum care, to increase the number of healthcare facility-based births, and to prevent or treat syphilis and malaria during pregnancy.

Specifically, the following ten interventions have been subjected to systematic review and reported to reduce stillbirth rates:

1. taking folic acid before and soon after conception
2. insecticide-treated bed nets or intermittent drug treatment to prevent malaria
3. detection and treatment of syphilis
4. detection and management of hypertensive disorders in pregnancy
5. detection and management of diabetes
6. detection and management of fetal growth restriction
7. routine induction to prevent post-term pregnancy
8. skilled care at birth
9. basic emergency obstetric care
10. comprehensive emergency obstetric care.

The main aim is to strengthen the healthcare systems involved in antepartum and intra-partum care, which include in addition to the ten items listed above:

- prevention of malaria (see Section 2.8.D) and syphilis (see Section 2.8.H) in endemic areas
- the availability of emergency obstetric surgery, in particular Caesarean section, without delay and with attention to ‘task shifting’ to improve access, especially in rural areas
- improved antenatal care
- advocacy to address poverty and its consequences (stillbirth rates are inversely correlated with wealth and development)
- systems to manage and prevent domestic violence
- efforts to achieve sexual equality, improve reproductive health and improve the secondary education of boys and girls.

Ideally, bereaved families should form groups that advocate for change at all of the levels identified above.

Further reading
2.6.C Fetal distress during labour

**BOX 2.6.C.1 Minimum standards**

- Pinard's stethoscope
- Hand-held battery-operated ultrasonic fetal heart rate monitor

**Introduction**

In all clinical circumstances, the well-being of the pregnant woman takes precedence over that of the unborn baby, and there are often situations where resuscitation of the mother will automatically bring about benefits for the fetus.

Careful thought has to be given to the assessment and management of the fetal condition in labour. This is especially so in resource-limited countries, where severe shortages of both equipment and suitably trained personnel often mean that women do not receive the life-saving care which they require in labour.

In such situations, strict prioritisation of needs is required, and fetal well-being has to take second place to maternal survival.

When considering taking steps to monitor fetal well-being, the following factors must be taken into account:

1. the cost of monitoring equipment, including maintenance, and replacement of disposable items
2. the cost of training staff in the use of such equipment
3. the proportion of caregivers’ time required to be allocated to assessment of fetal well-being
4. the availability of suitable interventions, should fetal distress be diagnosed
5. the potential risks to the mother of an intervention for the sake of fetal well-being
6. the availability of neonatal care facilities and expertise, following on from an intervention to deliver a distressed and possibly premature baby.

Methods of monitoring fetal well-being in labour range from the low-cost low-technology Pinard's stethoscope to the relatively expensive high-technology cardiotocograph.

**Pinard's stethoscope**

The Pinard's stethoscope is cheap, portable and resilient, and requires no electricity or battery. It is used to listen to the fetal heart through the maternal abdomen for 60 seconds immediately following a contraction. It should be recorded every 60 minutes in the latent phase of labour, every 15–30 minutes in the active phase of the first stage of labour, every 5 minutes in the second stage, and after every contraction when the woman is pushing in the second stage.

A healthy fetus will withstand the relative hypoxia brought about by the compression of the blood vessels in the placenta during a uterine contraction.

A simple ultrasound Doppler monitor (e.g., a Sonicaid) can be used instead of a Pinard's stethoscope, but it does require batteries.

**Fetal heart rate monitoring by Pinard's/ Sonicaid: normal ranges and abnormalities**

It should be noted that evidence and guidance is lacking on the use of intermittent fetal monitoring in settings without access to continuous electronic fetal monitoring (CEFM).

Where CEFM is available any abnormality detected by intermittent monitoring results in the mother being transferred to CEFM. Where this is not possible, it is even more difficult to determine whether fetal distress is present.

In addition, without the ability to perform fetal blood sampling (below), it is not possible to confirm whether the fetus is distressed before delivery, or to determine the degree of distress likely. It should be noted that approximately 50% of babies with pathological electronic fetal heart rate tracings are not in fact distressed.

The impact of intermittent fetal monitoring on Caesarean section rates and neonatal morbidity and mortality, in this context, is therefore unknown. Decisions on whether to pursue Caesarean section with its inherent risks for the current and future pregnancies, is extremely difficult in this context, where information on the fetal condition is so incomplete.

**The normal fetal heart rate**

**Baseline:** The baseline is the rate that is returned to after any episodes of variation such as an acceleration or a deceleration. In simple terms it is the most common heart rate for that baby.

When listening with a Pinard's this may be the rate over the first minute of listening. However, if part of the minute includes a period of more rapid heartbeat (an acceleration), or slower heart beat (deceleration) then it may be higher or lower than the baseline.

Therefore, if when listening, the fetal heart can be heard to be very slow or very fast for part or all of the period, auscultating this may not be the baseline and it will be necessary to continue listening over a longer period to gain more information.

The normal range for the baseline is between 120 and 160bpm. A rate of 110 to 120bpm is often also a normal finding, especially in babies at term or post term. A rate of 160 to 170 can also be a normal finding in a premature baby. A rate below 110 and above 170 is always considered to be abnormal.

**Variability:** It is normal for the fetal heart rate to vary with every beat. This variation occurs continually above and below the baseline and is usually by approximately 5 to 15bpm from the lowest to the highest reading (although normal variation is up to 25bpm). Variation is not easily detected by the Pinard's stethoscope as monitoring involves counting for 1 minute and it is therefore the average heart rate over that time that is obtained. With a Sonicaid, however, the fetal heart rate is often displayed and it can be seen to vary around a certain level (the baseline).

Variability is a positive sign, and generally suggests that the fetus is coping well with labour.

**Accelerations:** These are episodes where the fetal heart rate increases by 15 beats or more above the baseline and for more than 15 seconds. They can be heard on a Pinard’s with practice, although they are easier to hear the higher and longer they are. They are easier to see on a Sonicaid,
Abnormalities of the fetal heart rate

Tachycardia: This is a fetal heart rate above 160–170 bpm.

A tachycardia is often caused by a maternal pyrexia or tachycardia and in these instances it will often resolve once the maternal observations have normalised.

Decelerations: A deceleration is a reduction in the fetal heart rate 15 bpm or more below the base line for 15 seconds or more.

An early deceleration occurs at the onset of the contraction and recovers by the end of the contraction. It is a common feature during labour (especially the second stage) and is not usually associated with fetal distress, and therefore it is not routine to listen to the fetal heart rate during a contraction.

A late deceleration starts during or at the end of a contraction and persists beyond the end of the contraction. This is more commonly associated with fetal distress and if it occurs the fetal heart should be monitored following the next 2 contractions to see if it recurs. If it does, there is a significant chance that the fetus is distressed.

Bradydysrhythmia: A bradydysrhythmia is a deceleration that continues for over 3 minutes. It may occur during pregnancy or labour and may be associated with inferior veno-caval compression if the patient is lying supine, sudden drops in blood pressure from any cause or cord compression.

It may also represent the end stage of a prolonged period of fetal distress. If the cause of the bradydysrhythmia is self-limiting, then the fetal heart should recover, whereas if it has occurred due to period of prolonged distress or the insult is ongoing, it will not recover and will end in fetal death. Even if it resolves, a bradydysrhythmia of over 10 minutes may cause brain damage to the fetus and have implications for the neonate.

Cardiotocograph

The cardiotocograph is a relatively expensive, sophisticated but non-invasive item of equipment that requires expertise in its use and in its interpretation, as well as regular maintenance, and ongoing provision of disposables, such as print-out paper. It also requires a power supply (either mains electricity or batteries).

It has a high sensitivity for detecting possible evidence of fetal distress, but a relatively low specificity, such that an additional method of assessment of fetal well-being, usually scalp pH assessment, is required in order to avoid excessive intervention.

If a cardiotocograph is used in the absence of fetal blood sampling, there are certain fetal heart rate patterns which are very likely to be associated with serious fetal distress and that warrant urgent actions to protect the fetus, usually immediate delivery.

Fetal scalp pH assessment

This is achieved by fetal scalp blood sampling, which is carried out with the woman in the lithotomy position with a wedge to prevent aorto-caval compression or in the left lateral position.

A speculum is inserted in the vagina, the fetal scalp is visualised with the aid of a light source, and a blood sample is obtained using a lancet and a capillary tube.

A blood gas analyser (an extremely expensive item of equipment) is required for assessment of the sample.

Fetal blood gas analysis

This is used to detect fetal acidosis, which is a consequence of hypoxia.

A capillary sample is assessed for pH and base excess. Generally, a pH of a 7.25 is considered to be normal, but it has to be borne in mind that acidosis may develop rapidly, and the sample therefore needs to be repeated if the OTG abnormality persists. A full guide to the interpretation and use of fetal blood gas analysis is not included here as it is not a technique available in the majority of resource poor settings.

Fetal blood sampling is contraindicated if the mother is infected with HIV or in high prevalence areas in the untested patient.

Clinical assessment of fetal well-being

A large amount of information may be gained by clinical assessment as follows.

History

- Gestational age is important, as an immature fetus withstands the stresses of labour less well than if it had reached term. Similarly, those with intrauterine growth retardation are at risk.
- A reduction in fetal movements should always give rise to concern, as it may reflect fetal distress (see Section 2.6.B).
- Pre-eclampsia, antepartum haemorrhage (APH), preterm pre-labour rupture of membranes (PPROM) or other obstetric or medical problems, prolonged pregnancy, multiple pregnancy, diabetes and previous Caesarean section all increase the risk of fetal distress.
- The use of oxytocin, a maternal fever, meconium- or bloodstained liquor, and prolonged first and second stage of labour also increase the risk.
- The duration of labour at the time of admission is crucial, as obstructed labour is a potent cause of severe maternal and fetal morbidity and mortality.

Examination of the maternal abdomen

- Fetal size: small or large for dates.
- Amniotic fluid volume: oligohydramnios (too little) or polyhydramnios (too much).
  - Oligohydramnios is often associated with poor fetal growth. Growth-restricted fetuses are more likely to become distressed in labour than are well-grown fetuses.
  - Polyhydramnios may be associated with fetal abnormalities or fetal infection in utero.
- Abdominal tenderness with or without hardness feeling like wood: consider placental abruption.
- Colour of amniotic fluid after rupture of membranes:
  - bloodstained: consider placental abruption
meconium-stained: consider the possibility of a hypoxic episode causing fetal distress.

(a) Passage of meconium is often a physiological (normal) phenomenon in a mature fetus.

(b) In the presence of plentiful amniotic fluid, the meconium will be dilute. Where there is little fluid, it will be thick.

(c) Meconium may signal fetal distress. It may also trigger neonatal respiratory problems through meconium aspiration, which occurs when a distressed fetus gasps in utero or during delivery.

(d) During the final stages of a breech delivery, meconium may be passed because of the compression of the fetal abdomen. In this case, passage of meconium is not necessarily a sign of fetal distress.

- Frank blood loss vaginally: consider placental abruption, uterine rupture, placenta praevia and vasa praevia.
- Haematuria in labour: this may signal uterine rupture, usually in association with severe abdominal pain and tenderness, commonly in a woman with a previous Caesarean section scar or in a woman of high parity, particularly where labour is induced or augmented.

**Management of fetal distress**

- If fetal distress is suspected, attention should first be paid to detecting and treating maternal factors, including hypovolaemia, sepsis, obstructed labour and uterine rupture.

- The woman should be turned (tilted) on her left side or placed in the recovery position, to prevent aorto-caval compression.

- Facial oxygen should be administered at a high flow rate.

- Oxytocin should be discontinued if ongoing, and if still detected in situ, misoprostol tablets may be removed from the vagina.

- Antibiotic therapy will be indicated if infection (including chorio-amnionitis) is suspected.

- Vaginal examination should be performed to assess the feasibility of vaginal delivery, either spontaneously or by using forceps or ventouse.

- If suspected fetal distress continues despite the above measures and vaginal delivery is not rapidly achievable then a decision about whether to proceed to Caesarean section needs to be made. This is a difficult decision, which ideally takes into consideration a number of factors including: the obstetric history and wishes of the patient, the availability of neonatal care, the degree of fetal compromise suspected and the speed with which Caesarean section can be performed, the availability of hospital care and Caesarean section in subsequent deliveries, and the presence/absence of other relative indications for Caesarean section.

- If a decision is made to deliver by Caesarean section and a delay is anticipated (> 30 minutes), then a tocolytic such as terbutaline 250 micrograms s/c may be beneficial if the contractions are felt to be contributing to the fetal distress.

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**2.6.D Multiple births**

**Introduction**

Twins occur in around 1 in 80 pregnancies. Non-identical twin rates vary depending on age, parity and racial background; in Africa, rates are higher than the world average. The incidence of monozygous (identical) twins is relatively constant worldwide, at 3.5 in 1000 births.

Multiple pregnancies are associated with higher risks for both the mother and the fetus. Ultrasound scanning should be undertaken if the uterine size is larger than expected, or if abdominal examination of fetal parts leads to suspicion of multiple fetuses.

If ultrasound scanning facilities are not available, abdominal examination after delivery of any first baby should be performed to exclude a second twin before oxytocin or Syntometrine is given to aid delivery of the placenta.

**Maternal risks associated with multiple pregnancy**

These include the following:

- miscarriage
- anaemia
- preterm labour
- hypertension
- polyhydramnios
- operative delivery
- postpartum haemorrhage.

**Fetal risks associated with multiple pregnancy**

These include the following:

- stillbirth or neonatal death
- preterm delivery
- intrauterine growth restriction
- congenital abnormalities
- cord accident
- specific complications of twin pregnancies (e.g. twin-to-twin transfusion syndrome)
- difficulties with delivery.

![Twin pregnancy](image-url)
If a twin pregnancy is diagnosed, additional care should be provided. Iron and folate treatment must be ensured, due to the increased risk of anaemia. Preterm labour and delivery present the greatest risk of fetal illness and death. If the mother develops premature labour, a course of antenatal steroid injections should be given, betamethasone 12 mg IM, two doses 24 hours apart, or dexamethasone 6 mg IM four doses 12 hours apart.

**Presentation of twins**
- In 40% of cases both twins are cephalic.
- In 21% the second twin is a breech.
- In 14% the first twin is a breech.
- In 10% of cases both twins are breeches.
- In all remaining cases, one twin or the other, or occasionally both, are transverse.

In Figure 2.6.D.2, the first twin is the lower one.

**Antenatal monitoring in multiple pregnancy**
- A 2-weekly check-up (urine for protein if blood pressure is elevated, ultrasound if possible) is recommended from 28 to 36 weeks; warn the woman about the risk of preterm delivery.
- Iron and folate treatment must be ensured as increased risk of anaemia is present.
- A weekly check-up is recommended from 37 weeks.
- Be alert for signs of pre-eclampsia and premature labour.

**Twin delivery**
Vaginal delivery is usually safe, but must be undertaken in a healthcare facility where comprehensive emergency obstetric care is available. If labour has not started by 39–40 weeks' gestation based on an accurate LMP or first trimester ultrasound, consider induction.

**Summary of management during labour**

**Delivery of first twin**
1. Insert an IV cannula. Maternal blood should be obtained for a full blood count and blood grouping. A blood sample should be kept for cross-matching.
2. Ensure that the lie of the first baby is longitudinal.
3. Augment contractions only when indicated.
4. Prepare two delivery packs with extra clamps. Remember that there are almost always two membranes to rupture with twins, so have an aminohook ready.
5. Make sure that the cervix is fully dilated.
6. Empty the mother’s bladder.
7. Deliver the first baby as normal.
8. Always clamp the maternal end of the cord of the first twin to prevent the second twin bleeding from it.
9. As the first baby is delivered, stabilise the lie of the second twin to a longitudinal position by asking an assistant to place their palms firmly on either side of the uterus in a longitudinal direction. The baby's position should be stabilised in this way until the head or buttocks are fixed in the maternal pelvis. If the second twin is not longitudinal on assessment, undertake version (see below).
10. Tie a marker (e.g. gauze) to the clamp on the cord of the first baby to identify it.

**Delivery of second twin**
1. The second baby should preferably be born within 30 minutes.
2. Check the fetal heart rate of the second baby.
3. Stabilise the lie of the second twin, by external version if necessary (see above).
4. Provided the lie is longitudinal and contractions do not restart 5–10 minutes after delivery of the first baby, start an oxytocin infusion, increasing carefully to achieve adequate contractions. Note that contractions may not be felt by the mother, so it is important to keep your hand on the uterus to identify them.
5. When the presenting part is well into the pelvis, rupture of the membranes can be performed during a uterine contraction.
6. Delivery of the second baby should not be rushed, but assisted delivery should be considered if the second baby has not been delivered by 30 minutes after delivery of the first.
7. If the lie of the second twin is transverse, attempt external version.
8. If external version is successful, or the second twin is longitudinal, wait for the presenting part to enter the pelvis, then perform artificial rupture of membranes (ARM) and allow normal cephalic or breech delivery if there is no fetal distress.
9. If external cephalic version is unsuccessful, either carry out internal version with breech extraction or perform a Caesarean section.

**Internal podalic version:** It is essential that as the baby descends, rotation of the fetus is encouraged to obtain a back-up (back anterior) position (as in breech delivery). Grasp a fetal foot. Make sure that it is a foot, not a hand. Pull gently down into the birth canal so that the fetal back is encouraged to turn anteriorly. An attempt is made to pull the fetal foot as gently as possible in an attempt to pull it as low as the vulva before the membranes rupture. It may be that maternal effort will be sufficient once the baby’s leg has been brought down into the vagina and the remainder of the delivery can then be managed as for an assisted breech delivery. Continued traction (avoiding soft tissues as for all breech deliveries) is permissible in this scenario, to facilitate descent of the buttocks, arm and head (breech extraction, see Figure 2.6.D.3).

10. If there is fetal distress or delay, perform an assisted vaginal delivery if cephalic. Note that cephalo-pelvic
disproportion is very uncommon in the case of the second twin.

Postpartum management of a twin birth
1. After the birth of the second baby, give 10 IU oxytocin IM after ensuring that there is no third baby in the uterus. Then give oxytocin 40 units IV in 500 mL of Ringer-lactate or Hartmann’s solution over 4 hours, to reduce the risks of postpartum haemorrhage due to atonic uterus.
2. Deliver the placenta by controlled cord traction after giving oxytocin IM.
3. After the placenta and membranes have been delivered, examine and record on the chart the number of placentas, amnions, chorions and cord vessels. Check the placenta and membranes for completeness.
4. Check and repair any vaginal and perineal damage.
5. Monitor the mother carefully for postpartum bleeding over the next few hours.
6. Provide extra support to assist with the care of the babies.
7. At least a 24-hour stay in hospital is required.
8. Observe vaginal bleeding closely, because of the risk of postpartum haemorrhage.

Hooking or locking of heads
This is a rare complication during vaginal delivery.
Women may present with locked twins with the first trunk partially delivered. The head of the second twin will have entered the maternal pelvis, and needs to be pushed upwards to allow descent of the head of the first twin. If the first baby is already dead, it can be delivered by decapitation. After delivery of the body, the head is dis-impacted and the second twin is delivered. Finally, the first head is delivered with a vulsellum.
If the first baby is still alive (e.g. if the delivery is taking place in hospital), or if despite decapitation of the first baby the second one cannot be delivered, proceed immediately to Caesarean section if this is safe for the mother.
Section 2.6

First stage:
- Ensure that first twin lies longitudinally, with IV access and fetal heart rate monitoring of both twins
- Oxytocin augmentation for poor contractions in nulliparous women

Second stage:
- Set up two delivery packs with extra clamps and an amnihook
- Have oxytocin infusion ready for the second twin, and IV fluids and drugs in case of postpartum haemorrhage

Deliver the first baby as normal.
Check the lie of twin 2 – is it longitudinal?

- Yes, longitudinal
- No, transverse

Is the fetal heart rate normal?

- Yes
- No

Anticipate spontaneous delivery
Start oxytocin if no contractions are felt by operator after 10 minutes
Wait for the presenting part to descend well into the pelvis before rupturing the membranes
Delivery of the second baby should not be rushed, but consider assisted delivery if the second twin has not delivered approximately 30 minutes after the first baby

Cephalic – forceps/ ventouse if head is engaged
Breech – breech extraction

Internal podalic version (grasp the fetal foot and gently pull into the birth canal, leaving membranes intact as long as possible), then do an assisted breech delivery or a breech extraction. Ensure that the fetal back is kept anterior

Third stage
Oxytocin 10 units IM then CCT for delivery of placenta
Check placenta and membranes for chorionicity

Yes, longitudinal

Successful

Attempt ECV

Unsuccessful

Unsuccessful

Internal podalic version

Unsuccessful

Caesarean section with antibiotic cover

FIGURE 2.6.D.6 Pathway of care for delivery of twins. ECV, external cephalic version; CCT, controlled cord traction.

2.6.E Malpresentations and malpositions including breech delivery

Introduction
Malpresentations and malpositions can be due to maternal pathology (e.g. contracted pelvis, uterine fibroids) or fetal pathology (e.g. hydrocephalus), which ideally should be diagnosed antenatally. Most often there is no apparent cause.

Malpresentations are all presentations of the fetus other than a vertex presentation (e.g. face presentation, breech presentation).

Malpositions are abnormal positions of the vertex of the fetal head (with the occiput as the reference point) relative to the maternal pelvis.

A fetus in an abnormal position or presentation may result in prolonged or obstructed labour.

Management
Review the progress of labour using a partograph (see Section 2.2).

Note: Observe the mother closely. Malpresentations increase the risk of uterine rupture because of the potential for obstructed labour.

Assessment of the fetal position

Determining the presenting part
The most common presentation is the vertex of the fetal head.

If the vertex is the presenting part, use landmarks of the fetal skull to determine the position of the fetal head (see Figure 2.6.E.1). However, although the anterior fontanelle is larger than the posterior one and has four sutures leading from it, one of these is small and may be difficult to feel.

Determining the position of the fetal head

FIGURE 2.6.E.1 The fetal skull.
The fetal head normally engages in the maternal pelvis in an occiput transverse position.

With descent, the fetal head rotates so that the fetal occiput is anterior in the maternal pelvis (see Table 2.6.E.1). Failure of an occiput to rotate to an occiput anterior position results in a persistent transverse presentation. Rotation may also occur to an occiput posterior position.

An additional feature of a normal presentation is a well-flexed vertex (see Figure 2.6.E.2), with the fetal occiput lower in the vagina than the sinciput.

### TABLE 2.6.E.1 Diagnostic features of malpositions and malpresentations

<table>
<thead>
<tr>
<th>Position</th>
<th>Observations</th>
<th>Picture from introitus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Malpositions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occiput anterior</td>
<td>On vaginal examination provided that the head is flexed only the posterior fontanelle with three sutures entering it is felt</td>
<td>Occiput anterior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Left occiput anterior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right occiput anterior</td>
</tr>
<tr>
<td>Occiput posterior</td>
<td>On <strong>vaginal examination</strong>, the posterior fontanelle is towards the sacrum and the anterior fontanelle may be easily felt if the head is deflexed</td>
<td>Occiput posterior</td>
</tr>
<tr>
<td></td>
<td>On abdominal examination the lower part of the abdomen is flattened, and the fetal limbs are palpable anteriorly</td>
<td>Left occiput posterior</td>
</tr>
<tr>
<td><strong>Malpresentations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Brow presentation</strong></td>
<td>is caused by partial extension of the fetal head so that the occiput is higher than the sinciput</td>
<td></td>
</tr>
<tr>
<td></td>
<td>On <strong>abdominal examination</strong>, more than half of the fetal head is above the symphysis pubis, and the occiput is palpable at a higher level than the sinciput</td>
<td></td>
</tr>
<tr>
<td></td>
<td>On <strong>vaginal examination</strong>, the anterior fontanelle and the orbits are felt</td>
<td></td>
</tr>
</tbody>
</table>
Section 2.6

Position Observations Picture from introitus

**Face presentation** is caused by hyper-extension of the fetal head so that neither the occiput nor the sinciput are palpable on vaginal examination

On **abdominal examination**, a large amount of head is palpable on the same side as the back, without a cephalic prominence on the same side as the limbs

On **vaginal examination**, the face is palpated, the examiner’s finger enters the mouth easily and the bony jaws are felt

**Compound presentation** occurs when an arm prolapses alongside the presenting part

Both the prolapsed arm and the fetal head present in the pelvis simultaneously

**Transverse lie and shoulder presentation**

The fetus lies in the transverse position with usually the shoulder presenting

On **abdominal examination**, neither the head nor the buttocks can be felt at the symphysis, and the head is usually in the flank

On **vaginal examination**, a shoulder may sometimes be felt. An arm may prolapse and the elbow, arm or hand may be felt in the vagina

**Breech presentation** occurs when the buttocks and/or the feet are the presenting parts

On **abdominal examination**, the head is felt in the upper abdomen and the breech in the pelvic brim. Auscultation locates the fetal heart higher than expected with a vertex presentation

On **vaginal examination during labour**, the buttocks and/or feet are felt; thick, dark meconium is normal

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**Malpositions of the fetal head**

As the baby’s head extends (deflexes), the diameter that has to pass through the mother’s birth canal gets larger, until the baby becomes a brow presentation (14 cm). Then it gets smaller as the baby becomes a face presentation (see Figure 2.6.E.3).

Labour gets more difficult as the head extends, with brow and mento-posterior face presentations being impossible to deliver vaginally unless the baby is particularly small in relation to the mother’s pelvis.

A face presentation is easier to deliver than a brow presentation. This is because the head has now become fully deflexed.

The vertex presentations in Figure 2.6.E.3 show the diameters of the skull. When the head is well flexed (a), the shortest diameter of the skull is entering the mother’s pelvis.
International Maternal & Child Health Care

Management of malpositions
Occiput-posterior positions
Around 15–20% of term cephalic fetuses are in an occiput-posterior (OP) position before labour, and approximately 5% are OP at delivery. Most fetuses (around 90%) rotate to the occiput-anterior (OA) position, some maintain a persistent OP position, and others rotate from an OA to an OP position during labour and delivery.

Arrested labour may occur when the head does not rotate and/or descend. Delivery may be complicated by perineal tears or extension of an episiotomy because an instrumental delivery is performed or because a persistent OP presentation requires passage of a greater diameter. The newborn infant is more likely to need resuscitation.

Diagnosis of an OP position in the second stage is generally made by digital examination, but if there is uncertainty, ultrasound examination is both useful and accurate in the right hands.

Management
There is no effective method of facilitating rotation from OP to OA before labour begins.

First stage of labour
Manual rotation (see below) must not be attempted in the first stage of labour, as it can lead to a prolapsed cord or complex presentations (e.g., hand). It is also technically more difficult and may introduce infection.

1. If there are signs of obstruction or the fetal heart rate or pattern is abnormal (<110 beats/minute or >160 beats/minute, or abnormal dips) at any stage, deliver by Caesarean section if this can be safely undertaken.
2. If the membranes are intact, rupture them.
3. If there are no signs of obstruction, augment labour with oxytocin.

Second stage of labour
If the cervix is fully dilated:

- If the fetal head is more than 3/5 palpable above the symphysis pubis, or the leading bony edge of the head is above −2 station and there is fetal distress and failure to descend, perform a Caesarean section.

However, expectant management of the OP position is appropriate in the presence of a reassuring fetal heart rate, adequate space on clinical examination of the pelvis, and continued progress in the second stage. More than 50% of multiparous women and more than 25% of nulliparous women with persistently OP fetuses achieve spontaneous vaginal delivery.

Therefore it is not appropriate to routinely perform prophylactic rotation at the beginning of the second stage of labour.

Delivery from an OP position rather than rotation (see below) is more appropriate in women who, on clinical examination, are found to have ample room between the fetal occiput and the maternal sacrum/coccyx, and when the pelvis is too narrow to permit anterior rotation (women with an anthropoid pelvis with a narrow transverse diameter, and women with an android pelvis with a narrow arch).
Manual rotation
Successful rotation after the onset of the second stage of labour is more likely to be successful if it is performed before arrest occurs. Manual rotation can convert 90% of OP or transverse arrest situations to OA.

Manual rotation is more successful in multiparous women and young women.

Rotation is important if there is a need for a fast delivery and/or if there is minimal or slow descent after a trial of pushing.

First empty the bladder.

There are two methods for rotating the fetus.

1. A hand is inserted into the vagina with the palm upward. Digital rotation is performed by placing the tips of the index and middle fingers in the anterior segment of the lambdoid suture near the posterior fontanelle (see Figure 2.6.E.4).

The fingers are used to flex and slightly dislodge the vertex, rotating the fetal head to the OA position by rotation of the operator's hand and forearm. The thumb may also be used with gentle downward pressure more anteriorly on the parietal bone to aid this rotation. The fetal head should be held in place for a few contractions to prevent rotation back towards the posterior position.

2. The operator's four fingers are placed behind the posterior parietal bone with the palm up and the thumb over the anterior parietal bone. The right hand is used for the left OP position, and the left hand is used for the right OP position. The head is grasped with the tips of the fingers and thumb. During a contraction, the patient is encouraged to push and the operator attempts to flex and rotate the fetal head anteriorly. Occasional mild upward pressure may help to slightly displace the head and facilitate rotation (see Figure 2.6.E.5).

If rapid delivery is indicated, failed manual rotation may be followed by vacuum delivery from the OP position. Manual rotation performed prior to instrumental birth is associated with little or no increase in risk to the pregnant woman or to the fetus.

Ventouse or forceps delivery should never be attempted above 0 station or if the head is more than 1/5 above the symphysis pubis.

Delivery of a brow presentation (see Table 2.6.E.1)
In brow presentation, engagement is usually impossible, and arrested labour is common. Spontaneous conversion to either vertex presentation or face presentation can rarely occur, particularly when the fetus is small or when there is fetal death with maceration. It is unusual for spontaneous conversion to occur with an average-sized live fetus once the membranes have ruptured.

If the fetus is alive, deliver by Caesarean section if this can safely be undertaken.

If the fetus is dead and:
- the cervix is not fully dilated, deliver by Caesarean section
- the cervix is fully dilated, deliver after craniotomy.

If the operator is not proficient in craniotomy, deliver by Caesarean section.

Only if the fetus is small or very low in the vagina, a brow presentation might be delivered by vacuum extraction, forceps delivery or symphysiotomy.

Delivery of a face presentation (see Table 2.6.E.1)
Background
This presentation occurs in 1 in 500–1000 pregnancies. It is due to extension of the fetal neck, caused by either a fetal abnormality or progression from a deflexed occipito-posterior position in labour. Diagnosis is important, as a face presentation may be mistaken for breech presentation.

Diagnosis
Face presentation may be detected on ultrasound scan before labour, but the majority of cases are unpredictable because they arise in labour.

On abdominal examination, a large amount of head is palpable on the same side as the back, without a cephalic prominence on the same side as the limbs.

On vaginal examination, in early labour the presenting part is high. Landmarks are the mouth, jaws, nose, and malar and orbital ridges. The presence of bony gums (alveolar margins) distinguishes the mouth from the anus. The mouth and the zygoma ridges of the maxillae (upper jawbone) form the corners of a triangle, whereas the anus is on a straight line between the ischial tuberosities.

Avoid damaging the eyes with trauma or use of antiseptics.

**Ventouse must not be used.**

In early labour, particularly with the occipito-posterior position and a multiparous patient, deflexion is common. In such cases, uterine contractions often cause increased flexion, and delivery will proceed as normal. However, if extension occurs, a brow presentation and finally the fully extended face will result. Most face presentations therefore only become obvious late in labour.

Descent is usually followed by internal rotation with the chin passing anteriorly. If the chin is towards the pubis (mento-anterior), the baby can often be delivered normally, although an episiotomy is usually necessary. If the chin lies towards the back, delivery will not occur and a Caesarean section will be required.

The widest biparietal diameter is 7 cm behind the advancing face, so even when the face is distending the vulva, the biparietal diameter has only just entered the pelvis. Descent is less advanced than vaginal examination suggests, even allowing for gross oedema. The head is always higher than you think.

**Abdominal examination is vital.**

The head is born by flexion, causing considerable perineal distension in the process and risking considerable perineal trauma, so consider an episiotomy. Anterior rotation having occurred, the neck comes to lie behind the symphysis pubis and the head is born by flexion. The shoulders and body are born in the usual way.

With satisfactory uterine action and the mento-anterior (MA) position, spontaneous delivery or easy ‘lift-out’ (forceps-only) assisted delivery will ensue in 60–90% of cases (see Figure 2.6.E.6).

![Mento-anterior position](image)

**FIGURE 2.6.E.6** Mento-anterior position.

If spontaneous delivery of an MA face does not occur, a ‘lift-out’ forceps delivery can be performed (see Section 2.13 on forceps delivery).

In mento-posterior (MP) positions (see Figure 2.6.E.7), the neck is too short to span the 12 cm of the anterior aspect of the sacrum. In addition, the neck would have to be extended to pass under the symphysis, but it is already maximally extended. Delivery is impossible unless a very small fetus or one that is macerated allows the shoulders to enter the pelvis at the same time as the head.

Even with MP positions, anterior rotation will occur in the second stage in 45–66% of cases, so a persistent MP position or mento-transverse arrest is encountered in only 10% of face presentations.

Persistent MP positions are usually delivered by Caesarean section (if this is desirable and safe), in order to reduce fetal and maternal morbidity.

After birth, the oedema and bruising of the child’s face may persist for some days, and may make feeding difficult.

Vaginal manipulation of persistent MP position has been successfully achieved with ultrasound guidance.

**Management**

- Make a diagnosis.
- Check for cord presentation or prolapse.
- Continuously monitor the fetal heart rate.
- Examine regularly to check that progress is adequate.
- Give oxytocin if progress is not satisfactory. (Caesarean section may be preferred to augmentation if facilities are available.)
- Do not use scalp electrodes or perform fetal blood sampling.
- If the position is MA, vaginal delivery should be possible.
- Perform an episiotomy.
- If the fetus is persistently presenting in an MP position, deliver by Caesarean section (if appropriate resources are available and it is safe to do so).

**Delivery of compound presentations (see Table 2.6.E.1)**

Here more than one part of the fetus is facing the cervix (e.g. an arm prolapasing alongside the presenting part). It is more common in prematurity.

Compound presentations, especially minor degrees involving just a hand can be managed expectantly in the early stages of labour, especially in the multiparous patient, and can sometimes be digitally encouraged back into the uterus. If they progress or persist and cause delay in the first or second stages of labour, then Caesarean section should be undertaken.
Transverse and oblique lies (see Table 2.6.E.1)

Background

These are associated with prematurity, uterine fibroids and placenta praevia, and consequently are associated with high maternal and fetal morbidity. Always try to identify the underlying pathology, if any.

If the membranes are intact in early labour, it is worth attempting external cephalic version (see below under breech).

The presentation of shoulder, limb or cord in the presence of ruptured membranes means that Caesarean section is the only option for delivering a viable infant. If the fetus is dead, unless it is very small and macerated, it is safer to perform a destructive procedure if an operator experienced in the procedure is available, and it is acceptable to the patient.

Practical points to remember

- Using ultrasound, try to identify the cause of the abnormal lie, if any.
- Positively exclude placenta praevia with ultrasound before performing digital vaginal examinations. If there has been no vaginal bleeding, placenta praevia is still possible.
- Caesarean section can be extremely difficult:
  - The lower segment will be poorly formed.
  - Fibroids, when present, can distort the anatomy and inhibit access.
  - Placenta praevia is associated with severe haemorrhage.
- A vertical uterine incision may sometimes be most appropriate for the above reasons.
- Keep the membranes intact while making and extending the uterine incision, as this aids manipulation of the fetus into a longitudinal plane for delivery.
- Delivery is usually best achieved by finding, grasping and bringing down a foot (recognisable by the heel) into the incision. If the foot is difficult to find, the back and buttocks should be identified and the legs followed until a foot is found.
- If delivery is still impossible, the uterine incision can be extended upwards in the midline, making an ‘inverted T’. If an extended uterine incision has been used, it is essential to undertake an elective Caesarean section in subsequent pregnancies, because of the risk of uterine rupture during labour.

Breech delivery (see Table 2.6.E.1)

Background

At 28 weeks, 20% of babies are breech, but most fetuses will turn spontaneously so that only 3–4% will remain breech at term. There is a higher rate with prematurity. Vaginal delivery (although safer for the mother than Caesarean section) carries a higher risk of perinatal and neonatal mortality and morbidity due to birth asphyxia and trauma.

Hazards of vaginal breech delivery

Compared with the cephalic presentation at term, there is a greater risk of perinatal and neonatal mortality and morbidity, due principally to fetal congenital anomalies and birth trauma and asphyxia. In terms of maternal outcomes, vaginal birth is generally better for the mother than Caesarean section, as the operative complications associated with major abdominal surgery and the resulting uterine scar are avoided. All of these factors are especially relevant in resource-limited countries.

Minimising problems

Options

- If there are no associated complications of pregnancy (e.g. previous Caesarean section, pre-eclampsia), explain the three options to the woman and her family:
  - external cephalic version (ECV)
  - trial of vaginal breech
  - elective Caesarean section (only if this is safe).
- On the basis of current evidence, all women with uncomplicated breech presentation at term should be offered ECV.
- If it is decided that an elective Caesarean section is the best option, wait until at least 39 weeks (babies may still turn spontaneously until then).
- A trial of vaginal breech delivery is appropriate if both mother and baby are of normal proportions.
  - The presentation should be either frank (hips flexed, knees extended) or complete (hips flexed, knees flexed, but feet not below the fetal buttocks).
  - There should be no evidence of feto–pelvic disproportion – that is, adequate pelvis (using clinical judgement) and estimated fetal weight < 4000 grams (clinical measurement).
  - In some smaller women it may be appropriate to exclude a vaginal breech option where the estimated fetal weight is < 4000 grams, provided that Caesarean section is safe.
  - There should be no evidence (on ultrasound) of hyperextension of the fetal head.

Fetal complications of breech presentation

These include the following:

- cord prolapse
- birth trauma as a result of extended arm or head, incomplete dilatation of the cervix, or cephalo–pelvic disproportion
- asphyxia due to cord prolapse, cord compression, placental detachment or arrested head
- damage to abdominal organs
- broken neck.

External cephalic version (ECV)

Background

Current recommendations in well-resourced countries are that ECV should be performed with the mother wide awake, but ‘starved’, having made her informed choice and having given consent for Caesarean section if necessary, close to theatre, after fetal monitoring has been carried out, and using ultrasound guidance, and tocolysis where necessary. These safety guidelines minimise the risks of maternal injury and fetal distress, allowing early detection and treatment if necessary. However, in resource-limited settings, the avoidance of breech delivery by ECV is highly beneficial, and the method described below is a reasonable compromise.

ECV may be performed between 37 and 42 weeks’ gestation if there is a single uncomplicated breech pregnancy. There should be no previous uterine scars, previous antepartum bleeding, fibroids or a placenta praevia. On admission, the fetal heart should be listened to regularly. If
available, ultrasound should be performed to demonstrate the fetal presentation, an adequate amount of liquor, a flexed fetal head and the position of the fetal legs. The mother should be awake and have given consent to the procedure.

The membranes must be intact, with adequate amniotic fluid and no complications of pregnancy.

**Procedure**

If possible, use ultrasound to demonstrate the fetal position, an adequate amount of liquor, a flexed fetal head, a free loop of cord, and the position of the fetal legs (extended or flexed).

- The mother lies on her side (usually her right), which will allow a forward somersault (from ‘left sacro-anterior’ position, which is the commonest breech position).
- The bed is tilted head down to allow gravity to assist in disengaging the breech.
- If the uterus is relaxed, an attempt is made to turn the baby, by disengaging the breech with one hand and flexing the head further with the other.
  - This should not hurt the mother, but it will be uncomfortable; the movement on her abdomen is made easier by using lubricant (e.g. sweet almond oil, talc, ultrasound gel).
  - The manoeuvres are illustrated in Figure 2.6.E.8.

- Ensure that the fetal heart rate is normal (110–160 beats/minute).
- In well-resourced settings only, and with relatively only slightly more success, and if the uterus is not relaxed, tocolysis may be helpful. Consider giving a dose of 250 micrograms terbutaline subcutaneously.
- The fetal heart rate should be listened to regularly during the procedure.
- Whether the ECV is successful or not, after the procedure listen carefully to the fetal heart every 5 minutes for 30–60 minutes. If this is normal, the mother is allowed home.
- If the first attempt is unsuccessful, consider bringing the mother back the next day for a repeat trial.
- If the fetal heart rate becomes abnormal, turn the woman on to her left side, and reassess every 5 minutes. If the fetal heart rate does not become normal within 30 minutes, deliver by Caesarean section (if the facilities are available and it is safe to do so).
- In well-resourced settings where blood group including rhesus factor is universally collected, and where the mother is rhesus negative, 500 IU of anti-D immunoglobulin should be given after ECV. Unfortunately, anti-D immunoglobulin is expensive.

Figure 2.6.E.8 shows the steps involved in ECV. It illustrates how a right-handed person would turn a baby. If you are left-handed, turn the baby the other way.

(a) Place one hand below the breech, and your other hand above the head. Lift the breech out of the pelvis. Bring the head and breech closer together so as to flex the baby.
(b) and (c) Turn the baby by guiding the head forwards as you lift the buttocks up. In this way you make the baby do a forward somersault (i.e. turn head over heels).
(d) If you fail to turn the baby, try turning them with a backward somersault.

All mothers should be warned about the possible subsequent risks of reduced fetal movements, vaginal bleeding, rupture of the membranes and onset of labour. If ECV is successful, the pregnancy can be managed as a cephalic presentation. If it is unsuccessful, future management should be discussed and a decision made regarding whether to opt for elective Caesarean section or trial of vaginal breech delivery.

**Trial of vaginal breech delivery**

This is a difficult issue where there is limited availability of safe surgery, or surgery without delay. A trial may not be appropriate if:

- the mother is very small and/or the baby is large
- there is evidence of fetal–pelvic disproportion – that is, an inadequate pelvis (using clinical judgement) and an estimated fetal weight exceeding 4000 grams
- evidence (on ultrasound) of hyper-extension of the fetal head.

If there has been a previous Caesarean section or other scar in the uterus, a repeat Caesarean section may be preferable, although this will depend on the availability of safe surgery. Moving the woman to a waiting home next to a unit that provides comprehensive emergency obstetric care from 37 weeks’ gestation (if available) may be a good option.

**Procedure**

- The mother should confirm her informed choice of vaginal delivery.
- If the mother is in hospital, an obstetrician, anaesthetist and operating theatre should be ready.
- Careful fetal monitoring and documentation of the parograph should be undertaken.
- The bladder must be emptied either naturally or with an in–out catheter.
- If spontaneous rupture of the membranes occurs, do a vaginal examination to check for cord prolapse. Meconium is common and not a sign of fetal distress.
- Amniotomy may be used to accelerate labour, where indicated, and careful use of oxytocin may be used to correct poor uterine activity if the mother is having her first baby. However, oxytocin should only be used in a well-resourced hospital. It should not be used for poor
Section 2.6

progress due to poor uterine contractions in a mother who has previously given birth. Where available and safe, it is reasonable to perform a Caesarean section, rather than commencing oxytocin, even in primiparous women who are making inadequate spontaneous progress in labour.

- Caesarean section should be considered if there is poor progress or fetal distress.
- Ensure that a healthcare worker with adequate experience in delivering breech babies vaginally is present during the second stage.

The basic principle of delivering a breech is to avoid interfering.

- Active pushing should not be encouraged until the breech has descended to the pelvic floor and the cervix is fully dilated as confirmed by vaginal examination.
- Sitting the patient up at this stage may help to encourage descent of the breech. An episiotomy may well be required, but should not be performed until the anus is visible or until the baby’s buttocks are distending the perineum.
- The breech will usually rotate spontaneously to lie with the sacrum anteriorly. Rarely it will try to turn posteriorly, and this must be prevented by holding the baby by the bony pelvis and rotating the baby to the back-anterior position as it descends with maternal effort.
- Extended legs are delivered by flexing the knee joint of the baby and then extending at the hips.
- The baby is supported only when the arms are delivered and the nape of the neck becomes visible. Avoid holding the baby’s abdomen, as internal organs may be traumatised; the pelvis should be held gently to support the weight of the baby and prevent hyperextension of the fetal neck.
- As the mother pushes, the anterior shoulder tip will become visible. A finger is run over the shoulder and down to the elbow to deliver the arm, if this does not occur spontaneously. The other shoulder will rotate anteriorly spontaneously to allow similar delivery of the other arm. If the arms are not delivering spontaneously despite the shoulders being visible, the Løvset manoeuvre should be used (see Figure 2.6.E.9). Traction on the baby combined with rotations as shown (multiple if necessary) will usually result in each arm dropping out of the cervix. Minimal assistance by the healthcare worker running a finger along the arm to disengage it may sometimes help.
- The baby lies supported as the head engages and the neck comes into view (see Figure 2.6.E.10).


FIGURE 2.6.E.10 Breech delivery: the baby should hang until the hair line at the back of the neck is seen.

- Delivery of the head may then be performed by the Mauriceau–Smellie–Veit manoeuvre (see Figure 2.6.E.11). The right hand is placed in the vagina, the fetus is supported on the right forearm, the middle finger of the hand is passed into the baby’s mouth, and the first and third fingers are placed just below the bony ridges of the lower part of the orbits (the maxilla). The eyes must not be compressed. Pressure is applied to flex and deliver the head. The left hand is used to press upwards and posteriorly on the back of the fetal head to encourage flexion.
- Alternatively, forceps may be used to achieve the controlled delivery of the head. An assistant should hold the baby’s feet to elevate the body above the horizontal to

Alternatively, forceps may be used to achieve the controlled delivery of the head. An assistant should hold the baby’s feet to elevate the body above the horizontal to
allow the operator access to apply forceps. The nape of the neck must be in view before the baby’s body is lifted upwards, or damage to the fetal neck may be caused. It is also essential that the baby is not lifted too high, as this will damage the neck.

If the head fails to descend into the pelvis (i.e. the nape of the neck does not appear), first check that the cervix is fully dilated. If it is not, it will need to be incised. If the cervix is fully dilated, if possible forceps (ideally Piper’s) may be applied to the fetal head to facilitate delivery. Firm suprapubic pressure may be applied in the midline to encourage the unengaged head to flex and facilitate delivery. If this is unsuccessful, a symphysiotomy should be considered. All of these manoeuvres are potentially dangerous for the mother. If the fetus dies, a destructive procedure should be undertaken.

Before and at operation:
- Explain to the woman that she will have a scarred uterus, which may create problems in future pregnancies.
- Ensure that the presentation remains breech before anaesthetising the patient.
- Note that if the uterine incision is too small, there can be difficulty delivering the after-coming head.
- Remember to keep the fetal back upwards during delivery.

2.6.F Preterm pre-labour rupture of membranes (PPROM) and/or preterm labour

Introduction
PPROM is defined as spontaneous rupture of the membranes before the onset of labour and prior to 37 weeks’ gestation. It occurs in 2–4% of single pregnancies and 7–20% of multiple pregnancies, and accompanies 60% or more of preterm births.

PPROM is associated with maternal mortality and morbidity with neonatal complications, which include cord prolapse, neonatal sepsis and respiratory failure, pulmonary hypoplasia and malpresentations.

Preterm labour is defined as labour that begins before 37 weeks’ gestation. It has increasing serious implications for the neonate the earlier it occurs.

Preterm labour may occur without PPROM. However, ruptured membranes are a common early consequence of premature labour. Likewise PPROM can occur before labour, but the risk of progression to labour following PPROM is high (see below).

There are multiple risk factors for preterm labour and PPROM. They include intrauterine infection, twin pregnancy, polyhydramnios, abrupton, malaria, urinary tract infection/pyelonephritis and uterine anomalies (including large fibroids).

Clinical findings in the woman with PPROM and/or preterm labour
In PPROM the fluid may come out quickly as a sudden large flow, or it may trickle out over 1–2 hours, after which recognition is more difficult. Around 50% of women go into labour within 24–48 hours, and 70–90% within 1 week. The gap is longer the earlier in pregnancy the rupture occurs.

There may be no history or signs to suggest that PPROM has occurred, and therefore the woman may present with preterm labour. Preterm labour may also occur without PPROM.

It is important if possible to distinguish PPROM from urinary incontinence, bacterial/fungal vaginal infection or a ‘show’ of cervical mucus.

Premature labour is considered to be present if there are regular contractions (usually at least every 10 minutes) associated with cervical effacement and/or dilatation.

In its early stages it is very difficult to diagnose accurately, as the patient may present before cervical change has occurred, and it is then only with time that the cervical change becomes apparent.

Important differential diagnosis for premature labour, where cervical change has not yet occurred, include: Braxton Hicks contractions, urinary tract infection, musculoskeletal pain, constipation and diarrhoea.

Infection can itself result in premature labour and therefore patients presenting with threatened preterm labour should be assessed and treated for an underlying cause. Common examples of infections that precipitate premature labour include malaria and urinary tract infection/ pyelonephritis.

Management of PPROM and/or preterm labour
Avoid doing a digital vaginal examination unless active labour is under way and/or birth is imminent, as it increases the risk of infection.

A sterile speculum examination should be undertaken to look for amniotic fluid passing through the cervix or in the posterior fornix. A swab should be taken of the fluid and sent to the laboratory for microscopy and culture (if bacteriological facilities are available), looking especially for group B streptococcus.

Monitor vital signs (temperature, heart rate and blood pressure), vaginal discharge (check sanitary towels regularly; do not use tampons), uterine activity and possible tenderness, and fetal heart rate, and where possible perform an ultrasound examination to assess the amniotic fluid index, presentation, gestation and placental site.
Also check a full blood count, maternal blood group, malaria RDT +/- smear and a midstream specimen of urine (MSSU). If available a CRP along with the white blood cell count may help to indicate an underlying infection.

Although there is no evidence that bed rest is appropriate, if it is undertaken apply anti-thrombosis stockings (if available) and encourage leg exercises to prevent deep vein thrombosis.

Inform the paediatrician (if available).

Sexual intercourse should not occur after PPROM.

**When to consider antibiotics**

1. Symptomatic ascending infection *in utero* in the mother (fever, maternal and/or fetal tachycardia, foul-smelling vaginal discharge, uterine tenderness and signs of systemic illness) needs urgent treatment with IV antibiotics (ampicillin plus gentamicin plus metronidazole). If this is overlooked, the lives of both the mother and the baby will be in danger:
   - ampicillin 2 grams IV/IM, then 1 gram IV 6-hourly
   - plus gentamicin 80 mg IV/IM 8-hourly or 5 mg/kg body weight IV/IM once every 24 hours
   - plus metronidazole (vial containing 500 mg in 100 mL) 500 mg or 100 mL IV infusion every 8 hours. Do not give metronidazole IM.

   Usually there will be uterine contractions, but whether or not they are present the baby must be delivered as soon as possible.

2. Asymptomatic infection (no fever and no systemic signs of illness) is a more common problem which may progress to a life-threatening infection at any time. It is therefore essential that all women who have/or may have undergone rupture of membranes, are monitored regularly for the symptoms and signs of infection. These include: labour, generalised uterine pain, flushed and chilled, body aches, fever (> 37.5°C), tachycardia, tachypnoea and fetal tachycardia.

3. If premature rupture of membranes is confirmed, the patient is stable, and a decision has been made to manage the patient expectantly (see below) then give prophylactic antibiotics as follows to help more safely manage the patient expectantly (see below) then give prophylactic antibiotics:
   - a. Erythromycin 250 mg TDS plus amoxicillin 500 mg TDS both orally and for 7 days.

4. All patients with confirmed premature labour should receive prophylactic antibiotics when in active labour as follows:
   - a. IV ampicillin 2 grams IV/IM, then 1 gram IV 6-hourly. Discontinue antibiotics immediately after delivery if there are no signs of infection in the mother.

5. Maternal fever (> 38°C) or other indication of infection in labour (e.g. offensive liquor) requires that the mother be treated with IV penicillin/ampicillin, metronidazole and gentamicin as in 1. above. If this is the case, the newborn baby should also be treated with IV antibiotics from birth without waiting for any signs of infection to appear (see Section 3.1).

**Minimising the risk of surfactant deficiency in the newborn with antenatal steroids**

High-dose corticosteroids can improve surfactant production in the newborn, but steroids must not be given if there is evidence of tuberculosis or HIV infection. A transient increase in blood glucose levels can occur with the use of steroids in diabetes. Even one dose of steroids can be effective in improving lung maturity in the newborn.

Give betamethasone, 12 mg IM, two doses 24 hours apart or dexamethasone, 6 mg IM, four doses 12 hours apart. Maximum benefit is achieved 24 hours following the second dose and for 1 week thereafter. Although it is not evidence based, where delivery is urgent, it is common practice to accelerate the course of steroids by giving the two 12 mg doses of either betamethasone or dexamethasone 12 hours apart.

A second course of dexamethasone or betamethasone can be given if more than 2 weeks have elapsed since the first course of treatment was given, and delivery has not occurred but premature labour has restarted. No more than two courses should be given.

**Stopping premature labour**

There is evidence to demonstrate that labour can sometimes be delayed by treating the mother with tocolytic drugs. There is no evidence, however, that tocolysis alone is beneficial to the baby or mother. In fact their use is potentially dangerous, as delaying delivery may result in progression of the process which caused the premature labour in the first place, e.g. infection or abortion.

However, tocolysis may be useful to allow administration of antenatal corticosteroids (as above), thereby protecting the baby from lung surfactant deficiency. They may also allow transfer of the mother to a hospital where safer therapy can be provided for a preterm baby.

Tocolysis should not be given for more than 48 hours as this is the time taken for antenatal steroids to achieve their maximum therapeutic effects.

Premature labour is considered to be present if there are regular contractions at least every 10 minutes associated with cervical effacement and/or dilatation.

It is unsafe to try to stop labour if the membranes are ruptured.

Although tocolysis is not recommended after 34 weeks’ gestation in well-resourced settings, it may possibly be helpful between 34 and 36 weeks’ gestation in low-resource settings, as well as between 28 and 34 weeks.

If labour is well advanced and the cervix is more than 5 cm dilated, tocolysis will probably not be helpful.

**Drugs used for tocolysis**

There is always the option of not trying to stop uterine contractions, as the evidence of benefit is very limited. If antenatal corticosteroids are not going to be given and there is no need to transfer the patient, then tocolytics are not indicated.

**Terbutaline**

This is given in a dose of 250 micrograms subcutaneously every 6 hours.

**Nifedipine**

Nifedipine given orally is the most appropriate drug.

The side effects of nifedipine include facial flushing, headache, nausea, tachycardia, dizziness, a fall in blood pressure, heart failure and (rarely) increased liver enzymes.

Contraindications are situations where delivery is desired, such as antepartum haemorrhage, severe pre-eclampsia, infection, fetal distress and all cases of PPROM.
in low-resource settings. Nifedipine should not be given if the mother has heart disease.

Before starting nifedipine, measure urea and electrolytes and liver function tests (where available).

Regular and frequent measurements of the mother’s vital signs, as well as the fetal heart rate, should be undertaken. Closely observe for signs of heart failure. If the blood pressure falls, give a bolus of 250–500 mL of Ringer-lactate or Hartmann’s solution.

Doses of nifedipine:
- Initial dose: 20 mg of oral nifedipine.
- Up to three further doses can be given at 30-minute intervals if uterine contractions persist.
- If this stops labour, and the blood pressure is stable, give a maintenance dose of 20 mg three times a day for up to a total of 48 hours. The maximum daily dose is 120 mg of nifedipine.

How long to wait before inducing labour when there is PPROM

The decision on timing of delivery is difficult, and it depends on the stage of pregnancy, the availability of comprehensive emergency obstetric care, the quality of neonatal care available and the obstetric history and wishes of the patient.

If expectant management is undertaken women with PPROM should be resident in a healthcare facility where comprehensive emergency obstetric care is available. Induction of labour should be undertaken by 36 weeks as prolonging the pregnancy beyond this stage is of reduced benefit to the fetus.

In a resource poor setting it is reasonable to induce the pregnancy at a much earlier gestation, even if this will result in a neonatal death, in order to reduce maternal risk.

Patients should be monitored closely for any symptoms or signs of infection, and if any develop delivery should be achieved urgently (via induction or Caesarean section, whichever is indicated) regardless of gestation.

Suggested monitoring would include:
- Regular review for symptoms of infection, e.g. uterine pain, body aches, flushing, chills. The patient should be advised to report such symptoms as they occur.
- 2 to 4 times daily vital sign assessment – tachycardia (> 100 bpm), tachypnoea (> 20), and pyrexia (> 37.5º C) should raise suspicion of infection.
- At least twice weekly inflammatory marker assessment such as CRP (where available). Note: corticosteroid administration causes a transient increase in the maternal white blood cell count but does not affect CRP.

Clinical problems in the neonate associated with preterm birth

These include the following:
- Surfactant deficiency leads to increasing levels of respiratory difficulty with decreasing gestational age.
- There is an increased risk of infection and hypothermia.
- Nutritional problems: maturity is more important than weight with regard to the ability to feed and digest. Babies who are born before 36 weeks’ gestation nearly always need some help with feeding. Breast milk is ideal, and everything possible should be done to help the mother to sustain her lactation until the baby is ready to feed reliably from the breast. A limited ability to suck and swallow usually appears from 32 weeks’ gestation, but it remains unpredictable, unreliable and uncoordinated until 36 weeks’ gestation. In the event that breastfeeding cannot be initiated immediately after birth, the mother should be encouraged to start expressing breast milk, to be given by nasogastric tube or cup and spoon. Partial breastfeeding can also help the mother to sustain her lactation, but in any event she should regularly express milk.

Further information on care of the prematurely born infant can be found in Section 3.

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**2.6.G Prolapsed umbilical cord**

**Incidence**

Prolapse of the umbilical cord occurs in approximately 0.2% of all births, mostly in multiparous mothers. There is a significant risk of fetal death due to mechanical compression of the cord, and spasm of the cord vessels when they are exposed to cold air.

**Risk factors for cord prolapse**

The presenting part does not remain in the lower uterine segment due to any of the following causes.

**Fetal causes**
- Malpresentations (e.g. complete or footling breech, transverse and oblique lie).
- Prematurity or low birth weight.
- Polyhydramnios.
- Multiple pregnancy.
- Anencephaly.
- High head.

**FIGURE 2.6.G.1** Sagittal view showing compressed cord.
Maternal causes
- Contracted pelvis.
- Pelvic tumours.

Other predisposing factors
- Low-grade placenta praevia.
- Long cord.
- Sudden rupture of membranes in polyhydramnios.
- Artificial rupture of membranes (ARM).
- Manual rotation of the fetal head.

Management of cord prolapse
The longer the time between diagnosis of cord prolapse and delivery, the greater the risk of stillbirth and neonatal death.

1. Assess fetal viability. If the baby is alive and of a viable gestation, and fetal heart sounds are heard with a Pinard's stethoscope or ideally a hand-held ultrasound fetal heart rate detector (e.g. Sonicaid), urgently relieve pressure on the cord by placing the woman in the knee–elbow or exaggerated Sims' position (Figure 2.6.G.3). Care should be taken not to stimulate the cord by handling it. Exposure to low temperatures should also be prevented if possible. This gives time for decision making.
2. Discontinue oxytocin if it is being used. You can buy time to allow the baby to be delivered by giving tocolysis with terbutaline 250 micrograms every 6 hours subcutaneously.
3. If the fetus is alive, prepare for either emergency vaginal delivery or emergency Caesarean section (if this can be undertaken safely).
4. If the cervix is fully dilated, and delivery is likely to be achievable within 5 minutes, encourage the patient to push and prepare to expedite the delivery by use of forceps or ventouse. The choice of instrument will depend on availability, operator experience and the position of the fetal head. If appropriate, forceps delivery is usually the most rapid method of achieving delivery, but must not be used by inexperienced staff. Rapid delivery is far more likely to be achieved in a multiparous woman.
5. If Caesarean section is safe and the only option (i.e. the cervix is not fully dilated, and the fetus is alive and viable), fill the bladder to raise the presenting part off the compressed cord for an extended period of time, so that the woman or girl can be transferred to the operating theatre. Insert 500 mL of sterile IV fluid into the bladder using an IV giving set attached to a Foley catheter. Inflate the balloon of the Foley catheter, clamp it and attach drainage tubing and a urine bag. The full bladder may also decrease or inhibit uterine contractions. The bladder must be emptied by unclamping the catheter before opening the peritoneal cavity for Caesarean section. Mark the mother's abdomen to ensure that this is not forgotten. At skin incision, the bladder clamp must be released and the bladder emptied.
6. Ensure that venous access is in place with a reliable IV cannula.
7. Transfer the woman or girl to the operating theatre in the exaggerated Sims' position on a trolley.


FIGURE 2.6.G.3 Maternal positions for immediately relieving pressure on prolapsed cord.

FIGURE 2.6.G.4 Treating prolapse of the cord by elevation of the fetal presenting part by inflating the bladder with sterile IV fluid.
2.6.H Inverted uterus

Introduction
Definition
This occurs when the uterus, after or during delivery of the placenta, is inverted and may appear at the introitus. The inverted uterus has the endometrium and sometimes the placenta ‘on the outside’.

Prevention
Prevent an inverted uterus by avoiding cord traction until the uterus is contracted and placental separation has occurred, and ensuring that the uterus is held back with one hand during cord traction.

Clinical signs
An inverted uterus most commonly presents as a pelvic mass, sometimes protruding from the vagina. If the inverted uterus does not protrude from the vagina, it may go undetected, resulting in a sub-acute or chronic inversion which is very dangerous and may even present as a sudden unexpected maternal death.

Symptoms and signs include severe lower abdominal pain in the third stage of labour, haemorrhage, shock out of proportion to blood loss, the uterus not being palpable on abdominal examination, and vaginal examination revealing a mass in the vagina.

Early recognition is vital, as shock is the most common complication. Shock out of proportion to blood loss may be due to increased vagal tone, which may also produce a bradycardia (< 60 beats/minute), worsening the shock and confusing its diagnosis. Inversion is associated with haemorrhage in over 90% of cases. Alternatively, concealed bleeding may produce tachycardia and other signs of shock.

Incomplete inversion presents more subtly with continuing postpartum haemorrhage despite a contracted uterus. The fundus of the uterus may feel dimpled.

Suspect a diagnosis of inverted uterus if there is:
- shock with little obvious bleeding
- continuing postpartum haemorrhage despite an apparently well-contracted uterus
- associated lower abdominal pain
- a dimpled uterine fundus
- a fundus that is not palpable abdominally.

Management
The uterus must be replaced as soon as inversion is recognised, as a matter of urgency, as this becomes more difficult over time. Call for help and try to push it back while ABC resuscitation is being undertaken.

Primary assessment and resuscitation
Call for senior help, including a surgeon and an anaesthetist.

If shock is present, manage ABC as described below.

Manual replacement of the uterus
As soon as possible, and wearing sterile gloves, attempt manual replacement of the uterus by pushing the fundus...
back through the cervix (the longer the delay, the more difficult it will be to achieve resolution).

It is important that the part of the uterus that came out last (the part closest to the cervix) goes in first.

FIGURE 2.6.H.1 Bimanual replacement of inverted uterus. Reproduced with the permission of Medical Aid Films, www.medicalaidfilms.org

Do not attempt to separate the placenta until the inversion has been corrected.

However, if the inversion has been present for some time (e.g. if it occurred at home), and replacement is not possible without placental removal, then be prepared for possible severe bleeding if this is undertaken.

Hydrostatic correction
- If manual replacement is unsuccessful, hydrostatic correction should be attempted.
- Place the woman in the steep Trendelenburg position (lower her head about 0.5 metres below the level of the perineum).
- Prepare a high-level sterile douche system with a large nozzle, long tubing (2 metres) and a reservoir (1–2 litres of sterile Ringer-lactate or Hartmann’s solution at room temperature, not from a refrigerator).
  - Note: This can also be done using Ringer-lactate or Hartmann’s solution and an ordinary IV administration set.
- Identify the posterior fornix. This is easily done in partial inversion when the inverted uterus is still in the vagina. In other cases, the posterior fornix is recognised by the place where the ridged vagina becomes the smooth vagina.
- Place the nozzle of the douche in the posterior fornix.
- At the same time, with the other hand hold the labia sealed over the nozzle and use the forearm to support the nozzle.
- Ask an assistant to start the douche at full pressure (raise the water reservoir to at least 2 metres). Ringer-lactate or Hartmann’s solution will distend the posterior fornix of Airway: Maintain as level of consciousness requires Breathing: Give 100% O₂ by face mask or bag and mask if needed Circulation: Shock is usually severe Two IV lines (14–18G) Elevate legs Consider use of NASG Give 500 mL to 1 litre of Ringer-lactate or Hartmann’s IV as rapidly as possible while awaiting blood Give atropine IV 100 micrograms and repeat every 2 minutes up to maximum of 400 micrograms if bradycardia < 60 beats/minute Establish monitoring of pulse, blood pressure, respiratory rate, SₐO₂ and urine output Establish adequate analgesia and call for senior help (if available) Attempt manual replacement as soon as possible: gently push the fundus back through the cervix before attempting to separate off the placenta.

FIGURE 2.6.H.2 Pathway of care for inverted uterus. FBC, full blood count; NASG, non-pneumatic anti-shock garment.
the vagina gradually so that it stretches. This causes the circumference of the orifice to increase, relieves cervical constriction, and results in correction of the inversion.

- If a Silc Cup ventouse is available, this can be used to occlude the vagina and give a seal. Two IV infusion sets are inserted into the narrow end while the wide end lies against the inverted uterus vaginally.

- Terbutaline, 250 micrograms subcutaneously, may help to stop any uterine contractions that prevent correction of the inversion.

**Manual correction under general anaesthesia**

If hydrostatic correction is not successful, try manual repositioning under general anaesthesia, using halothane. Halothane is recommended because it relaxes the uterus, but be aware of the risk of possible atonic uterus and haemorrhage.

**Airway**

- Use an opening manoeuvre if the airway is not open or is partially obstructed. Keep the airway open. If there is an improvement but the airway closes without active opening support, consider using an airway adjunct to support the airway.

- Suction only under direct vision and only if necessary.

- The airway may need to be secured by intubation using experienced senior help (if available).

**Breathing**

Provide a high concentration of oxygen through a face mask with a reservoir bag if there is adequate spontaneous respiration. Give 100% oxygen (mask with reservoir and a flow rate of at least 6 litres/minute) regardless of SaO₂.

For inadequate ventilation or depressed conscious level (P or U on the AVPU scale), respiration should be supported with oxygen via a bag-mask, and experienced senior help should be summoned (if available).

**Circulation**

**Primary assessment suggesting shock:**

- Fast, weak pulse (< 100–110 beats/minute). Normal heart rates in a pregnant mother at rest are 60–90 beats/minute. Tachycardia is the first sign of shock.

- Bradycardia (< 60 beats/minute) may occur as a result of increased vagal tone due to the inversion.

- Low-volume (weak) pulse.

- Pallor (especially of the inner eyelid, palms or around the mouth).

- Sweatiness or cold clammy skin.

- Prolonged capillary refill time (> 3 seconds).

- Rapid breathing (> 30 breaths/minute). Normal respiratory rates in a pregnant mother at rest are 15–20 breaths/minute. Tachypnoea can be due to acidosis.

- Low blood pressure (systolic < 90–100 mmHg) is a very late sign. Healthy women and girls can maintain a normal or even high blood pressure while large volumes of blood are lost.

- Anxiety, reduced conscious level, confusion or unconsciousness.

If the woman or girl is shocked, obtain vascular access to give large volumes quickly. Insert two wide-bore IV cannulae (14- to 16G) and send blood for a full blood count, cross-matching (2 units) and clotting. If peripheral veins are difficult to access, the external jugular vein or long saphenous vein cut-down are good alternatives.

- Give an initial rapid bolus of 500 mL to 1 litre of Ringer-lactate or Hartmann’s solution or blood if available. It is essential that the bolus is given as rapidly as possible. In the absence of syringe pumps, they should be pushed in manually using a 20- to 50-mL syringe (using a three-way tap and link to an IV giving set).

- Further 500- to 1000-mL boluses may be required in the first hour. Once more than 2 litres have been given IV, complications such as pulmonary or cerebral oedema may occur. If available, expert help, including CVP monitoring, is valuable.

- A blood pressure cuff can be used to speed up infusions in emergency situations. Wrap the cuff around the blood/ fluid bag and place it inside a non-compressible bag.

- Keep the patient warm but do not overheat them, as this will cause peripheral vasodilatation and reduce the blood supply to vital centres. Hypothermia will exacerbate poor peripheral perfusion, acidosis and coagulation abnormalities.

- Elevate the legs (raise the foot of the bed).

- Give O-negative or group-specific blood if there is not time for full cross-matching. Have O-negative blood ready in the ward at all times if possible.

- Consider giving atropine 100 micrograms IV, and repeat every 2 minutes up to a maximum of 400 micrograms IV if bradycardia is < 60 beats/minute.

- Consider using the non-pneumatic anti-shock garment (NASG).

**Post-procedure care**

Once the inversion is corrected, infuse IV oxytocin, 40 units in 500 mL of Ringer-lactate or Hartmann’s solution, over 4 hours. If the uterus does not contract after oxytocin, give misoprostol 3 tablets each of 200 micrograms orally or 600 micrograms of powder sublingually if the patient is conscious, or 4 × 200 micrograms rectally if she is drowsy.

The patient must be observed closely for haemorrhage.

Give a single dose of prophylactic antibiotics after correcting the inverted uterus. Use ampicillin 2 grams IV plus metronidazole 500 mg IV, and give appropriate analgesia.
2.6.1 Hyperemesis gravidarum

Introduction
Some nausea and vomiting is common in early pregnancy, with nausea affecting 70–85% of women. Around 50% of pregnant women experience vomiting. However, in a small proportion of patients severe vomiting (hyperemesis) can occur. This condition is more common if there is a larger than normal placental mass (e.g. in multiple pregnancy and molar pregnancy). Hyperemesis peaks at 11 weeks, with 90% of cases resolved at 16 weeks.

Associated conditions
Severe hyperemesis requiring hospital care is associated with the following:
- depression and severe stress
- multiple pregnancy
- molar pregnancy.

Consequences of hyperemesis
Consequences that are severe enough to require hospital care include the following:
- ketosis
- hypochloraemic alkalosis, hypokalaemia and hyponatraemia
- malnutrition with anaemia and hypoalbuminaemia
- ulcerative oesophagitis
- Wernicke’s encephalopathy from thiamine deficiency
- worsened depression, may result in the patient seeking a termination of pregnancy
- hyperemesis is dangerous in type 1 diabetes and can result in ketoacidosis.

Investigations
- Ultrasound examination to exclude molar or multiple pregnancy.
- Urine for ketones and to exclude urinary tract infection.
- Blood for haemoglobin, urea and electrolytes.
- Special investigations as indicated to exclude serious medical problems affecting the gastrointestinal, genitourinary, neurological, metabolic or endocrine and psychological systems.

Treatment of severe hyperemesis
Intravenous 0.9% saline, 1 litre given over 4 hours initially and then repeated as required, is the most effective treatment for severe hyperemesis with dehydration.

Small volumes (100–200 mL every 2–3 hours) of WHO oral rehydration salts (ORS) powder dissolved in 1 litre of water giving Na+ 75 mmol/litre, K+ 20 mmol/litre and glucose 75 mmol/litre can be given in addition to IV fluids until vomiting settles and if tolerated.

After IV fluids have been started, anti-emetic drugs may not be required, but if vomiting continues try prochlorperazine 12.5 mg IM and then orally 5 to 10 mg three times daily. Alternatives include cyclizine, 50 mg IM, IV or orally TDS domperidone 10 mg orally or 30–60 mg rectally four times a day, and metoclopramide 10 mg IM, IV or orally three times a day. If suppositories are available, rectal administration is ideal as it can be self administered and avoids the oral route in the nauseous and vomiting patient. It is often necessary to use a combination of anti-emetics. If this is done it is often best to combine drugs with different mechanisms of action (e.g. cyclizine and metoclopramide) and to stagger their administration.

Supplements with thiamine should be given (IV if available) if there is evidence suggesting a severe deficiency may be present (Wernicke–Korsakoff syndrome). It should also be used prophylactically if the vomiting has been severe and/or protracted. See below for dosing.

If available, urea and electrolytes should be monitored (ideally daily) in women with severe hyperemesis. Women are at particular risk of hypokalaemia if the vomiting is severe and protracted. In a vomiting patient who is not tolerating any diet, potassium replacement should be considered even where blood measurement is not available. The daily requirement of potassium is approximately 60 mmol in a 60 kg woman, and will be higher in the vomiting patient.

Replacement should be undertaken with great care as too rapid replacement is dangerous.

A reasonable approach would be to add 20 mmol to 1 litre of 0.9% saline and to administer over 8 hours (42 dpm when using a standard giving set with a drop factor of 20). This provides a large margin of error as the infusion could be increased to >100 dpm before becoming hazardous.

Ringer’s lactate does contain 5 mmol of potassium/litre and will provide some replacement if potassium is not available.

Hyperemesis is a risk factor for venous thromboembolism (DVT and PE). If a patient is admitted with severe hyperemesis she should be treated with anti-embolic stockings (if available).

Wernicke–Korsakoff syndrome
Symptoms of Wernicke’s encephalopathy include the following:
- confusion
- loss of muscle coordination (ataxia)
- leg tremor
- vision changes
- abnormal eye movements (back-and-forth movements called nystagmus)
- double vision
- eyelid drooping.

Symptoms of Korsakoff syndrome include the following:
- inability to form new memories
- loss of memory, which can be severe
- making up stories (confabulation)
- seeing or hearing things that are not really there (hallucinations).

Treatment of severe hyperemesis where possible symptoms or signs of Wernicke–Korsakoff syndrome are present
Give an IV infusion of 10 mL of Pabrinex (Vials 1+2) in 100 mL of 0.9% saline over 1 hour (vials contain thiamine, ascorbic acid, nicotinamide, pyridoxine and riboflavin).
Subsequently, give oral thiamine 50 mg three times daily until vomiting has stopped.

**Other management on discharge from hospital**
Withhold iron tablets until vomiting has resolved, but ensure that they are taken subsequently, as iron-deficiency anaemia may have been an important consequence of the hyperemesis.

Try to help with any depression that is present and also, if resources to address intimate partner violence are available in the community, make sensitive inquiries of the woman or girl in case this is a contributing factor.

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### 2.7 Medical disorders complicating pregnancy and delivery

#### 2.7.A Heart failure during pregnancy, including rheumatic heart disease

**BOX 2.7.A.1 Minimum standards**
- Oxygen.
- Furosemide.
- Digoxin.
- Nitroglycerine sublingual tablets.
- Blood transfusion.
- Morphine.

**Introduction**
Serious cardiac pathology may present either as heart failure where respiratory distress is the most obvious finding, or as cardiogenic shock (see shock section later).

**Causes of heart failure during pregnancy**
There are five main causes of heart failure in pregnancy:
1. severe anaemia
2. structural heart disease
3. circulatory overload (e.g. excessive IV fluids)
4. hypertension in severe pre-eclampsia
5. hypertrophic cardiomyopathy (HCM) and peripartum cardiomyopathy.

Heart failure can result from:
- left ventricular volume overload (aortic and mitral valve incompetence) or excessive pulmonary blood flow (e.g. congenital heart defects)
- left heart obstruction (aortic stenosis, mitral stenosis, hypertension)
- primary pump failure (severe anaemia, myocarditis, cardiomyopathy or arrhythmia)
- over-transfusion (a particular risk in hospital with IV blood or fluid infusions, especially in the anaemic mother).

**Clinical signs**
These include the following:
- respiratory distress (raised rate and some chest wall recession)
- tachycardia out of proportion to respiratory difficulty
- raised jugular venous pressure
- gallop rhythm/murmur
- enlarged liver
- basal lung crepitations.

**Jugular venous pressure**
Normal levels of jugular venous pressure (JVP) are 4–5 cm above the sternal angle. In heart failure the JVP can be raised so that the external jugular vein is filled up to or above the angle of the jaw (see Figure 2.7.A.1).

**FIGURE 2.7.A.1 Clinical measurement of central venous pressure.**

**Treatment of severe decompensated heart failure**
- Assess ABC.
- Sit the patient upright and ensure bed rest.
- Give a high concentration of oxygen via face mask with reservoir bag.
- If there are signs of shock (poor pulse volume or low blood pressure with extreme pallor and depressed conscious level), treat for cardiogenic shock with inotropes (if available).
- If there are signs of pulmonary oedema, give IV furosemide 40 mg (and repeat as required).