family on her postnatal recovery and childcare, including advice and support with infant feeding.

**Health education and promotion**

The midwife or healthcare worker should use every interaction she has with the woman and her family throughout pregnancy, labour and the postnatal period as an opportunity to provide health advice, promote good health and deliver education. This should include antenatal education and information on the recognition of danger signs occurring at any stage during the pregnancy and in the postnatal period, including haemorrhage, abdominal pain, reduced fetal movements, severe headache and any other signs and symptoms of pre-eclampsia, and the immediate action to take when these signs occur. The healthcare worker also needs to provide education on parenting and childcare, again with advice on recognising abnormalities in the child, in order to seek appropriate medical advice. There will also be an ideal opportunity to give family planning advice and advice on the necessary immunisations, prophylactic treatments and available health screening for the whole family.

**Critical incident audit and feedback to improve perinatal and maternal mortality and morbidity**

There is little doubt that this is a vital activity that should be undertaken on a regular basis, and that resources and time must be made available for this. Effective methods of preventing maternal and perinatal mortality are available, but the systems of care that should ensure they are put in place are frequently impaired. Critical incident reviews are potentially a simple cost-effective way of defining the local problems and pointing the way to local solutions.

**Further reading**


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### 2.3 Managing normal labour and delivery

#### BOX 2.3.1 Minimum standards
- WHO partograph
- Disinfectant cream for vaginal examinations
- Sterile gloves
- Fetal heart monitor (Pinard’s or Doppler)
- Oxytocin and a safe way of giving it
- Amniotic hook
- Sterile vaginal speculums
- Postnatal care programmes for mother and baby

#### Positions for assisting with delivery of the baby

All mothers in labour should be sitting upright or in a lateral or semi-recumbent position (see Figure 2.3.3). They should not lie flat on their back, as this causes compression of the inferior vena cava and aorta, with reduced cardiac output, as well as limited ability to push. They should be encouraged to stand and be mobile for as long as is comfortably possible.

#### Basic anatomy to aid understanding of the birthing process

![Figure 2.3.1] Basic anatomy of the pelvis.

![Figure 2.3.2] The baby's birth path.
Figure 2.3.4 shows delivery on a birth stool. A TBA is delivering this mother’s baby, and the husband is helping. Sitting up like this helps the uterus to contract, and it also makes it easier for the mother to bear down. In addition, when the mother opens her legs they act as pivots to help to increase the diameter of the pelvis.

The WHO partograph


The partograph is a graphic record of the progress of labour and relevant details of the mother and fetus. It was initially introduced as an early warning system to detect labour that was not progressing normally. This would allow for timely transfer to occur to a referral centre, for augmentation or Caesarean section as required. The partograph indicates when augmentation is needed, and can point to possible cephalopelvic disproportion before labour becomes obstructed.

It increases the quality and regularity of observations made on the mother and fetus, and it also serves as a one-page visual summary of the relevant details of labour. The partograph has been used in a number of countries, and has been shown to be effective in preventing prolonged labour, in reducing operative intervention, and in improving the neonatal outcome.

It is important to ensure that adequate supplies of the form are always available.

The WHO partograph begins only in the active phase of labour, when the cervix is 4 cm or more dilated (see below).

However, it is a tool which is only as good as the health-care professional who is using it. The observations that are recorded will document the following:

- **Maternal well-being:** record pulse rate every 30 minutes, blood pressure and temperature 4-hourly, urine output and dipstick testing for protein, ketones (if available) and glucose after voiding, and record all fluids and drugs administered. If the findings become abnormal, increased frequency of observation and testing will be required, and intervention may be implemented.
- Fetal well-being: record fetal heart rate for 1 minute every 15–30 minutes after a contraction in the first stage, and every 5 minutes in the second stage. If abnormalities are noted, urgent delivery can be considered.
- Liquor: clear, meconium stained (thick or thin), bloody or absent. Thick meconium suggests fetal distress, and closer monitoring of the fetus is indicated. Check every 30 minutes.
- Frequency, duration and strength of uterine contractions (assessed by palpation): record every 30 minutes.
- Abdominal examination: to assess descent of the fetal head.
- Vaginal examination: this should be done no less than every 4 hours to assess cervical dilatation, descent of the fetal head, and moulding of skull bones. More frequent examination is only undertaken if indicated.

There must be a team approach, and senior staff must oversee the care of high-risk patients. Ideally there should be one-to-one care.

Key to partogram
- Amniotic fluid: I = membranes intact, C = membranes ruptured, clear fluid, M = meconium-stained fluid, B = bloodstained fluid.

![Figure 2.3.7](image1.png) The modified WHO partogram without latent phase.

![Figure 2.3.8](image2.png) Sample partogram showing normal progression of labour.

![Figure 2.3.9](image3.png) How to record contraction frequency and length. The number of squares filled in records the number of contractions in 10 minutes. The shading shows the length of contractions.

![Figure 2.3.10](image4.png) Recording effacement: the length of the cervix. Effacement can be recorded by thickening a line with a pen as shown in the diagram, or 'percentage' effacement can be written in the squares.
● Moulding: 0 = bones are separated and sutures can be easily felt; + 1 = bones are just touching each other; + 2 = bones are overlapping but can be reduced; + 3 = bones are severely overlapping and irreducible.

● Cervical dilatation: assess at each VE and mark with a cross ×. Begin at 4 cm.

● Alert line: starting at 4 cm of cervical dilatation, up to the point of expected full dilatation at the rate of 1 cm per hour.

● Action line: parallel and 4 hours to the right of the alert line.

● Descent assessed by abdominal palpation: this refers to the part of the head (which is divided into five parts) palpable above the symphysis pubis; recorded as a circle (○) at every vaginal examination. At 0/5, the station (S) is at the level of the symphysis pubis.

● Hours: this refers to the time elapsed since the onset of the active phase of labour (observed or extrapolated).

● Time: record the actual time at 30-minute intervals.

● Contractions: chart every 30 minutes; palpate the number of contractions in 10 minutes and their duration in seconds (< 20 seconds, 20–40 seconds, > 40 seconds).

● Oxytocin: record the amount (in units) of oxytocin per volume of IV fluids, and the number of drops per minute, every 30 minutes when used.

● Drugs given: record any additional drugs given.

● Pulse: record every 30 minutes and mark with a dot (●).

● Blood pressure: record every 4 hours and mark with arrows, unless the patient has a hypertensive disorder or pre-eclampsia, in which case record every 30 minutes.

● Temperature: record every 4 hours.

● Urine, ketones and volume: ideally record every time urine is passed.

Maternal condition

Maternal vital sign observations are crucial in labour, in order to detect pre-eclampsia, haemorrhage (accompanied by a rise in heart rate, or, as it worsens, a fall in blood pressure) and sepsis (fever). A fall in blood pressure is usually a late sign. The pulse rate and respiratory rate are valuable early features of worsening maternal condition.

Fetal condition

The normal baseline fetal heart rate is 110–160 beats/minute. The fetus’s baseline heart rate should remain stable throughout labour. Fetal heart rate accelerations are healthy features, whereas decelerations may suggest fetal compromise. This applies particularly if the decelerations do not recover immediately after the contraction (this is described as a late deceleration). A baseline rate of > 160 beats/minute (tachycardia) or < 110 beats/minute (bradycardia) may indicate fetal distress, as can a rising baseline.

Membranes and liquor

If the membranes are intact, write 'I'. If the membranes are ruptured:

● if liquor is clear, write ‘C’

● if liquor is meconium-stained, write ‘M’

● if liquor is absent, write ‘A’

● if liquor is bloodstained, write ‘BS’.

If liquor is absent, or if there is meconium staining of liquor, drainage, fetal distress should be considered and monitored for closely (meconium staining is present in 15–30% of all pregnancies, with a higher prevalence after 41 weeks’ gestation).

Stages of labour

Labour is divided into latent and active phases.

● The latent phase is cervical dilatation from 0 cm to 4 cm with gradual shortening of the cervix.

● The active phase is cervical dilatation from an effaced 4 cm cervix to full dilatation with good contractions. Progress should be at the rate of at least 1 cm/hour.

Latent stage of labour (0 cm to 4 cm cervical dilatation)

In the latent phase of labour, contractions usually start off as irregular, establishing into regular painful uterine contractions. In the primigravida, this can take up to a few days to occur, but usually takes less time in the multigravida.

The well-being of the mother and fetus in the latent phase should be assessed without unnecessary interventions, and mobilisation should be encouraged. Adequate hydration and nutrition are important, and the woman should be enabled to empty her bladder as required. During this time it is important to check the haemoglobin level and review the notes with regard to possible future problems with delivery.

Unnecessary vaginal examinations in the latent phase can lead to life-threatening infections in the mother and baby.

Active phase of labour

First stage

There should be regular painful contractions, and the cervix should efface and dilate at a rate of about 1 cm/hour from 4 cm to full dilatation (10 cm).

Vaginal examinations during labour must be recorded and only done by those caring for and monitoring the mother. They should not be undertaken more than 4-hourly unless there is a reason for doing so. During such examinations, the use of Hibitane cream or similar disinfectant cream can help to prevent infections. Care should be taken when diagnosing active labour as misdiagnosis can
lead to unnecessary medical intervention and risk to the mother and fetus. The cervix should be 4 cm and effaced and there should be regular contractions. It should be noted that in multiparae the cervix is often soft and easily stretchable to 4 cm and even beyond. This can be the case in the latent phase and sometimes even before the onset of contractions.

The progress of labour

Measurement of cervical dilatation

Cervical dilatation is assessed by vaginal examination, which should be performed every 4 hours, unless there are indications to do so more frequently.

The cervical dilatation can be plotted on a partograph against time. When the patient is admitted in active labour, the dilatation is immediately plotted on the alert line, the first line drawn upwards on the graph illustrating a rate of 1 cm/hour from this first plot. If subsequent progress is satisfactory, the cervical dilatation will be on, or to the left of, this alert line in later vaginal examinations.

Bishop’s Score: The early pre-labour/early labour changes that occur to the cervix can be quantified by using the Bishop’s score which assigns a score of 0 to 2 for each of the following characteristics: dilatation, effacement, consistency, position of cervix and station of the head (see below). It is useful both for assessing progress in the latent phase of labour, and also for assessing the “favourability” of the cervix for induction of labour. A patient with a favourable cervix has a Bishop score of 6 or more and is likely to be easier to induce. It should also be possible to rupture the membranes by the time the Bishop score is 6.

Diagnosis of the stages and phases of labour

Cervix not dilated = not in labour
Cervix dilated < 4 cm = first stage and latent phase (usually 1 cm/hour) and onset of fetal descent
Cervix fully dilated (10 cm) = second stage (non-expulsive phase), no urge to push and fetus continues to descend
Cervix fully dilated (10 cm) = second stage (expulsive phase), urge to push and fetus reaches pelvic floor
Delivery of the baby = Onset of third stage
Delivery of the placenta = End of third stage
Descent of the fetal head
Dilatation of the cervix should be accompanied by descent
of the head, although this may not occur until advanced
labour. Sometimes descent does not occur until full dilata-
tion, especially with the pelvis of African women.

The descent of the head is measured in fifths (20% increments) palpable above the pelvic brim.

Abdominal examination should always be performed
immediately before vaginal examination, and plotted on
the partogram with the cervical dilation.

Assessing fetal descent
By abdominal palpation
This method involves measuring by fifths of the head
palpable above the symphysis pubis as described above.
- 5/5: head entirely above the inlet of the pelvis (head
totally free)
- 0/5: head deep in the pelvis.

By vaginal examination
This method measures the descent of the head past the
mother’s ischial spines. When the presenting fetal head is
at the level of the spines, this is designated ‘0’.

Figure 2.3.16a shows the occiput entering the brim of
the pelvis on the left side, so the fetus is left occipito-lateral.
Later drawings show the occiput moving round to the front
so that in (d) it becomes anterior (OA). The mother was
admitted soon after labour began. The baby’s head is 3/5
palpable, it will soon engage in the pelvis and has started
to flex. The membranes are intact, and the cervix is 2 cm
long (uneffaced).

In Figure 2.3.16.b, the fetal head is now 2/5 palpable; it
is more flexed and has just started to turn towards the front
(anteriorly). The cervix is fully effaced but has not begun to
dilate. The membranes are still intact.

In Figure 2.3.16.c, the fetal head is now 1/5 palpa-
ble; the neck is more flexed and has turned a little more.
The cervix is now 7 cm dilated, so the progress line has
been transferred to the alert line on the partogram. The
membranes are still intact. Until now the mother has been
allowed to move and walk about. She has chosen to lie
down for delivery.

In Figure 2.3.16.d, the fetal head is 0/5 palpable, the
occiput is anterior and the scalp is visible. The mother is
almost fully dilated, so the first stage is almost over.
Figure 2.3.17 shows the use of the ischial spines to measure descent of the head. Feel the vertex with your index finger and feel for an ischial spine with your third finger. Is the vertex higher or lower than the ischial spines? You may only be feeling caput. Measuring fifths abdominally is more reliable but can be difficult, especially in obesity.

**Uterine contractions**

For labour to progress satisfactorily there must be good contractions. They normally become more frequent and longer-lasting as labour progresses.

Uterine contractions are assessed by palpation, usually hourly in the latent phase, and every 30 minutes in the active phase. The frequency is measured by the number of contractions felt in a 10-minute period, and the duration is measured from the start of the contraction until it passes off (e.g. 3 in 10 minutes, each lasting for 45 seconds).

**Management of the first stage of labour**

1. Place an IV cannula early on in all high-risk patients.
2. If a fever develops give intravenous antibiotics (ampicillin 2 grams IV/IM 6-hourly plus gentamicin 80mg IV/IM 8-hourly or 5mg/kg IV/IM once 24 hours).
3. If the first stage is prolonged, consider the following:
   - malpositions or malpresentations
   - pelvis too small or head too big
   - contractions too weak
   - membranes need rupturing (only if there are no malpresentations or malpositions)
   - dehydration, ketosis and/or exhaustion.

**Pain control in labour**

At present in low resource settings the only safe pharmacological treatment is nitrous oxide plus oxygen. Epidural anaesthesia is effective but requires careful monitoring (unlikely to be available), risks local infection, and can increase the need for Caesarean section. Opiate drugs, such as pethidine and morphine, have many potentially harmful effects on the woman and newborn infant.

Our recommendation is that, where possible, nitrous oxide plus oxygen should be made available for all women who need pain control, particularly the primigravida.

**Nitrous oxide plus oxygen**

It is recommended that a maximum concentration of 50% nitrous oxide and 50% oxygen should be used.

The labour ward must be adequately ventilated and the mask fit well to avoid contamination of others in the vicinity.

The drug is always self-administered to ensure its safety (if drowsiness occurs, the woman will drop the mask).

It should not be used for more than 24 hours, and can interfere with vitamin B12 metabolism if used continuously rather than intermittently (i.e. only during contractions).

The cylinder must not be mixed up with those containing 100% nitrogen. Nitrous oxide and oxygen mixture (Entonox) is supplied in a blue cylinder with white quadrants on the shoulder, whereas 100% nitrogen is supplied in a plain blue cylinder without white shoulders.

**Treatment**

The woman should inhale the gas only during painful contractions. After starting an inhalation, it takes 30 seconds to 1 minute for the nitrous oxide and oxygen mixture to act, and ideally the onset of the contraction should be anticipated, and inhaling started 30 seconds before it begins. Between contractions the mouthpiece or mask should be removed and the woman should breathe normally from room air.

Between patients the mouthpiece or mask must be cleaned and disinfected.

Side effects include drowsiness, dizziness, nausea and vomiting, and buzzing in the ears.

Nitrous oxide and oxygen is contraindicated in patients with impaired consciousness.

It does not modify uterine contractions or cause harm to the neonate.

**Prolonged pregnancy**

This is defined as a pregnancy that continues for more than 14 days after the expected date of delivery. This is a particularly difficult management issue in low-resource settings, where the dates of the last menstrual period may not be recalled by the time of antenatal presentation, and where early ultrasound scanning during pregnancy is unlikely to have been performed.

Prolonged pregnancy is associated with fetal distress, shoulder dystocia, poor progress in labour, and increased fetal, maternal and neonatal mortality.

If there is reasonable evidence that a patient is at or above 40 weeks’ gestation, stretching and sweeping of the membranes in a suitably equipped healthcare facility can be helpful in starting off labour, and may thus avoid the need for formal induction of labour (see below).

**Stretching the cervix and sweeping the membranes**

First check the fetal position and ensure that the head is not high, and record the fetal heart rate. If there has been any antepartum haemorrhage this procedure must not be undertaken because of the risk of placenta praevia. The woman should empty her bladder.

A vaginal examination in the lateral tilt position using sterile gloves coated with an obstetric antiseptic cream (e.g. chlorhexidine) should be undertaken. If there is any evidence of vaginal infection or spontaneous rupture of membranes, a membrane sweep must not be performed.

The cervix should be assessed for effacement, whether it is soft or hard, and for dilatation. If there is no cervical dilatation or the head is not at a minimum of –3, then a sweep should not be undertaken.

If the cervix is closed but soft, it may be massaged until it allows the insertion of a finger. Once the cervical os is open (more likely post term), introduce a finger into the cervical os and pass it circumferentially around the cervix. This should separate the membranes and result in the release of local prostaglandins, increasing the likelihood of the onset of labour within 48 hours.

The whole procedure is uncomfortable but afterwards it should produce only slight pain or bleeding with irregular contractions. If pain or bleeding is marked, keep the woman under close observation in the healthcare facility.

The process can be repeated if labour does not start spontaneously after 36 hours.
Induction or enhancement of labour
This may be required if there is prolonged pregnancy, pre-labour rupture of membranes, placental abruption, or a hypertensive disorder. Ensure induction is indicated, as failed induction is usually followed by Caesarean section.

Artificial rupture of membranes (ARM)
This is undertaken to either induce or augment labour. Induction of labour usually also requires uterotonic drugs.

Slow progress in labour can often be corrected by ARM. However, in areas of high HIV prevalence, leaving the membranes intact for as long as possible may reduce the risk of perinatal transmission.

ARM risks infection and cord prolapse. It is contraindicated where placenta praevia is possible, in the first episode of active herpes infection, and in vasa praevia. It is more risky with a high fetal head or polyhydramnios.

Procedure for ARM
ARM is best delayed until the cervix is ‘favourable’ as this will reduce the length of time the membranes are ruptured (and hence risk of chorioamnionitis), and limit the duration of any oxytocin infusion used. It is also likely to result in a reduced risk of failed inductions and thus unnecessary caesarean sections. A favourable cervix is one where softening, dilatation and effacement has started to occur, and corresponds to a Bishop score of 6 or more.

It is therefore advised to ‘ripen’ the cervix with one of the following before ARM: misoprostol, a Foley catheter or an oxytocin infusion (all discussed below), whichever is considered the most appropriate.

- Listen to – and note – the fetal heart rate.
- Ensure that the woman has emptied her bladder.
- Palpate the abdomen. If the presenting part is well descended, cord prolapse is less likely.
- Ideally perform an ultrasound scan to identify the position of the placenta.
- Wearing sterile gloves and with chlorhexidine obstetric cream on your fingers, examine the cervix, and note the consistency, position, effacement and dilatation. Confirm the fetal presentation.
- With the other hand (again with obstetric cream) insert an amniotic hook or a Kocher clamp into the vagina.
- Guide the clamp or hook along the fingers of your first hand towards the membranes in the vagina.
- Place two fingers against the membranes and gently rupture them with the instrument in the other hand. Allow the amniotic fluid to drain slowly around your fingers.
- Check that no cord can be felt.
- Note the colour (clear, yellow, greenish or bloody) and smell of the fluid. If thick meconium is present, suspect fetal distress. Some light bleeding may occur.
- After ARM, listen to the fetal heart during and after a contraction. If the fetal heart rate is abnormal (less than 110 beats/minute or more than 160 beats/minute), suspect fetal distress.
- If delivery has not occurred within 18 hours, give prophylactic antibiotics (IV ampicillin 1 gram 6-hourly plus gentamicin 80mg IV/IM 8-hourly or 5mg/kg body weight IV/IM once every 24 hours) in order to help to prevent infection in the baby and the mother. If there are no signs of infection in the mother after delivery, discontinue antibiotics.

- If the liquor is foul smelling or there is a maternal fever or other indication of uterine infection/chorioamnionitis treat with the antibiotics as above but with the addition of metronidazole 500mg IV 8 hourly.
- Regularly monitor vital signs.

Oxytocin infusion
Indications
- If active labour is not established within 2–4 hours after ARM, and only if contractions are weak, begin oxytocin infusion. If there are strong contractions and no progress, look for a reason (e.g. obstructed labour).
- If labour is induced because of severe maternal disease (e.g. sepsis, eclampsia), begin oxytocin infusion at the same time as ARM.

Contraindications
- It is essential that obstructed labour is excluded before oxytocin is administered.
- Use oxytocin with great caution, as fetal distress can occur from hyperstimulation and, rarely, uterine rupture can occur. Multiparous women are at higher risk for uterine rupture (see below).
- Carefully observe all women receiving oxytocin. They must never be left alone.
- Never use oxytocin in a woman or girl who has undergone two or more previous Caesarean sections, or who has a uterine scar for another reason, such as fibroid removal or traumatic uterine rupture.

- If labour has been progressing and then stops in a multiparous woman there is likely to be a reason for this secondary arrest, such as cephalo-pelvic disproportion or malposition. The use of oxytocin (rather than Caesarean section) in this situation is dangerous, as uterine rupture may occur. However, in low-resource settings this concern has to be balanced against the risks associated with Caesarean section (assuming that this procedure is even available without transfer). We recommend that secondary arrest in a multiparous woman should result in urgent transfer to a facility where Caesarean section can be undertaken.
- Never use oxytocin where a previous classical Caesarean section has been performed. Provide a timed Caesarean section.

Concerns about oxytocin and the need for great care in its use
- If a woman has undergone one previous Caesarean section, the use of oxytocin is associated with a much increased risk of uterine rupture, and these patients must be delivered in a facility where immediate Caesarean section can be performed if required. Oxytocin may, in this latter setting, be used with great care and discontinued when adequate contractions are present.
- If more than four pregnancies after 24 weeks’ gestation have been delivered, there is increased risk of uterine rupture. Oxytocin must be used with great care and discontinued when adequate contractions are present.
- Wait before starting oxytocin if misoprostol or another prostaglandin has been given within the previous 8 hours.

Administration of oxytocin
The individually needed effective dose of oxytocin varies greatly; so all patients must be monitored carefully.
Fluids can be calculated in drops per minute. Identify from the IV giving set what the ‘drop factor’ is (in standard giving sets it may be 10, 15 or 20 drops/1 mL). For micro-drop systems, (with burettes), 1 mL is 60 drops. Set the infusion rate with the flow controller below the chamber where the drops occur, and always count the rate over a full minute.

Cautiously administer oxytocin in IV fluids (Ringer-lactate or Hartmann’s solution), gradually increasing the rate of infusion until active labour is established (three contractions in 10 minutes, each lasting more than 40 seconds). Maintain this rate until delivery. The uterus must relax between contractions.

A burette in-line IV giving set (see Figure 2.3.18) can help to prevent too much oxytocin being given.

Figure 2.3.18 Burette for safer and more accurate administration of oxytocin.

When oxytocin infusion results in an active labour pattern, maintain the same rate until delivery.

Ensure that the woman is in the left lateral tilt or recovery position.

Record on a partogram every 30 minutes:
- rate of infusion of oxytocin (note that changes in the woman’s arm position may alter the flow rate)
- duration and frequency of contractions
- fetal heart rate: listen every 30 minutes, always immediately after a contraction; if less than 100 beats/minute, stop the infusion.

Monitor pulse, blood pressure and contractions every 30 minutes. Keep a fluid balance chart. Regularly reassess for contraindications.

Details of oxytocin infusion

An ampoule of oxytocin usually contains 5 international units in 1 mL. Insert oxytocin 5 international units (5000 milliunits) in 500 mL of Ringer-lactate or Hartmann’s solution. The concentration of this solution is 10 milliunits in 1 mL.

Start infusion at 2.5 milliunits/minute (i.e. at 5 drops/minute with a standard giving set with a drop factor of 20 drops/1 mL).

Increase infusion rate by 2.5 milliunits/minute (5 drops/minute using a standard giving set with a drop factor of 20 drops/1 mL) every 30 minutes until good contractions are established. — That is, contractions lasting more than 40 seconds, and occurring 3 times in 10 minutes. Maintain this rate until delivery is completed.

If there are not three contractions in 10 minutes, each lasting more than 40 seconds, with the infusion rate at 20 milliunits/minute (40 drops/minute if using a giving set with a drop factor of 20 drops/1 mL):
- In multigravida, further increases may risk uterine rupture. The reason for this may be cephalo-pelvic disproportion or malposition. Therefore consider Caesarean section.

Set the infusion rate with the flow controller below the chamber where the drops occur, and always count the rate over a full minute.

In the primigravida, infuse oxytocin at a higher concentration (rapid escalation).
- Change to a more concentrated solution with oxytocin 10 international units (10 000 milliunits) in 500 mL of Ringer-lactate or Hartmann’s at a concentration of 20 milliunits/mL.
- Give an initial infusion of 20 milliunits/minute (20 drops/minute if using a giving set with a drop factor of 20 drops/1 mL).
- Increase the infusion rate by 5 milliunits/minute (additional 5 drops/minute if using a giving set with a drop factor of 20 drops/1 mL) every 30 minutes until good contractions are established.
- If good contractions are not established at 40 milliunits/minute (40 drops/minute if using a giving set with a drop factor of 20 drops/1 mL), deliver by Caesarean section.

Do not use oxytocin 10 international units in 500 mL (i.e. 20 milliunits/mL) in multigravida.

If hyperstimulation occurs (i.e. any contractions lasting longer than 60 seconds or more than 4 contractions in 10 minutes), stop the infusion. The half-life of oxytocin is short (between 1 and 5 minutes), and therefore any hyperstimulation should stop with appropriate titration of the dose given. If hyperstimulation resolves, restart oxytocin infusion at half of the last dose given.

Consider terbutaline, 250 micrograms subcutaneously if the uterus does not relax.

Possible side effects of oxytocin infusion

These include the following:
- uterine hyperstimulation (see above).
- hyponatraemia due to water retention from vasopressin-like actions (unlikely if diluted with Ringer-lactate or Hartmann’s and more likely with prolonged infusions). Monitor urine output carefully and, if possible, measure plasma sodium concentrations.
- hypotension, flushing and tachycardia if oxytocin is given as a bolus IV by mistake.

The use of oral misoprostol to induce labour

Because of its stability at high room temperatures and low cost, misoprostol is increasingly being used to induce labour, especially in low-resource settings. Close monitoring of uterine contractions is still essential, and misoprostol must not be used if there has been a previous Caesarean section.

Misoprostol is available as a vaginal or oral tablet or an oral solution. The latest Cochrane reviews suggest that oral misoprostol solution is the most appropriate.

Dose of oral misoprostol solution

A single misoprostol tablet is dissolved in drinking water (200-microgram tablet in 200 mL of water or 100-microgram tablet in 100 mL of water), and 20–25 mL of misoprostol solution (20–25 micrograms) are then given orally every 2 hours. It may be used in women with ruptured membranes, where the oral route has the additional benefit of avoiding vaginal installations with their increased risk of infection. Solutions are stable for up to 24 hours, but should then be discarded. For safety reasons it may be better to discard
unused solutions and make up a 20- to 25-microgram dose every 2 hours. Review progress by a doctor after 100 micrograms have been given although the induction can be continued with further doses if necessary.

When induction of labour is urgent and delivery indicated within a short period of time (e.g. eclampsia) consider increasing the misoprostol dose to 50 micrograms orally every 2 hours. This may increase the speed of the induction but may also increase the risk of hyperstimulation. The recent Cochrane review recommends an oral dose of 20-25 micrograms and not more than 50 micrograms every 2 hours.

Oral misoprostol tablets
It is possible to cut 100-microgram misoprostol tablets into quarters that are 25 micrograms in size and administer them orally every 2 hours up to a maximum of six doses. However, this is not accurate, and there is a danger of giving an incorrect dosage. The oral misoprostol solution described above is safer.

The use of a Foley catheter to induce labour
An effective alternative to misoprostol is to use a Foley catheter to mechanically ‘ripen’ the cervix and induce labour. The Foley catheter tip is passed through the cervical os either during a sterile digital examination, or with the use of a sterile/high-level disinfected speculum and forceps. The inflatable bulb is introduced beyond the internal cervical os and then inflated with 10ml of sterile water. The catheter tip is then left in situ for up to 24 hours to allow cervical ripening and contractions to begin. It may fall out in the interim if the cervix dilates adequately. Once removed amniotomy and oxytocin can be commenced if needed.

This method is particularly useful in women at high risk of rupture as it does not risk hyperstimulation.

Delay in the first stage of labour
If progress is initially good, but then slows down or stops, there may be:
- malpositions or malpresentations
- obstructed labour
- an increased risk of shoulder dystocia.

Prolonged active phase (first stage) of labour
If cervical dilatation crosses the alert line, this warns that labour is slow and there may be problems. If possible, transfer the patient to an obstetric unit practicing comprehensive EmOC. If the action line (4 hours to the right according to the WHO, or 2 hours to the right according to recent evidence from South Africa) is reached, the mother must be reassessed to ascertain the reason for lack of progress and further management determined.

Other complications of the first stage of labour
Urgent help may be required to diagnose and manage cord prolapse (see Section 2.6.G), placental separation (see Section 2.5.D.iii) or ruptured uterus (see Section 2.5.F).

Second stage of labour
This begins when the cervix is fully dilated. Fetal descent occurs, but initially there may be no urge to push usually occurring only when the fetal head reaches the pelvic floor. It may be helpful for the mother to stand up or squat during this time to assist pushing. She must not lie flat on her back. (Note; some patients have an urge to push early in labour with a high head, generally with an occipito-posterior presentation)

Delivery of the baby may be allowed to take 2 hours from full cervical dilatation in the primigravida, and 1 hour in the multigravida, before there is cause for concern. The mother must not push if the cervix is not fully dilated.

During delivery, trauma to the perineum should be minimised. Routine episiotomy is not indicated, but should be performed if significant perineal trauma is anticipated, or to aid more rapid delivery if indicated. Anterior episiotomy/ reversal of genital mutilation may be required in some women.
Episiotomy is recommended for the following:
- complicated vaginal delivery (breech, shoulder dystocia, forceps and some vacuum extractions)
- scarring from female genital mutilation (see above) or poorly healed third- or fourth-degree tears
- fetal distress.

Sometimes contractions become less strong when the cervix becomes fully dilated. After confirming the well-being of the mother and fetus, mobilise the mother, hydrate her orally, including sufficient calories to help to prevent ketosis, and then wait for up to 1 hour for the head to descend. If the mother is unable to tolerate oral fluids, administer IV glucose and fluids. However, be alert for the possibility of cephalo-pelvic disproportion. After 1 hour encourage pushing, provided that the cervix is fully dilated.

Ensure that delivery of the head is controlled so that there is not a sudden release of pressure on it as it delivers (this may damage the neonatal brain).

If there is fetal distress, or delivery has not occurred after 2 hours in a primigravida or 1 hour in a multigravida, assisted vaginal delivery should be considered. A ventouse or forceps may be considered so long as none of the head is palpable per abdomen. The cervix must be fully dilated.

Delivery of the baby
- Ask the mother to pant or give only small pushes with contractions.
- Control the birth of the head by placing the fingers of one hand against the baby’s head to ensure that it does not deliver too quickly.
- Support the perineum with your other hand as it distends and the head is delivered.
- In low-resource countries, if meconium is present, suck it out of the baby’s nose and mouth on the perineum as soon as the head is delivered.
- Call the paediatrician (if available) if you consider that the baby might need resuscitation.
- Once the head is delivered, ask the mother not to push.
- Feel around the baby’s neck for the umbilical cord:
  - If it is round the neck but loose, slip it over the baby’s head.
  - If it is too tight round the neck that it is preventing delivery of the baby’s shoulders, double clamp it and cut it before unwinding it from the neck. Delivery can often be achieved with the cord left in place.
- Allow the baby’s head to turn spontaneously.
- After the head has turned, place a hand on each side of the head and ask the mother to push gently without the need to wait for contractions.
- Avoid tears by delivering one shoulder at a time. Routine traction of the baby’s head in an axial direction should be used and should result in delivery of the anterior shoulder.
- Lift the baby’s head anteriorly to deliver the shoulder that is posterior.
- Support the baby’s body as it slides out.
- After delivery of the baby, give the mother 10 units of oxytocin IM to reduce the risk of haemorrhage, but only do this if the possibility of a second twin has been excluded by earlier ultrasound examination or by abdominal palpation. Alternatively, 10 units of oxytocin plus 500 micrograms of ergometrine (called Syntometrine) IM can be given, but never give ergometrine if the mother has hypertension or pre-eclampsia, as it can increase blood pressure and cause a cerebrovascular accident.
- Dry the baby, cover with a dry clean towel and assess the baby (see Section 3.1).
- If the baby does not need resuscitation, place on the mother’s abdomen for 1 to 3 minutes to provide a transfusion of placental blood to the baby, but keep warm (for details, see Section 3.1).
- Then cut the umbilical cord and place the baby in skin-to-skin contact with the mother, ensuring that the body and head are covered to keep the baby warm. The baby may seek to suck on the breast which should be encouraged.
- If the baby needs resuscitation, cut and clamp the cord immediately, and proceed to open the airway and breathe for the baby (see Section 3.2).
- If the mother is not well, ask an assistant or relative to care for the baby.

Always prepare for the need to resuscitate the baby, especially if there is a history of eclampsia, prolonged or obstructed labour, bleeding, preterm birth or infection. Always have a bag-valve-mask of the right size available next to the mother, and ideally on a Resuscitaire®, in case assisted ventilation is required.

If the head retracts on to the perineum during delivery (the turtle sign), this suggests shoulder dystocia (see Section 2.5.F).

Active management of the third stage of labour
This is advised for preventing postpartum haemorrhage (PPH), and it consists of four possible interventions:
1 a prophylactic uterotonic drug after delivery of the shoulders of the baby and after ensuring that another fetus is not present in the uterus
2 early cord clamping and cutting
3 controlled cord traction
4 uterine massage after delivery of the placenta.

Of these, a uterotonic drug (see above), is the most important, with oxytocin the first choice because it causes uterine contraction to prevent atony rapidly with minimal adverse effects. Atony is the most common cause of PPH (around 80% of cases). If oxytocin is unavailable, or does not work, other uterotonic drugs should be used, including ergometrine or misoprostol.

All uterotonic drugs should be given within 1 minute of the complete birth of the fetus, to aid separation of the placenta by enhancing uterine contractions and reducing the risk of bleeding from an atonic (relaxed) uterus. It is essential that you are certain there is not another fetus in the uterus before such drugs are given.

Ensure that both oxytocin and ergometrine are protected from heat damage by close attention to the cold chain and their storage, otherwise they may not be effective. Ideally oxytocin should be stored in a fridge, but it can be kept at 15–30°C for 3 months. Oxytocin must never be frozen. Always store ergometrine in a fridge at 2–8°C. Misoprostol is not affected by ambient temperature.

Ergometrine is contraindicated in patients with heart
disease, hypertension, pre-eclampsia or eclampsia, as it raises the blood pressure by vasoconstriction, with the risk of cerebrovascular accidents.

Early cord clamping and cutting (the second intervention listed above) as part of the active management of the third stage of labour is no longer recommended unless the infant needs resuscitation (see above).

Controlled cord traction (the third intervention listed above) is optional where delivery is undertaken by a skilled birth attendant, but contraindicated if a skilled attendant is not available. It must not be undertaken if a uterotonic drug has not been given.

1. After the cord has been clamped, use cord clamp/straight clamp to hold the cord close to the perineum.
2. Place the other hand just above the pubis, and counter the uterus during traction of the cord to prevent it from inverting (see Figure 2.3.22).
3. Keep slight tension on the cord and wait for a uterine contraction.
4. When the uterus becomes rounded or the cord lengthens, assume that the placenta has separated, and pull gently down on the cord to deliver the placenta. Do not wait for or expect a gush of blood before applying traction. Continue to apply counter traction on the uterus with your other hand.
5. If the placenta does not descend and deliver within 1 minute of cord traction the placenta is not separating. Therefore stop traction, wait for the next contraction and repeat the process.
6. As the placenta delivers, the membranes can tear off. To avoid this, hold the placenta in two hands and gently turn it until the membranes are twisted.
7. Gently pull to complete the delivery.
8. If the membranes do tear, wearing sterile gloves gently examine the upper vagina and cervix and use a sterile sponge forceps to remove any fragments of membrane that are present.
9. If the cord is pulled off the placenta, uterine contractions may still push it out, but if this does not happen a manual removal may be needed (see Section 2.13).
10. If the uterus is inverted, push it back immediately (see Section 2.6.H).

Most placentas separate within 1 hour after birth. If this does not happen, seek help.

Controlled cord traction should not be undertaken prior to the separation of the placenta in the absence of uterotonic drugs.

Monitoring after the placenta has been delivered by active or expectant management
Monitor the patient’s vital signs, blood pressure, pulse rate and volume, and the state of the uterus (is it contracted?) every 15 minutes for 2 hours after delivery of the placenta. Examine the placenta for completeness.
Checking the placenta

Check that the placenta and membranes are intact. If they are not, there are retained products of conception which may pass spontaneously or that may need to be removed manually through the vagina.

Checking for tears

Examine the patient for tears in the cervix or vagina, and repair these as well as any episiotomy (see Section 2.13).

Skin-to-skin contact between mother and baby

If neither the mother nor the baby need resuscitation, ensure that the newborn baby is placed in skin-to-skin contact with the mother for at least 1 hour after birth, and encourage and support the baby to attach to and suck on the breast.

This approach recommended by the Baby Friendly Hospital Initiative (step 4) improves temperature control and respiratory function, increases milk production and helps to ensure weight gain for the baby.

Vitamin A for all recently delivered mothers

High-dose vitamin A should be avoided during pregnancy because of the risk of birth defects. A single dose of 200,000 units should be given to all postpartum mothers within 6 weeks of delivery, when the likelihood of pregnancy is very low, and when infants benefit most from its presence in breast milk.

Discharge of mothers and their babies from hospital after uncomplicated deliveries

In high resource settings there is evidence of lower economic costs associated with early discharge (e.g. at 6 hours after delivery compared with 48 hours). However, there is no conclusive evidence for or against the policy of early postnatal discharge in resource-limited healthcare facilities. Care should be taken when extrapolating the results of studies from countries with good socio-economic conditions to communities where resources are scarce. Consideration should also be given to different settings even within the same country (e.g. urban versus rural settings), and the cultural contexts in which the trials are conducted.

Postnatal care for mothers and their babies in resource-limited settings

In resource-limited African settings, 50% of postnatal maternal deaths occur in the first week after birth, with the majority occurring in the first 24 hours. The two most important causes of postnatal maternal death are PPH and puerperal sepsis. Mothers who are HIV positive are most at risk.

One in four deaths in childhood occurs during the neonatal period. Birth asphyxia is the most common cause, and occurs on day 1. Preterm babies most commonly die during the first week of life, and neonatal sepsis is most common after 7 days, especially in low-birth-weight/preterm babies. The origins and markers of many long-term childhood development problems occur or are seen in the first 6 weeks of life.

Despite a lack of research, mothers and their babies should remain in hospital for at least 24 hours after birth in low resource settings in order to ensure that breastfeeding is established and that any complications in the mother and baby are identified and treated. Those with high risk factors should remain in hospital for longer, and before going home all mothers should be trained to recognise danger signs in themselves and their babies.

The WHO has produced a landmark paper on postnatal care in Africa, and Tables 2.3.1 and 2.3.2 summarise their advice.

When and how many postnatal visits should occur?
The optimum number and timing of postnatal care (PNC) visits, especially in resource-limited settings, is a subject of debate. Although no large-scale systematic reviews have been conducted to determine this protocol, three or four postnatal visits have been suggested. Early visits are crucial because the majority of maternal and newborn deaths occur during the first week, most frequently on the first day, and this period is also the key time for promoting healthy behaviours. Each country should make decisions based on the local context and existing care provision, including who can deliver the PNC package and where it can be delivered.

The following information is offered as a guide.

First contact

If the mother is in a healthcare facility, she and her baby should be assessed within 1 hour of birth and again before discharge. Encouraging women to stay in the facility for 24 hours, especially after a complicated birth, should be considered. If birth occurs at home, the first visit should target the crucial first 24 hours after birth.

Follow-up contacts

These are recommended at least at 2–3 days, 6–7 days and 6 weeks after birth.

Extra contacts

Babies who need extra care (LBW babies or those whose mothers are HIV-positive) should have two or three visits in addition to the routine visits.

Where should postnatal care be provided and by whom?
The supervision and integration of postnatal care packages is essential.
TABLE 2.3.1 Routine postnatal care (PNC): What, when, where and who?

<table>
<thead>
<tr>
<th>What should be routine postnatal care?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preventive care practices and routine assessments to identify and manage or refer complications for both mother and baby, including the following:</td>
</tr>
</tbody>
</table>

**Essential routine PNC for all mothers**

1. Assess and check for bleeding; check temperature.
2. Support breastfeeding, checking the breasts and advising how to prevent mastitis.
3. Manage anaemia, promote nutrition and insecticide-treated bed nets, and give vitamin A supplementation.
4. Complete tetanus toxoid immunisation, if required.
5. Provide counselling and a range of options for family planning.
6. Refer for complications such as bleeding, infections or postnatal depression.
7. Counsel on danger signs and home care.

**Essential routine PNC for all newborns**

1. Assess for danger signs, measure and record weight, and check temperature and feeding.
2. Support optimal feeding practices, particularly exclusive breastfeeding.
3. Promote hygiene and good skin, eye and cord care.
4. If prophylactic eye care is local policy and has not been given, it is still effective up to 12 hours after birth.
5. Promote clean dry cord care.
6. Identify superficial skin infections, such as pus draining from the umbilicus, redness extending from the umbilicus to the skin, more than 10 skin pustules, and swelling, redness and hardness of the skin, and treat or refer if the baby also has danger signs.
7. Ensure warmth by delaying the baby’s first bath until after the first 24 hours, practising skin-to-skin care, and putting a hat on the baby.
8. Encourage and facilitate birth registration.
9. Refer the baby for routine immunisations.
10. Counsel on danger signs and home care.

**Extra care for low-birth-weight (LBW) or small babies and other vulnerable babies, such as those born to HIV-infected mothers (two or three extra visits)**

The majority of newborn deaths occur in LBW babies, many of whom are preterm. Intensive care is not needed to save the majority of these babies. Around one-third could be saved with simple care, including the following:

1. Identify the small baby.
2. Assess for danger signs and manage or refer as appropriate.
3. Provide extra support for breastfeeding, including expressing milk and cup feeding, if needed.
4. Pay extra attention to warmth promotion, such as skin-to-skin care or kangaroo mother care.
5. Ensure early identification and rapid referral of babies who are unable to breastfeed or accept expressed breast milk.
6. Provide extra care for babies whose mothers are HIV-positive, particularly for feeding support (see Section 2.8.C).

TABLE 2.3.2 Early identification and referral or management of emergencies for mother and baby

**Appropriate detection and management or referral is necessary to save the mother and the baby in the event of life-threatening complications.**

**Danger signs for the mother**

1. Excessive bleeding.
2. Foul-smelling vaginal discharge.
3. Fever with or without chills.
4. Severe abdominal pain.
5. Excessive tiredness or breathlessness.
6. Swollen hands, face and legs with severe headaches or blurred vision.
7. Painful engorged breasts or sore cracked bleeding nipples.

**Danger signs for the baby**

1. Convulsions.
2. Movement only when stimulated, or no movement even when stimulated.
3. Not feeding well.
4. Fast breathing (more than 60 breaths/minute), grunting or severe chest in-drawing.
5. Fever (above 38°C).
6. Low body temperature (below 35.5°C).
7. Very small baby (less than 1500 grams or born more than 2 months early).
8. Bleeding.

**At the hospital**

This is more likely if the mother gives birth in hospital, but even then women and babies do not necessarily receive an effective PNC contact before discharge from the healthcare facility, and even if the mother comes to hospital for the birth, she may not return during the first few days after discharge. Where a waiting home is available, the mother and baby could remain there until it is considered safe for them to go home.

**Through outreach services:**

1. A skilled provider can visit the home to offer PNC to the mother and baby.
2. Home visits from a specially trained community health worker (CHW) linking to the hospital or other healthcare facilities for referral as required.
3. A combination of care in the healthcare facility and at home. PNC may be provided in the hospital following childbirth, and at home during the crucial first 2–3 days, with subsequent visits to a healthcare facility or clinic at 6–7 days and 6 weeks after the birth, when the mother is better able to leave her home.

**Further reading**

World Health Organization. Reproductive Health Library of videos on YouTube: www.youtube.com/user/WHOrhl
