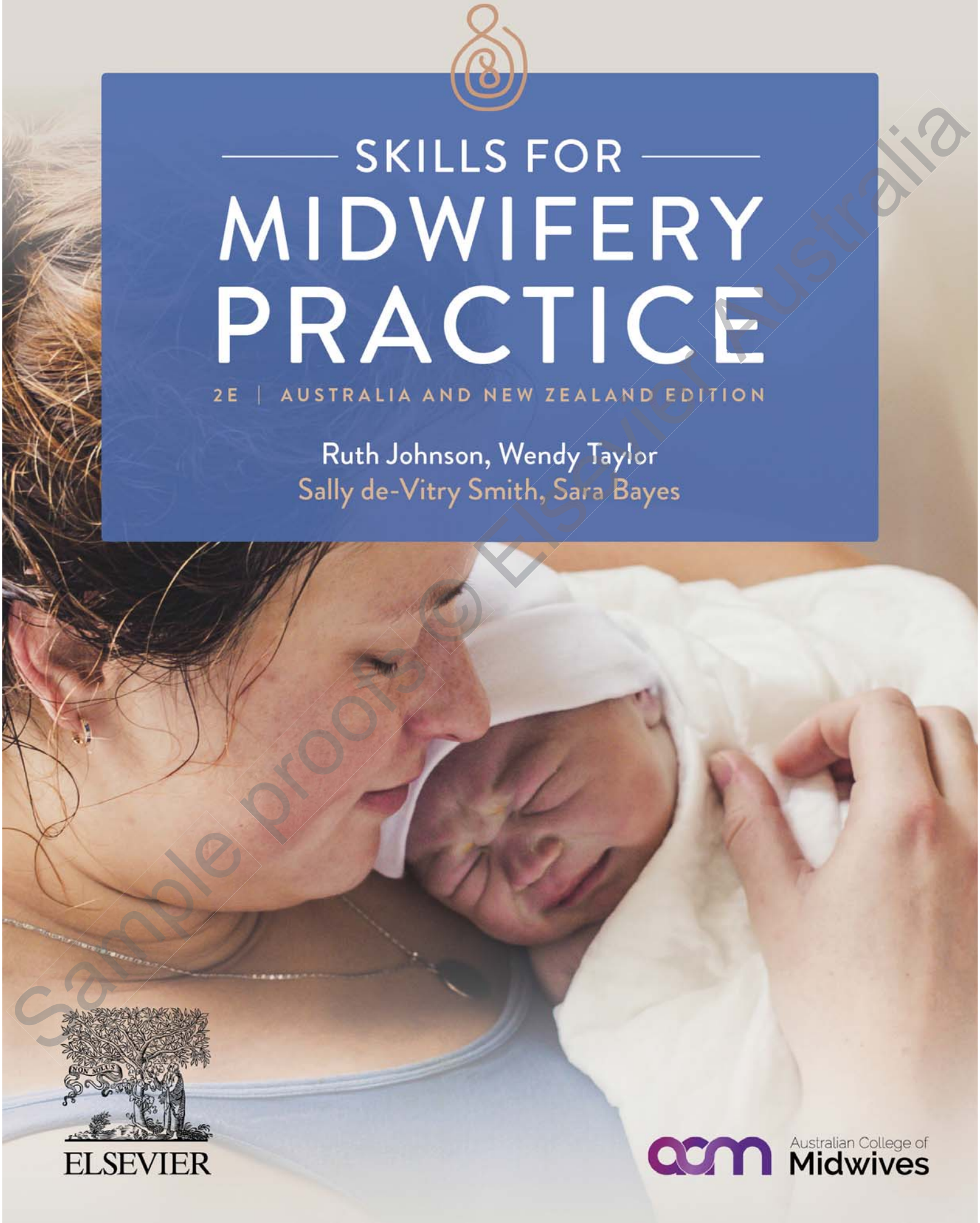

SKILLS FOR MIDWIFERY PRACTICE

2E | AUSTRALIA AND NEW ZEALAND EDITION

Ruth Johnson, Wendy Taylor
Sally de-Vitry Smith, Sara Bayes

ELSEVIER

Australian College of Midwives

SKILLS FOR MIDWIFERY PRACTICE

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2nd edition

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CONTENTS

PREFACE

Welcome to the second Australia and New Zealand edition of *Skills for Midwifery Practice*. We hope this text proves a useful resource for your practice. Each chapter is underpinned by evidence related to midwifery care and updated to reflect best practice at the time of writing.

We have attempted to capture a comprehensive range of woman-centred midwifery skills, but recognise further advances in midwifery practice will continue as midwives strive to improve outcomes for women and babies. We understand knowledge is rapidly superseded as new research emerges.

As midwives we are inspired by and privileged to accompany women, babies and families on their journey through the birth process. We also recognise the demands of our work and the importance of midwives caring for their health and emotional wellbeing in a safe work environment.

Theory and evidence sections precede each skill. Australian and New Zealand guidelines, policies, standards, statistics, terminology, models of care and cultural considerations are reflected. Each chapter addresses woman, baby and midwife as relevant. We also recognise individuals have gender diverse identities. Terms such as *pregnant person, childbearing people* and *parent* can be used to avoid gendering birth and those who give birth as feminine. However, because women continue to be marginalised and oppressed around the world, we have continued to use the terms *woman, mother* and *maternity* in this edition. By using these terms, we do not mean to exclude those who give birth and do not identify as a woman.

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CHAPTER 30

PRINCIPLES OF INTRAPARTUM SKILLS: FIRST-STAGE ISSUES

Learning outcomes

Having read this chapter, the reader should be able to:

- discuss what is meant by the latent phase and active/established phase of the first stage of labour and how this affects subsequent assessment of progress
- discuss the different positions a woman may adopt during the first stage of labour and when each of these may be recommended
- list the indications for undertaking a vaginal examination (VE) during labour
- discuss the information that may be obtained from a VE and how this assesses progress
- describe the procedures for VE, amniotomy and the application of a fetal scalp electrode.

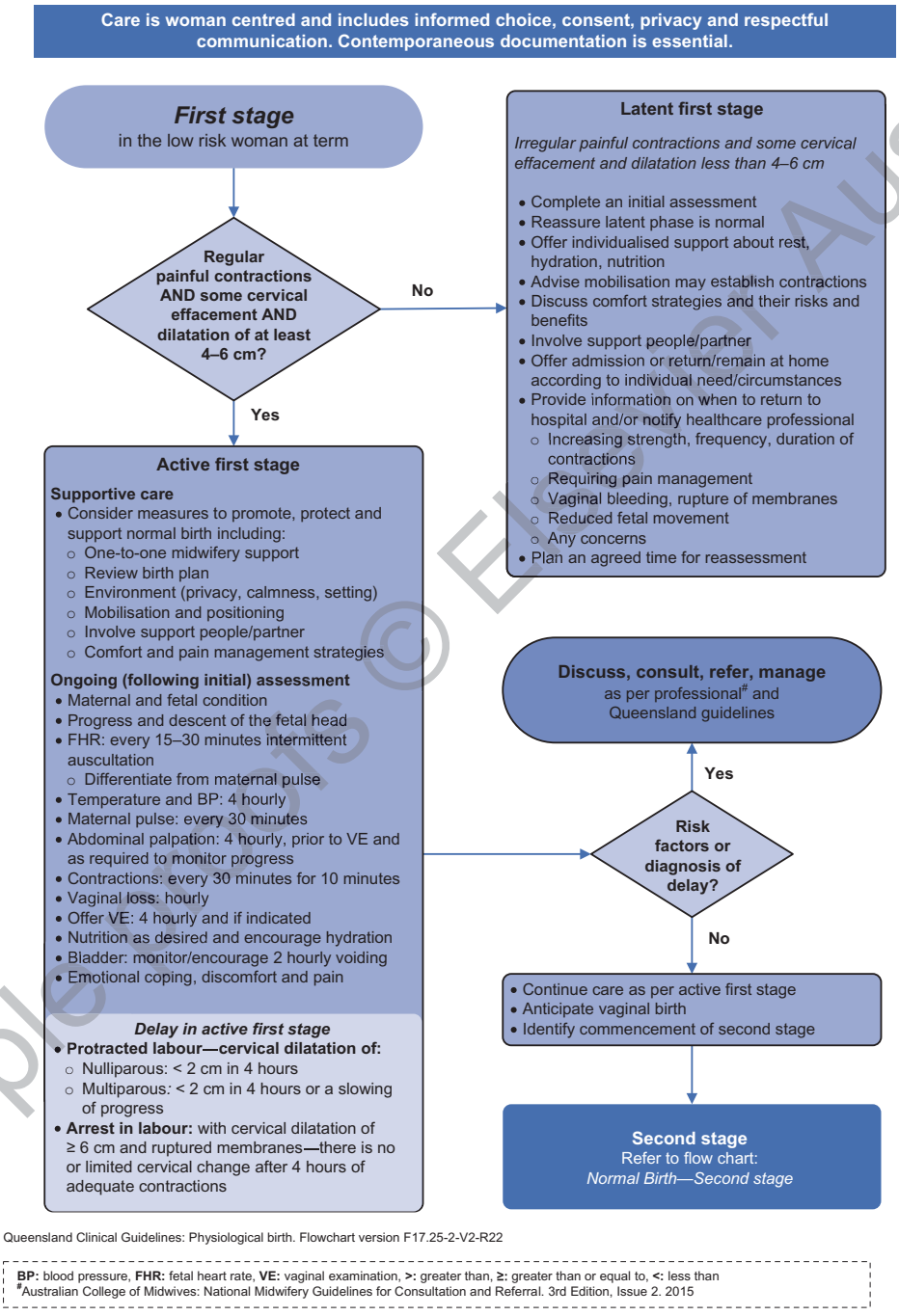
The first stage of labour consists of two phases, which have been identified as the latent phase and the active/established phase. The transition between the two phases is difficult to objectify as they are variable and no definition will apply to all women. The first stage commences with the onset of labour contractions and is completed when the cervix is no longer detectable. This chapter focuses on a selection of the skills used by the midwife when caring for a woman during the first stage of labour (some of which may also be used at other times; e.g. second stage of labour). The chapter begins with a discussion of the definition of latent and active phase as progress is assessed on the basis of how these are defined. The use of different positions the woman can adopt follows and the chapter concludes with some of the skills used during the first stage of labour. The skills reviewed are examination per vaginam, often referred to as a vaginal examination (VE), amniotomy (artificial rupture of membranes [ARM]) and application of a fetal scalp electrode (FSE) which may occur during a VE. It is recognised that the midwife uses other important skills during labour, in particular communication with and observation of the woman, as much information can be gleaned from this. However, this is not discussed within this text.

THE LATENT AND ESTABLISHED PHASES OF THE FIRST STAGE OF LABOUR AND PROGRESS OF LABOUR

While the first stage of labour is classified as having two phases: the **latent phase** and **active phase**, otherwise known as established labour, there is no universal agreement as to when one phase ends and the other begins, which makes assessing progress difficult. The latent phase has been described as a period of time, possibly intermittent periods, associated with irregular painful contractions and some cervical effacement and dilation less than 4 cm (NICE 2014) to 6 cm (Zhang et al 2010). Women who present to hospital in the latent phase are often encouraged to go home and wait for labour to establish. NICE (2014) provides a very clear definition of the latent phase based around whether painful contractions are regular and whether the cervix is dilated from and beyond 4 cm. However, some multiparous women are assessed as being in the latent phase when they have painful contractions every 15 minutes and their cervix is 4 cm dilated as this may be considered a 'multiparous os'. The woman herself may consider she is

in labour and not wish to go home. Equally, some women will never have regular contractions, yet still birth their baby, and when, if ever, they were in a discernible latent or established phase at any point will never be known. A medicalised definition of when the different phases of labour begin and end is often very different to the woman's perception of her labour (Royal College of Midwives [RCM] 2012b) (Fig 30.1).

There is no consensus in the literature on what constitutes the length of a normal latent phase.



Queensland Clinical Guidelines: Physiological birth. Flowchart version F17.25-2-V2-R22

BP: blood pressure, **FHR:** fetal heart rate, **VE:** vaginal examination, **>:** greater than, **≥:** greater than or equal to, **<:** less than
#Australian College of Midwives: National Midwifery Guidelines for Consultation and Referral. 3rd Edition, Issue 2. 2015

FIGURE 30.1 **Normal birth—first stage.**
Source: Queensland Clinical Guidelines (QCG): Normal birth.
Maternity and Neonatal Clinical Guidelines, 2017. Online 14 May 2018. Available: www.health.qld.gov.au/__data/assets/pdf_fi le/0014/142007/g-normalbirth.pdf.

Definitions vary from 6 to 8 hours (NICE 2014) up to 24 to 36 hours (Stables & Rankin 2010). Confusing the latent phase with a poorly progressing active phase can lead to inappropriate and unnecessary interventions that may affect the outcomes for mother and baby (Kobayashi et al 2017).

NICE (2014) suggests the average length of time for the duration of established labour (following the latent phase) for primiparous women is around 8 hours, and it is unusual for it to last longer than 18 hours, whereas for multiparous women the duration is around 5 hours and is unlikely to last over 12 hours. This would indicate the expectation that the duration of labour between primiparous and multiparous women is different. However, NICE (2014) classifies a suspected delay in the first stage where there is cervical dilatation of < 2 cm in 4 hours for both primiparous and multiparous women. They also both state that the amount of descent and rotation of the presenting part and any changes in the strength, duration and frequency of uterine contractions should be considered (NICE 2014). However, a reduction in the frequency of contractions and slowing of cervical dilatation may be experienced as part of normal labour. Schmidt and Downe (2010) suggest the woman will undergo a number of transition phases during labour, which include a period when the cervix is dilated to 5–6 cm and again around 8–9 cm. During these transition periods, for some women, contractions slow and labour can slow down, perhaps even stop. According to Schmidt and Downe (2010), this is a time when the woman can restore her physical energy and, as such, should not be considered abnormal, otherwise unnecessary intervention will occur. Zhang and colleagues (2010) found it can take > 6 hours for the cervix to dilate from 4 to 5 cm and over 3 hours to move from 5 to 6 cm and suggest that with both primiparous and multiparous women the progress of cervical dilatation is the same up to 6 cm, after which the multiparous labour often progresses more rapidly than the first labour. They argue that, particularly for primiparous women, labour does not progress in a consistent manner (Zhang et al 2010) yet women can birth their babies vaginally without adverse outcomes to the mother or the baby, which is a view supported by Incerti and colleagues (2011). They also suggest that the established phase of labour should not be considered to begin until cervical dilatation is ≥ 6 cm, as before then it is often normal for there to be no change in cervical dilatation (Zhang et al 2010).

Grasek and colleagues (2014) studied the descent of the fetal head during term labour and calculated the median station for each centimetre of cervical dilatation for primiparous and multiparous women. Primiparous women had a median station of -3 at 0–1 cm, -2 at 2–3 cm, -1 at 4–5 cm, 0 at 6–8 cm, $+1$ at 9 cm and $+2$ at 10 cm, whereas multiparous had a slower descent of -3 at 0–3 cm, -2 at 4–5 cm, -1 at 6 cm, 0 at 7–9 cm and $+2$ at 10 cm (Grasek et al 2014). Descent time between each of the stations was significantly quicker in multiparous women, except for descent between $+2$ and $+3$.

When assessing progress, the midwife should consider more than cervical dilatation; they should also consider whether the position of the cervix has moved from a posterior to a central or anterior position, whether it has ripened (softened), whether it has become effaced (thinned out) and whether the presenting part has rotated, flexed and descended (RCM 2012a). The midwife should also consider where the woman is in her labour, what is happening with the contractions, whether the woman has entered a transition phase (as may be noted by her changing behaviours) and what definition of latent and established labour and 'progress' is being used. One advantage of assessing progress is that it allows time to transfer the woman to a facility with a higher level of care if delay is suspected (Downe et al 2013).

MATERNAL POSITIONING

Women should be encouraged to adopt whichever positions they find comfortable during the first stage of labour (Leap & Hunter 2016). Lawrence and colleagues (2013) suggest that, given the freedom to do so, women will change position throughout labour and a change in positions should be encouraged to avoid the occurrence of pressure ulcer formation (see Chapter 47). For some women, changing position is more difficult due to constraints such as epidural anaesthesia or continuous fetal heart rate monitoring; however, the midwife can still enable the woman to make some positional changes, such as side-lying. The RCM (2012c) suggests midwives should be proactive in demonstrating and encouraging different positions in labour, particularly for women with challenges such as continuous fetal heart rate monitoring and intravenous therapy. The environment is often the key to freedom of movement; one without a variety of furniture and props to encourage positional changes is more likely to have women who remain semireclined on the bed (Cutler 2012, RCM 2012c). When the bed is the dominant feature in the room women are likely to adopt this position; it is also a convenient position for the midwife when certain procedures are required (e.g. abdominal palpation, examination per vaginam). Lawrence and colleagues (2013) suggest many women will be upright throughout labour but within the Western world, there is a preference for lying down when the cervix is around 5–6 cm. This would tie in with the transitional phase that occurs around this time in labour and at a time when the woman needs to recharge her energy. Once this has happened the woman should be encouraged to be upright again. Cutler (2012) cautions midwives not to guide the woman onto the bed for their own convenience. Equally, after procedures such as abdominal palpation and VE are undertaken with the

woman on the bed, the midwife should encourage her to adopt her previous position.

Positions adopted can vary from upright (including walking, sitting, kneeling, squatting, all-fours) to recumbent (including supine, semirecumbent, lateral or side-lying). Upright positions appear more comfortable than sitting positions (Chapman 2009, RCM, 2012c). Upright positions encourage the fetus to descend into the pelvis (Lawrence et al 2013) and may also result in a shorter first stage, less severe pain and less narcotic and epidural use (RCM 2012c). Leap and Hunter (2016) encourage women to keep moving in labour and also advocate: rocking against the wall; holding onto an open door; swaying; walking around, up and down stairs; and using a birthing ball to remain upright. Simkin and colleagues (2017) support the use of upright positions, suggesting moving around during labour can help the pelvic bones accommodate the fetus during its travels through the pelvis. Baker (2010) agrees, suggesting upright positions optimise the changes that occur within the pelvic joints during the end of pregnancy and labour (increasing pelvic diameters and causing slight changes in pelvic shape). Midwives advocate the use of stair walking or lifting one leg onto a surface so that the woman's knee is higher than the other where labour appears to be slowing or asynclitism is present. The National Childbirth Trust (NCT 2011) suggests that if a woman has been mobilising but is getting tired she could try kneeling or if she wants to sit, to ensure her feet are lower than her pelvis.

Squatting makes use of gravity and the pelvic changes (Sanderson 2012), but Cutler (2012) cautions that women in the Western world find it hard to maintain a squatting position as a result of shortening of the Achilles tendon from the use of chair sitting, wearing heeled shoes and not using squatting toilets. For a woman to use squatting during labour, it is worth discussing this during pregnancy and encouraging her to practice, particularly if her partner is going to support her in the squat.

All-fours

Hunter and colleagues (2007) found that women who were labouring with fetuses in an occipitoposterior position experienced less backache when adopting an all-fours position. This may also be achieved by leaning over a birthing ball to relieve pressure on the woman's arms. It may be more comfortable for the woman if she has support/cushioning under her knees (e.g. pillow, padded mat). Hanson (2009) suggests that an open knee–chest position (the buttocks are high, with the thighs at right angles to lower legs) can help to reduce the premature urge to push, while a closed knee–chest position (the buttocks are lower to the ground, with knees and hips flexed and abducted beneath the abdomen) is useful if the cervix is oedematous.

Lateral (side-lying)

Simkin and colleagues (2017) recommend women with an occipitoposterior position lie on their side, ensuring it is the same side as the position of the fetal spine, to encourage fetal rotation to an occipitoanterior position (e.g. lie on right side for right occipitoposterior position). This was found to increase the incidence of spontaneous vaginal delivery, decrease the length of labour and reduce the risk of caesarean section compared with lying on the opposite side or any other position (Ridley 2007). This may be a way of alternating the position of a woman with restricted mobility (e.g. with epidural use) and relieving pressure from the buttocks, sacral area and heels.

Supine

Women should be discouraged from lying supine. When the woman lies flat, the weight of the pregnant uterus can compress the major blood vessels (aortocaval compression), which can compromise maternal cardiac function and uterine blood flow. This reduces fetal oxygenation and causes alterations in the fetal acid–base status. If a woman wishes to lie supine, it is advisable to place a wedge under her right side to relieve the pressure off the major vessels. Contractions can appear to be less strong in the supine position, compared to upright or lateral positions, but if the woman becomes upright again, the contractions should return to their previous state (Lawrence et al 2013).

Semirecumbent

Kerrigan (2006) suggests there is little evidence to support use of this position; however, some women may need to rest and adopt this position periodically during labour.

EXAMINATION PER VAGINAM

A VE is an intimate, invasive procedure with the potential to cause distress and pain to the woman; thus, it should only be undertaken when there is a clear clinical indication. Hassan and colleagues (2012) remind us that for women, VE is a living experience that they may feel empowers them by increasing their self-confidence and belief in their childbearing ability or, equally, increase their feeling of vulnerability. In a more recent study, 35% of women associated VE with pain, embarrassment, not being able to relax, not feeling respected and not feeling able to stop the examination (de Klerk et al 2018). While it is often undertaken to assess progress, VE is imprecise when performed by different clinicians (RCM 2012a). There is also a risk of ascending infection with multiple examinations, particularly once the membranes have ruptured, although Cahill and colleagues (2012) suggest the risk of maternal fever is not significantly increased by the number of VEs. While Lewin and colleagues (2005)

found women experience an average of three VEs during labour, some women will have far more than this: Shepherd and Cheyne (2013) found the number of VEs undertaken increased as the length of time in labour in hospital increased, with 52% of women undergoing three or more VEs during labour with the most common rationale given by midwives being that it was to assess labour progress.

Dixon and Foureur (2010) suggest VE is an intervention which disrupts the woman's concentration and interferes with the labour rhythm, particularly as the woman may be required to change her position. There is no research-based information on which to make a recommendation for the timing and frequency of VEs during labour (RCM 2012a). Hassan and colleagues (2012) caution that a VE should be done only when necessary and consideration should be given to the woman's feelings and experiences during a VE. However, NICE (2014) recommends it should be undertaken 4-hourly if there is concern about progress or in response to the woman's wishes. An abdominal palpation should be undertaken prior to the VE so the results of each can be correlated.

Indications

A VE may be undertaken prior to labour as part of an induction of labour procedure to insert a prostaglandin pessary or gel (Chapter 20) or to perform a membrane sweep (Chapter 32).

During labour, the midwife may undertake a VE to:

- confirm the onset of labour
- identify the presentation and position
- assess progress during labour
- perform an ARM
- apply an FSE
- exclude cord prolapse following spontaneous rupture of the membranes where there is an ill-fitting or high presenting part
- confirm the onset of the second stage of labour, especially with a breech presentation and multiple pregnancy.

Contraindications

The midwife should not undertake a VE when there is:

- no consent from the woman
- active bleeding
- placenta praevia
- suspected preterm labour
- pre-labour rupture of the membranes.

This can be a very distressing procedure for some women and it is important the procedure is discussed with the woman before the VE is undertaken. Her informed consent should be obtained and the VE not undertaken if the woman does not agree. The discussion should include the rationale for the procedure, what will happen, what is required of the woman and confirmation that the VE will be stopped at any point if requested by the woman. The ideal time for much of this discussion is before the onset of labour, but it should be repeated each time a VE is indicated. The discussion should also occur in a manner that allows the woman to ask questions and refuse the examination. Verbal and non-verbal communication should be continued during the procedure, not only to provide the woman with information about what is happening, but also so the midwife can recognise when the woman is experiencing discomfort or pain and requires the VE to end (Dixon & Foureur 2010).

INFORMATION GAINED FROM UNDERTAKING AN EXAMINATION PER VAGINAM

External genitalia

Prior to performing the VE the external genitalia should be observed for abnormalities such as varicosities, oedema, warts, signs of infection and scarring, particularly if indicative of previous perineal or labial trauma or female genital mutilation. NICE (2014) indicates a VE, catheterisation and application of an FSE may be very difficult in the presence of infibulated genital mutilation. If this circumstance is noted, a discussion should occur with the woman to inform her of the risks around delay in the second stage of labour, spontaneous 'perineal' trauma, the need for an anterior episiotomy and possibly defibulation in labour (NICE 2014), although this discussion should ideally take place during pregnancy.

If there is any discharge or bleeding from the vagina, the colour, consistency, amount and odour should be recorded. If the membranes have ruptured, amniotic fluid may be seen and the colour and odour should be noted. Clear liquor with a non-offensive odour is normal.

Vagina

The vagina should feel warm and moist, with soft distensible walls. A hot, dry vagina could be indicative of dehydration, infection or obstructed labour and a vagina that feels 'tense' may be associated with fear or previous scarring. The presence of varicosities, a cystocele or rectocele should be noted. A full rectum may be felt through the posterior vaginal wall, which may lead the midwife to suggest the use of suppositories or an enema.

Cervix

The cervix is assessed for position, consistency, effacement, dilatation and application to the presenting part. The cervix is usually in a central or posterior position, firm, non-effaced with the os closed (unripe) during pregnancy. However, during the latter weeks of pregnancy and early labour, the structure and position of the cervix alters as the cervix 'ripens', causing the

cervix to feel less rigid and adopt an anterior position. A soft and stretchy 'ripe' cervix is often associated with good dilatation of the os uteri, whereas a tight unyielding unripe cervix at term is more likely to be associated with prolonged labour. An unripe cervix requires three to four times more uterine effort than a ripe cervix (Burnhill et al 1962).

With the primigravid woman, effacement usually precedes dilatation, but they can occur simultaneously with the multigravid woman. Effacement is assessed by the length of the cervix and the degree to which it protrudes into the vagina. A non-effaced cervix feels long and tubular, with the os closed or partly dilated. The cervix thins out and becomes shorter with effacement, as the lower uterine segment 'takes it up' (Fig 30.2). A fully effaced cervix feels continuous with the lower uterine segment and does not protrude into the vagina.

In the primigravid woman, the os uteri is usually closed until labour begins, but with a multigravid woman the os may allow one or two fingers through before labour, commonly referred to as a 'multip's os'. With a breech presentation the fetal anus should not be mistaken for a closed cervix as the anus will be traumatised if fingers are inserted through it (Warwick et al 2013).

Dilatation of the os uteri, measured in centimetres, is assessed by inserting one or both fingers through the external os and parting the fingers to assess the diameter. In early labour, when the cervix is less than 2 cm dilated, usually only one finger can be inserted. It may be easier to feel around the remaining rim of the cervix towards the end of the first stage to estimate dilatation; for example, a rim of 1 cm equates to a dilatation of 9 cm, as there is 1 cm of cervix remaining. When feeling a rim of the cervix that is stretchy, it is important to assess dilatation without stretching; this may be easier to achieve by using fingertips on the edge of the cervix. Full dilatation occurs when the cervix can no longer be felt and is equal to 10 cm. This is the point at which the fetal head can pass through the cervix; although for the preterm fetus this may happen before full dilatation. If the presentation is breech, the foot and leg can protrude through the cervix before it is fully dilated (footling breech). Dilatation of the os uteri should occur progressively throughout the first stage of labour and is one factor in determining progress.

A cervix that is well applied to the presenting part is associated with good uterine activity (Blackburn 2013). The reverse may also be true, that a poorly applied cervix is associated with less efficient uterine activity and slower progress. For example, when the fetus is in an occipitoposterior position, the head is not pushed directly onto the cervix; rather, it is directed downwards and forwards against the back of the symphysis pubis, leading to a decrease in the effectiveness of uterine contractility, slower cervical dilatation and prolonged labour (Chamberlain 1993). The application of the cervix to the presenting part can be assessed by feeling between them.

The membranes

The membranes should be felt to determine if they are intact or ruptured. Intact membranes can be felt as a shiny surface over the presenting part but may be difficult to feel, especially in early labour or when the forewaters are shallow with the membranes tightly pressed against the presenting part. In this situation they may be mistaken for ruptured membranes. Bulging forewaters may be felt when the cervix is poorly applied to the presenting part as amniotic fluid is positioned between the membranes and the presenting part. During a contraction the pressure within the forewaters increases, causing the membranes to feel tense with a predisposition to rupturing spontaneously. This is more likely to occur if the presenting part is poorly applied (e.g. high or ill-fitting presenting part, malposition or malpresentation). Occasionally the membranes are

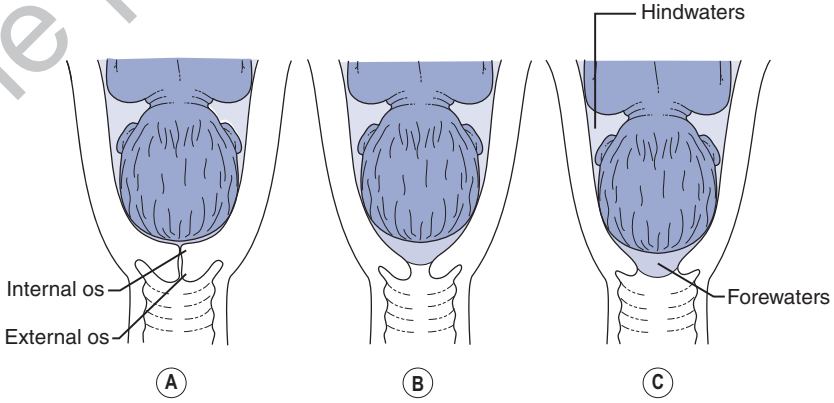


FIGURE 30.2 **Effacement of the cervix.**
Source: Johnson R, Taylor W: Skills for midwifery practice, 4th ed., Elsevier, London, 2016.

intact but amniotic fluid is leaking; this is most likely caused by a hindwater leak. Care should be taken not to rupture the membranes (unless there is an indication to do so and consent obtained), particularly if a pulsation is felt beneath the membranes, as this could be due to either a cord presentation or vasa praevia. Referral should be sought as an emergency caesarean section may be indicated to prevent cord prolapse or fetal haemorrhage from ruptured vasa praevia.

Presentation

The information gained from the abdominal examination is used in conjunction with the landmarks identified on the presenting part to confirm the presentation.

- A cephalic presentation will feel smooth, round and firm, and sutures or fontanelles may be felt, which can help confirm the position and the degree of flexion. Moulding can be assessed by the degree of overlapping of the bones of the vault. No moulding is when there is normal separation of the bones with open sutures; 1+ occurs when the bones are touching each other; 2+ occurs if the bones overlap but can be separated with gentle digital pressure; 3+ (severe moulding) occurs when the bones are overlapping and cannot be separated with gentle digital pressure. Caput succedaneum may also be felt as a soft or firm mass on the presenting part, which can make the identification of sutures and fontanelles more difficult.
- Both the breech and face presentation feel soft and irregular. With the breech presentation, the sacrum may be palpable as a hard bone, with the anus close by and the landmarks of the ischial tuberosities and sacrum located in a straight line. A finger inadvertently inserted into the anus will be gripped and no gum margins will be felt. Fresh meconium is also likely to be present.
- With a face presentation, the orbital ridges may be felt, a finger inserted into the mouth may be sucked and gum margins felt, the landmarks of the malar bones and mouth are located in a triangular position and an ear may be felt. If a face presentation is suspected or confirmed, care should be taken to avoid damaging the eyes; application of an FSE is not recommended and obstetric cream should not be used, as it could initiate a chemical conjunctivitis.
- When the cord presents, the pulsations may be palpated through the membranes; the membranes should not be ruptured due to the danger of cord prolapse. If a cord is felt without membranes, the emergency procedure for managing cord prolapse should be instigated while the examining midwife keeps her fingers in the vagina and attempts to push the presenting part off the cord.

Level of the presenting part

The level of the **presenting part** is determined by assessing the distance between the presenting part and the ischial spines in centimetres (Fig 30.3). The ischial spines are referred to as zero station, with the presenting part being above (−cm) or below (+cm) this. The ischial spines may be difficult to palpate; thus, this becomes a subjective measurement. The midwife should ensure it is the level of the presenting part being assessed and not caput succedaneum. Descent of the presenting part is one indicator of progress during labour and the assessment should correlate with the

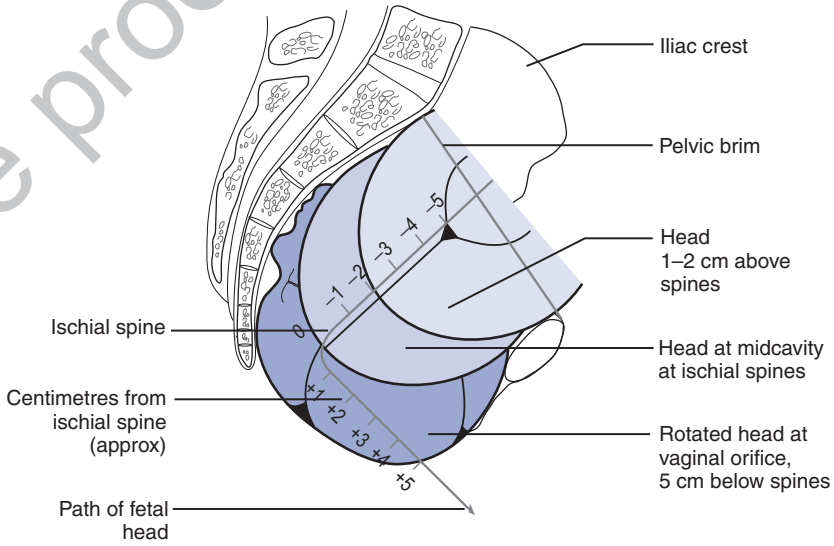


FIGURE 30.3 **Level of presenting part in relation to the ischial spines.**
Source: Johnson R, Taylor W: Skills for midwifery practice, 4th ed., Elsevier, London, 2016.

findings from the degree of engagement assessed during the abdominal examination.

Position

With a cephalic presentation, identification of sutures and fontanelles will confirm the position and attitude. The sagittal suture is easily identified as a long straight suture; its position is taken in relation to the maternal pelvis, moving from back to front.

- If it is in the anteroposterior diameter, it is indicative of a direct occipitoanterior or occipitoposterior position.
- A sagittal suture in the right oblique (felt moving from the posterior right quadrant of the maternal pelvis obliquely forwards to the left anterior quadrant) (Fig 30.4) is indicative of left occipitoanterior or right occipitoposterior position. If in the left oblique diameter, it is indicative of a right occipitoanterior or a left occipitoposterior position.
- Where the sagittal suture is in the transverse diameter, it is indicative of a right or a left occipitolateral/transverse position.
- A sagittal suture that does not run centrally through the pelvis but is located more to one side than the other may be indicative of asynclitism.

The posterior fontanelle is felt as a small triangular area with three sutures running from it and is indicative of a well-flexed cephalic presentation, usually occipitoanterior position if felt in the upper quadrant of the pelvis. As labour progresses the posterior fontanelle may close due to moulding and it may not be possible to feel three sutures if a caput succedaneum is present.

The anterior fontanelle is felt as a larger, diamond-shaped area, with four sutures running from it. However, if a caput succedaneum is present, it may not be possible to feel all four sutures. Palpation of the anterior fontanelle is usually associated with a deflexed head, often with an occipitoposterior position (where it will be felt in the upper quadrant of the pelvis). If felt centrally, it could be indicative of a brow presentation.

Progress is indicated where there is progressive flexion (or extension with a face presentation), descent and rotation. Comparing the position of the landmarks from all previous VEs should demonstrate this. Some midwives will draw what they felt and this will also reflect the changing attitude and rotation.

Pelvic outlet

The adequacy of the pelvis for the size of the baby can be assessed as part of the VE. However, this is a subjective assessment and the pelvis is a dynamic structure with measurements that can vary according to the position of the woman. The assessment of the size of the fetus may also be considered a 'best estimate'; even the use of ultrasound scans to assess weight gives a weight range. For the midwife undertaking the VE, usually two assessments of pelvic adequacy are undertaken which give an indication of whether the pelvic outlet is narrowed. The first is to assess the distance between the ischial spines. Ischial spines are difficult to palpate; if they are prominent and easily felt, the transverse diameter of the outlet is reduced, which could affect progress, particularly in the second stage of labour. The second assessment is of the subpubic angle and is assessed by moving the top

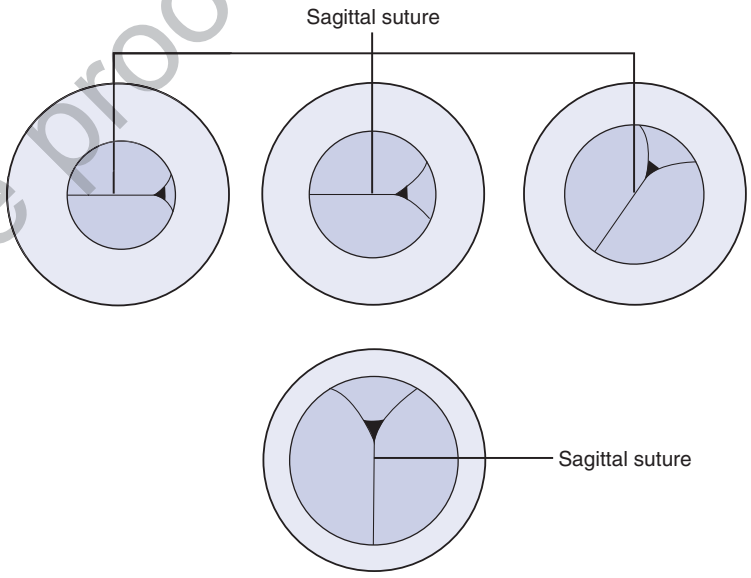


FIGURE 30.4 **Rotation of a cephalic presentation felt on examination per vaginam.**
Source: Johnson R, Taylor W: Skills for midwifery practice, 4th ed., Elsevier, London, 2016.

part of the two examining fingers towards the pubic arch. Two fingers should fit snugly under the pubic arch, indicating an angle of 90° or greater. A reduced subpubic angle is often found with prominent ischial spines and may be associated with an android pelvis. This can result in more pressure being placed on the perineum and perineal trauma, as well as delay in the second stage. Care should be taken when assessing the subpubic angle to avoid pressing on the clitoris, which can be painful.

A VE should be carried out using an aseptic non-touch technique (ANTT) with the wearing of sterile gloves providing the non-touch component. Sterile VE packs and lotions to wash the genital area are no longer used in labour wards as NICE (2014) advises tap water is sufficient for perineal cleansing where it is required. In support of this, Ohlsson and colleagues (2014) and Lumbiganon and colleagues (2014) found the use of chlorhexidine did not reduce the incidence of maternal and neonatal infection; the midwife should refer to the hospital policy for local requirements on perineal cleansing. The procedure for perineal cleansing follows this procedure. If an assistant is present, she can open packs and equipment for the midwife.

1. Confirm the woman's identity if she is not known to the midwife.
2. Discuss the procedure fully with the woman and gain informed consent.
3. Recognise and discuss religious and cultural considerations with the woman.
4. Ensure privacy.
5. Gather equipment:
   - apron
   - sterile gloves
   - lubricant (e.g. water-soluble lubricant, obstetric cream [the latter should not be used with a face presentation])
   - disposable sheet
   - alcohol-based hand rub
   - other equipment as necessary (e.g. amnihook, FSE)
   - Pinard stethoscope or Sonicaid.
6. Encourage the woman to empty her bladder if she is not catheterised.
7. Wash and dry hands.
8. Perform an abdominal palpation to determine the lie, presentation, position and degree of engagement, and auscultate the fetal heart.
9. Ask the woman to adopt an almost recumbent position (use a wedge to avoid aortocaval occlusion if necessary), with her knees flexed and parted, and ankles together (be aware of the difficulty experienced by women with pelvic girdle pain when opening their legs).
10. Place the disposable sheet beneath her buttocks.
11. Ask the woman to remove any sanitary towels or underwear, while keeping the genital area covered with a modesty sheet (assistance may be required, particularly in the case of epidural analgesia).
12. Wash and dry hands and apply an apron.
13. Open the equipment to be used, including the lubricating gel.
14. Apply alcohol-based hand rub, allow it to dry and then put on gloves.
15. Ask the woman to lift up the modesty sheet to allow access to the genital area.
16. Lubricate the first two fingers of the dominant hand with lubricant/antiseptic cream.
17. Advise the woman that she will feel her labia being touched and with the thumb and forefinger of the non-examining hand, part the labia, observing the condition of the vulva.
18. Assess for any fluid loss evident on the maternity pad, bedding or vaginal area.
19. Inform the woman of what is about to happen; then, if no contraction is present, gently insert the first two fingers of the examining hand into the vagina, in a downwards and backwards direction along the anterior vaginal wall, ensuring the thumb does not come into contact with the woman's clitoris or anus.
20. Locate the cervix and determine the position, tone, consistency, degree of effacement and dilatation and application to the presenting part (if the cervix is not located, ask the woman to place her clenched hands under her buttocks, tilting her pelvis upwards).
21. Gently move the fingers through the cervical os to ascertain the presence/absence of the forewaters, the presentation, position, degree of flexion and level of the presenting part, the presence of caput succedaneum and the degree of moulding.
22. If necessary and consent has been gained prior to the examination, rupture the membranes (see next section) and/or apply an FSE (p. 305).
23. Withdraw the fingers gently, assessing the pelvic outlet.
24. Auscultate the fetal heart.
25. Assist the woman into a comfortable position, reapply sanitary pad if required and discuss the findings.
26. Dispose of equipment appropriately, removing the gloves then apron.
27. Wash and dry hands.
28. Document the findings in the notes (also the partogram and or cardiotocograph [CTG] if being used) and act accordingly.

AMNIOTOMY (ARTIFICIAL RUPTURE OF MEMBRANES)

Intact membranes provide a cushion for the presenting part, providing protection from compression and infection. They also apply an even pressure on the cervix to assist with effacement of the cervix. Vincent (2005) suggests bulging membranes at the introitus help to prestretch the perineum prior to crowning.

Over two-thirds of women can reach full dilatation prior to the membranes rupturing spontaneously (Romano 2008); however, for many women this is not achieved, as the membranes have been ruptured artificially. While many midwives would not rupture the membranes without a clear clinical indication, **artificial rupture of membranes (ARM)** remains one of the most commonly performed procedures in both obstetric and midwifery practice (Smyth et al 2013).

A disposable sterile amnihook or an amnicot should be used for the procedure. The **amnihook** is a crochet-like, long-handled hook with a very sharp tip that is pressed against the chorion with the intention of tearing a hole in the membranes. The **amnicot** is a latex fingercot with a hook attached that is placed over the pulp of the middle or index finger of a gloved hand. The hook is used to gently scratch the membranes to rupture. The amniotic fluid can leak out through the hole increasing its size, or the membranes can be torn apart digitally.

ARM should not be undertaken with a labour that is progressing normally, as removing the cushion of the intact membranes means the presenting part will press directly onto the cervix. The RCM (2012d) argue that an ARM can have a negative impact on the woman by altering her ability to cope, and recommend using benign measures (e.g. positional changes) to increase the strength of contractions if progress is considered 'slow'. An ARM, 'breaking the waters', is not part of physiological labour and can disrupt the normal process of labour, often leading to other interventions (Andrees & Rankin 2007, Svardby et al 2007), such as continuous electronic fetal monitoring (CEFM). However, NICE (2014) is clear that ARM alone for suspected delay in labour is not an indication for CEFM. Prostaglandin PGE_2 is released by the amnion and cervix, while the chorion produces prostaglandin dehydrogenase (PDHG), an enzyme that prevents the cervix from ripening (Smyth et al 2013). It has been proposed that the part of the chorion in contact with the cervical os at term releases less PDHG, thus allowing PGE_2 to exert its effect. However, if an amniotomy is performed early in labour (< 3 cm) this effect is lost and labour may slow down (Smyth et al 2013). Olsen and colleagues (2010) caution that the risk of endometritis increases approximately 1.7-fold within 1 hour following amniotomy; thus it is important to monitor the woman for signs of this if an ARM is undertaken.

Amniotomy is often undertaken to 'speed up' labour by increasing the frequency of contractions, possibly by releasing prostaglandins and oxytocin. NICE (2014) concurs, advising an ARM shortens labour length by 1 hour, but the strength of contractions will intensify, increasing the degree of pain felt. However, Smyth and colleagues (2013) found no evidence indicating this was a significant outcome from performing an ARM.

The RCM (2012d) caution that fetal heart rate abnormalities can be seen after ARM, which can result in intervention with an increased risk of caesarean birth. The fetal heart should always be auscultated/recorded following an ARM. Dilbaz and colleagues (2006) suggest there is an increase in variable decelerations with early amniotomy. These changes may be a result of fetal haemodynamic changes. Fok and colleagues (2005) found there was a significant reduction in the impedance of the fetal middle cerebral artery (MCA) and renal artery, which they attribute to being a response to fetal stress and release of vasoactive substances following ARM. Amniotic fluid embolism (anaphylactoid syndrome of pregnancy) is a rare side-effect associated with ARM (Mato 2008).

Indications

- Induction of labour
- Augmentation of labour
- Application of FSE and/or assessment of liquor colour
- Maternal request
- Often prior to birth of second twin

Contraindications

- No maternal consent
- High presenting part (risk of cord prolapse)
- Preterm labour
- Known vaginal infection
- Maternal HIV-positive status
- Caution is taken with polyhydramnios or any malposition or malpresentation
- Placenta praevia
- Vasa praevia

If the presenting part is high and ballotable, it is unwise to perform an ARM. However, the obstetrician may choose to perform a controlled ARM and the midwife may be asked to apply light pressure to the fundus to encourage the presenting part to engage in the pelvis as the membranes rupture. The obstetrician ensures the fluid has drained and no cord has prolapsed before removing the hand. Cord prolapse does occur following ARM; Dilbaz and colleagues (2006) suggest this is more likely to occur if there is a malpresentation, multiparity, low birth weight, prematurity or polyhydramnios, but it may still be unexpected. Thus, it is important the midwife feels for the presence of cord following the ARM and takes appropriate steps if it is found.

Standard precautions should be followed and the sharpness of the amnihook or amnicot means the

midwife must take care to avoid personal injury and dispose of the hook into a sharps box. It is also important to confirm the membranes are intact, as trauma to the fetal scalp or anus (if a breech presentation) (Warwick et al 2013) can occur if the membranes have already ruptured and the amnihook or amnicot is scraping the fetal skin. This can be difficult to ascertain when the membranes are tight across the presenting part and no liquor is draining. It may be easier to rupture the membranes when a contraction is present and the membranes are bulging under the pressure; however, this is not an absolute necessity.

1. Discuss the indication with the woman and gain her informed consent.
2. Auscultate the fetal heart or review CTG if in progress.
3. Gather equipment:
   - equipment as for VE
   - amnihook or amnicot.
4. Undertake a VE as detailed in Skill 30.1, maintaining sterility of the amnihook or amnicot. With the examining hand, locate the cervix and ensure conditions are favourable for an ARM to be performed (e.g. descent of presenting part, no pulsation felt beneath the examining fingers).

For amnihook

   a. Holding the amnihook with the non-examining hand, slide it carefully between the examining hand and anterior vaginal wall with the point of the hook pointing downwards.
   b. Use the examining hand to guide the amnihook into position with the hook pressed against the membranes.
   c. Use the non-examining hand to twist the amnihook slightly to tear the membranes.
   d. Withdraw the amnihook gently while retaining the fingers in the cervix as the amniotic fluid drains out (ensuring the amniotic fluid does not come into contact with the midwife's clothing).
   e. The examining fingers can then locate the tear and digitally increase the size of the opening.

For amnicot

   a. Apply the amnicot over the middle or index finger.
   b. Ensure the hook is facing the palm.
   c. So that the hook remains in position during use, roll the amnicot up tight and pull it tightly over the finger for at least 1 cm.
   d. Complete rolling the amnicot firmly to the base of the finger. Define the presenting part and absence of contraindications by inserting one finger through the cervix.
   e. Without removing the hand from the vagina, remove the examining finger and insert the finger with the amnicot through the cervix.
   f. Gently scratch the membranes to rupture.
   g. Remove the amnicot from the finger.

5. Reassess the cervix, fetal descent and position, and feel for the presence of the umbilical cord.
6. If indicated, an FSE can be applied at this point (see below).
7. Withdraw the hand and auscultate the fetal heart.
8. Assist the woman with regard to hygiene, comfort and position.
9. Discuss the findings with the woman.
10. Dispose of equipment correctly and wash and dry hands.
11. Document the indications for ARM with the findings and act accordingly.

APPLICATION OF A FETAL SCALP ELECTRODE

A **fetal scalp electrode (FSE)** can be used when continuous CTG monitoring is indicated to ensure continuity of contact. Fetal cardiac electrical activity is detected through the FSE to a transducer, usually located on the woman's thigh. This is then attached to the electrocardiograph (ECG) port on the monitor. The sound of the fetal heart is continuous regardless of maternal or fetal position and movement, and is not accompanied or confused by sounds of fetal movement or uterine blood flow. Harper and colleagues (2013) found a decrease in caesarean section birth with FSE use which they attribute to an improved ability to monitor fetal heart tones compared with external monitoring. However, it is an invasive procedure for both the woman and the fetus; the electrode is secured under the fetal scalp, with either a clip or spiral connection. It is assumed that the fetus experiences some pain from its application and the transfer of viruses such as HIV and herpes simplex from mother to child is more likely (Baker 2007) (both are contraindications to FSE use). Skin infection or long-term scarring on the baby's scalp can also occur. Harper and colleagues (2013) did not find an increase in maternal infection with FSE use.

Needs and colleagues (1992) found clip electrodes performed better than other types with regard to attachment. The clip is applied by rotating the end of the electrode: anticlockwise rotation causes the clip to recede into the electrode head while clockwise rotation causes it to emerge from the electrode head and be caught on the scalp. It is usually spring-loaded and therefore rarely requires an active rotation clockwise

to apply the clip. The Copeland FSE is commonly used and is considered to reduce the risk of needlestick injury as it has a protecting penetrating needle; this also controls the depth of penetration, reducing the risk of fetal injury to the skull (Cutlan 2006). If using a spiral electrode, it is rotated in the direction of the spiral, usually clockwise, until caught under the scalp.

Accuracy of scalp electrodes depends on their correct application. If the membrane is between the electrode and the scalp the tracing is likely to be unreliable, sometimes known as 'artefact' and interpretation of the trace is impossible. The electrode should not be placed near or through a fontanelle or suture line, the cervix or vagina; it should be positioned on the skin folds of the scalp. It can be used on the buttocks of a breech presentation, but causes obvious scarring. It should not be used with a face presentation.

1. Discuss the indication with the woman and gain her consent.
2. Ensure that the monitor has an ECG facility and the correct leads and attachments.
3. Gather equipment:
   - equipment as for VE with amnihook or amnicot if membranes are intact
   - sterile FSE.
4. Perform a VE, as detailed in Skill 30.1.
5. Undertake an ARM (Skill 30.2) if membranes intact.
6. With the examining hand, locate the fetal scalp; ensure that sutures and fontanelles are avoided.
7. Slide the FSE (using the non-examining hand) between the examining hand and vaginal wall.
8. Use the examining hand to guide the electrode into place and support the head of the electrode against the scalp.
9. With the non-examining hand, turn the end of the electrode anticlockwise, then release to attach to the scalp, maintaining support of the electrode against the scalp.
10. The electrode should be attached to the scalp; a gentle pull will confirm whether it is attached.
11. An assistant may attach the leads to the transducer and the transducer to the monitor while the examining hand remains in place; if the electrode is not working, reapplication may be attempted.
12. Before withdrawing the examining hand, check that the electrode is securely placed over an appropriate area of the scalp.
13. Apply conductive gel to the transducer or the appropriate fastening and attach around the woman's thigh using a small belt or attach to the monitor on the woman's abdomen if appropriate (e.g. EZIplug 3 attaches to either the leg or the abdomen [Cutlan 2006]); ensure that monitoring is occurring satisfactorily.
14. Assist the woman with regard to hygiene, comfort and position.
15. Explain the differences in the fetal heart sounds heard.
16. Dispose of equipment correctly, wash and dry hands.
17. Document the indications for FSE with other aspects of the examination and act accordingly.

Removal of the FSE

It is important that the FSE is removed from the baby's scalp at or just before birth. This is particularly important to remember if the woman has an emergency caesarean section to avoid trauma to the fetal scalp as the baby is removed from the uterine cavity while the FSE is attached to the external monitor. It is imperative that the FSE is also removed from the woman's vagina to avoid it being retained within her body (Valenzuela 2006).

To remove the clip-style FSE, the electrode head is held against the scalp while the end is rotated anticlockwise. While an anticlockwise rotation can remove the spiral electrode, it is quicker to take hold of the two wires hanging from it and pull them apart; this will cause the clip to rotate and come loose from the scalp as the wires unravel. Care should be taken not to create any trauma while removing it. Any obvious puncture marks should be noted on the initial birth examination. The electrode should be disposed of in the sharps box.

Role and responsibilities of the midwife

These can be summarised as:

- encouraging and supporting the woman in the use of appropriate positions to enhance her comfort and labour progress
- undertaking a competent examination per vaginam in which all the information is gained without causing distress to the woman
- undertaking an amniotomy correctly, when indicated
- undertaking appropriate application of an FSE, when indicated
- recognising deviations from normal and instigating referral

- providing education, explanations and support to the woman
- undertaking appropriate record keeping.

SUMMARY

- Progress in labour is individual and can be assessed using a variety of indicators.
- Women should be encouraged and supported to change position during the first stage of labour and use those positions that are most comfortable, while avoiding the supine position.
- There is a need for more high-quality evidence regarding the advantages and disadvantages of the different positions used.
- An examination per vaginam is an invasive procedure, but one that can yield valuable information in relation to the assessment of progress in labour.
- Amniotomy should not be undertaken routinely in a labour that is progressing normally.
- Fetal scalp electrodes offer continuity of contact if continuous fetal monitoring is indicated.
- The risk of ascending infection is high; an aseptic non-touch technique should be used throughout.

Self-assessment exercises

The answers to the following questions may be found in the text.

1. How is progress assessed during the first stage of labour?
2. What advice can the midwife give to a woman regarding positioning during the first stage of labour?
3. For what reasons would the midwife undertake an examination per vaginam during labour?
4. What should be discussed with the woman to gain her informed consent regarding an examination per vaginam?
5. How would you perform an examination per vaginam?
6. How could the midwife identify a flexed cephalic presentation?
7. What information can be gained from an examination per vaginam and what is the significance of it?
8. Describe how to perform an amniotomy and apply a fetal scalp electrode.
9. What are the role and responsibilities of the midwife in relation to an examination per vaginam, artificial rupture of the membranes and application of a fetal scalp electrode?

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CHAPTER 44

POSTPARTUM HAEMORRHAGE

Learning outcomes

Having read this chapter, the reader should be able to:

- define postpartum haemorrhage
- discuss the risk factors for postpartum haemorrhage
- describe how blood loss is estimated
- list how uterotonics are used for postpartum haemorrhage management
- describe emergency management of post-partum haemorrhage
- summarise the role and responsibilities of the midwife.

Globally, **postpartum haemorrhage (PPH)** is the leading cause of maternal mortality, accounting for over one-quarter of maternal deaths (Say et al 2014), with one woman dying from PPH about every 4 minutes (Sebghati & Chandraharan 2017). In Australia, obstetric haemorrhage was responsible for 15 maternal deaths between 2009–2018, with one direct maternal death occurring in 2018 (Australian Institute of Health and Welfare [AIHW] 2020). In New Zealand there were four direct maternal deaths from obstetric haemorrhage between 2006–2018 (Perinatal & Maternal Mortality Review Committee 2021). Australian Indigenous women continue to have a higher incidence of adverse outcomes (AIHW 2021). Māori women also have a higher incidence of adverse outcomes (Health Quality & Safety Commission New Zealand [HQSC] 2021). New Zealand's Severe Acute Maternal Morbidity (SAMM) audit found delay or failure to recognise deterioration occurred with major PPH (HQSC 2017). New Zealand has developed a *National Consensus Guideline for the Treatment of Postpartum Haemorrhage* (Ministry of Health 2013). **Obstetric haemorrhage** relates to bleeding from the uterus, usually the placental site, and is used in reporting to distinguish mortality and morbidity from non-obstetric haemorrhage, such as intracerebral haemorrhage.

PPH is excessive blood loss from the genital tract after the infant is born and during the 6 weeks postpartum. The traditional definition of PPH is blood loss of 500 mL or more during the puerperium, with severe or major PPH defined as blood loss of 1000 mL or more (Royal Australian And New Zealand College of Obstetricians and Gynaecologists [RANZCOG] 2017a). In addition, major PPH can be classified into moderate if between 1001–2000 mL and severe if > 2000 mL (Dey & Weeks 2020). PPH definitions differ depending on the mode of birth, with loss of 500 mL or more after vaginal birth and loss of 1000 mL or more after caesarean section considered as a PPH. Further classification is related to timing of the haemorrhage, with primary PPH occurring within 24 hours of birth and secondary PPH occurring between 24 hours and 6 weeks postpartum (RANZCOG 2017a). The American College of Obstetricians and Gynecologists (ACOG 2017, p. 923) have updated their definition of maternal haemorrhage to: 'a cumulative blood loss of greater than or equal to 1000 mL or blood loss accompanied by signs or symptoms of hypovolaemia within 24 hours after the birth process'. Most definitions of PPH discuss the importance of recognising signs of haemodynamic instability (RANZCOG 2017b, Sebghati & Chandraharan 2017). It is essential that the response to PPH considers blood loss as a proportion of circulating blood volume in relation to a woman's body weight (Tuffnell & Knight 2020). Smaller women may tolerate less blood loss (see Table 44.1).

PPH can cause serious morbidity including multi-organ failure, multiple blood transfusions, damage

TABLE 44.1 ESTIMATED BLOOD VOLUMES AND BLOOD LOSS IN RELATION TO BODY WEIGHT

Weight	Total blood volume*	Moderate haemorrhage 15% blood volume loss	Severe haemorrhage 30% blood volume loss	Life-threatening haemorrhage 40% blood volume loss
50 kg	5000	750	1500	2000
60 kg	6000	900	1800	2400
70 kg	7000	1050	2100	2800
80 kg	8000	1200	2400	3200
90 kg	9000	1350	2700	3600
100 kg	10000	1500	3000	4000

*Based on 100 mL/kg blood volume in pregnancy; may over-estimate blood volume in obese women (Lemmens et al 2006).
Source: Lemmens HJ et al: Estimating blood volume in obese and morbidly obese patients, Obesity Surgery 16(6):773–776, 2006. Tuffnell D, Knight M on behalf of the MBRRACE-UK haemorrhage and AFE chapter-writing group: Chapter 7, Lessons for care of women with haemorrhage or amniotic fluid embolism. In Knight M, Bunch K, Tuffnell D, et al, eds, on behalf of MBRRACE-UK. Saving lives, improving mothers' care—lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2016–18, National Perinatal Epidemiology Unit, University of Oxford, Oxford, 2020, pp. 58–63.

to pelvic organs, hysterectomy, loss of fertility and psychological trauma (Sebghati & Chandraharan 2017). PPH can result in anaemia and fatigue, making it more difficult for mothers to care for their infant (AIHW 2016). Significant haemorrhage also increases the risk of venous thromboembolism (VTE) (Kennedy & McMurtry Baird 2017).

The national Australian incidence of PPH is between 5% and 15% of births (Keating et al 2018). However, the incidence of PPH appears to be increasing substantially in Australia and other developed countries (Flood et al 2018a, 2018b, Kearney et al 2018, Nathan 2019). Due to inconsistent definitions and reporting variations within Australia, it is difficult to provide current national estimates of PPH (Flood et al 2018a, 2018b). A study in Queensland using gravimetric assessment of blood loss found a 28.1% rate of PPH of > 500 mL in women who had a vaginal birth (Kearney et al 2018). A Victorian study found 21.8% of women experienced a primary PPH between 2009 and 2013 (Flood et al 2019). The lowest incidence of primary PPH occurred in women with an unassisted vaginal birth and the highest incidence in women with an unplanned caesarean section (Flood et al 2019). In 2020 in New Zealand, primary PPH ≥ 500 mL occurred in 39.1% of births and primary PPH of ≥ 1000 mL occurred in 12.2% of births (Auckland District Health Board 2020).

PHYSIOLOGY OF POSTPARTUM HAEMORRHAGE

Third stage

For the majority of women, the **third stage of labour** occurs with no adverse outcomes. However, vigilance is important as it is during the third stage that PPH is most likely to occur. The placental circulation is approximately 750 mL/min at term (RANZCOG 2017a); therefore, bleeding from the placental site can be profuse and rapid. Control of bleeding is achieved in three ways.

1. The middle oblique fibres of the uterus contract, constricting and kinking the blood vessels passing through them. Blood flow slows down and stops, allowing time for clot formation at the placental site.
2. The uterine walls become in apposition to each other, exerting pressure on the placental site.
3. The coagulation process begins to work at the placental site, within the sinuses and torn vessels. The damaged tissues release thrombokinase, which converts prothrombin to thrombin. Then thrombin combines with fibrinogen to form fibrin, which forms a clot by combining with platelets. Vitamin K, calcium and the other clotting factors are required for this process to happen efficiently.

RISK FACTORS FOR PPH

Identified risk factors

The majority of women who develop PPH have no identifiable risk factors (Dey & Weeks 2020). Identified risk factors include induction of labour, caesarean section, fetal macrosomia, retained placenta and prolonged third stage (Finlayson et al 2021). **Abnormally adherent placentation** is an increasing cause of PPH and reflects the increased incidence of caesarean section (Goh & Zalud 2016, Jauniaux et al 2019). Disorders of placental implantation (placenta praevia, placenta accreta spectrum) and velamentous cord insertion are mostly iatrogenic with > 90% occurring as a result of caesarean section and in vitro fertilisation (Jauniaux et al 2019). Risks factors for placenta accreta include

increased maternal age, previous caesarean section, placenta praevia and multiple birth (Farquhar et al 2017). The incidence of placenta praevia is now 1 in 200 pregnancies with approximately 4.1% of women with one previous caesarean section diagnosed antenatally (Jauniaux et al 2019). **Placenta accreta** spectrum occurs in approximately 1 in 533 pregnancies (Goh & Zalud 2016). **Placenta praevia** is a major risk factor with a 45.5% risk of PPH ≥ 1000 mL.

Active management of third stage is recommended for women with risk factors for PPH (RANZCOG 2017a). The **four Ts**—tone, trauma, tissue and thrombin—are commonly cited as the underlying reasons for PPH. **Uterine atony** is the cause of over 60% (Nyfløt et al 2017) to 90% of PPH (Say et al 2014), making atony the most common cause (Dey & Weeks 2020). It is important to note in the case of uterine atony the extent of blood loss may not be visible because the dilated uterus has poor tone and can conceal a significant amount of blood (Belfort 2021). The following is a list of risk factors (adapted from RANZCOG 2017a).

Tone

- Prolonged labour, particularly second stage
- Prolonged third stage
- Induction of labour
- Anaemia and high parity
- Oxytocin withdrawal
- Uterine over-distention: multiple pregnancy, polyhydramnios, macrosomia
- Obesity (body mass index [BMI] > 35)
- Previous PPH
- Asian ethnicity
- Age (> 40 years, nulliparous)
- Medications promoting atonia, such as magnesium sulfate

Trauma

- Elective or emergency caesarean section
- Uterine rupture
- Cervical, vaginal or perineal tear
- Episiotomy
- Instrumental birth
- Large for gestational age (LGA) baby

Tissue

- Retained products of conception: placenta, membranes
- Placenta praevia, placenta accreta
- Uterine inversion

Thrombin

- Bleeding disorders such as von Willebrand's disease
- Thrombocytopenia
- Disseminated intravascular coagulation (DIC)
- Severe pre-eclampsia, sepsis, fetal death in utero (FDIU), amniotic fluid embolism
- Unsuspected or proven placental abruption
- Pyrexia in labour
- Massive PPH from any cause results in coagulopathy.

Unclassified

- Anaemia (< 9 g/dL) will exacerbate the response to haemorrhage

RISK FACTORS FOR SEVERE PPH

A PPH > 1500 mL occurred in 1.4% of births in a Victorian study; the risk factors for PPH > 1500 mL identified by Davey and colleagues (2020) included:

- multiple pregnancy
- older maternal age
- overweight/obesity
- first births
- placental complications
- macrosomia
- instrumental vaginal birth
- third- and fourth-degree perineal laceration
- in-labour caesarean section
- birth outside 37–41 weeks gestation
- 12- to 24-hour labour
- use of oxytocin infusion in labour.

In this study PPH > 1500 mL occurred in 0.7% of women with no identified risk factors (Davey et al 2020). A cohort-based study found women with a previous caesarean section, women with an induced or augmented labour, and women who gave birth to a baby with a birth weight > 4000 g had increased risk of severe PPH (Graugaard & Maimburg 2021).

RISK MITIGATION STRATEGIES

Caesarean section increases the risk of PPH; therefore, avoiding unnecessary caesarean sections has the potential to decrease the incidence of PPH (Hofmeyr & Qureshi 2016). Uterine hyperstimulation following induction of labour has occurred in women who died from PPH. During labour induction or augmentation, attention must be given to avoidance of uterine hyperstimulation and uterine tachysystole (Knight et al 2014). Oxytocin for induction of labour should be used for the shortest time and at the lowest effective dose as the risk of severe PPH is increased with longer duration of oxytocin infusion, possibly due to desensitisation of oxytocin receptors (Page et al 2017). Examination of the rates of PPH in women with an induction who had cessation of intravenous oxytocin at 15, 30 or 60 minutes after birth found no statistically significant differences (Lewis et al 2020). The risk of PPH in Australia is increased with induction or augmentation of labour, possibly due to uterine desensitisation and downregulation of oxytocin receptors (Springhall et al 2017). The rate of PPH was 34% in women who were augmented, 26% for women who were induced

and 19.3% for women who had a spontaneous birth (Springhall et al 2017). In contrast, an Australian study using retrospective data found nulliparity, induction of labour and augmentation were not associated with PPH (Kearney et al 2018). This study found high neonatal body weight, perineal injury, labour complications and the baby being separated from their mother during the first hour following birth were factors associated with PPH (Kearney et al 2018). Induction or augmentation of labour should not occur without women being fully informed about their options and the risks and benefits of these interventions. The International Confederation of Midwives (ICM) statement related to caring for women during the COVID-19 pandemic indicates routine interventions such as induction of labour increase the risk of complications, length of hospital stay and possible exposure to COVID-19 (ICM 2020).

Significant risk factors, such as previous PPH and placenta accreta, should be flagged in the woman's health record. Women with abnormal placentation, such as placenta accreta or **placenta percreta**, require multidisciplinary planning including blood group, antibody testing and cross-match, availability of blood products and care by staff with resuscitation and intensive care skills. Maternal haemoglobin screening for anaemia and correction of iron-deficiency anaemia improves women's tolerance to blood loss; therefore, haemoglobin should be optimised during pregnancy. Women with blood disorders require specialist care and a birth plan regarding appropriate care during labour, birth and the postpartum period to provide a guide for all staff. Women may benefit from prophylactic intravenous (IV) access as it may be difficult to cannulate in the setting of haemorrhage and hypovolaemia.

Every facility benefits from a PPH protocol and a PPH kit containing appropriate rapidly accessible resources (Belfort 2021). Interdisciplinary high-quality simulation exercises help staff be well prepared and identify any gaps in protocol, staff, equipment and knowledge (Davis 2018). Checklists can be utilised effectively in the emergency management of PPH and assist with communication, coordination and ensuring critical tasks are completed (Elmezzi & Deering 2019).

Women who are Jehovah's Witnesses should discuss their preferences and acceptance of blood derivatives (such as cryoprecipitate), techniques (such as intraoperative cell salvage) and the use of erythropoiesis-stimulating agents and pharmacological drugs (such as tranexamic acid and intravenous iron transfusion). If a woman has declined blood products, this should be documented in her health record.

MANAGEMENT OF THIRD STAGE

Active management of third stage with uterotonics and controlled cord traction (CCT) is recommended to prevent PPH (RANZCOG 2017a, World Health Organization [WHO] 2012). According to RANZCOG (2017a), the risk of PPH is reduced by approximately 50% with use of prophylactic oxytocin. For vaginal birth, oxytocin 10 international units (IU) is given intramuscularly (IM). For caesarean section births, oxytocin 5 IU is given IV over 1 to 2 minutes. Variations in local protocols may occur and these should be followed. Active management includes CCT and is performed by a trained midwife or obstetrician following administration of uterotonics (see Chapter 43). If excessive bleeding occurs with a physiological third stage, uterotonics are recommended. Interestingly, data from the National Women's Health Annual Report (Auckland District Health Board 2020) shows women who had a physiological third stage following a vaginal birth were less likely to have a PPH or to require blood transfusion postpartum. Delayed cord clamping (DCC) does not increase the risk of PPH and is recommended.

UTEROTONIC DRUGS

Uterotonic drugs are used prophylactically for women at increased risk for PPH and during a PPH to stimulate the uterus to contract. They primarily consist of oxytocin (Syntocinon), and ergometrine, or a combination of the two (Syntometrine). A list of the various uterotonic drugs is presented in Table 44.2.

Oxytocin

Oxytocin is a cyclic 9-aminoacid peptide secreted by the posterior lobe of the pituitary gland. It is released into the systemic circulation during labour and breastfeeding. Syntocinon is the synthetic form of oxytocin. Oxytocin binds with oxytocin receptors within the uterus, triggering calcium release from intracellular stores, which leads to rhythmic contraction of smooth muscle, primarily of the upper segment of the uterus, mimicking the body's own actions. Oxytocin also has a weak antidiuretic activity and water intoxication can occur with repeated administration in large volumes of electrolyte-free solutions (Therapeutic Goods Administration [TGA] 2020a).

Oxytocin appears to be the most effective first-line treatment of PPH (Parry Smith et al 2020). The usual dose of Syntocinon is 5 or 10 IU. When administered intravenously (IV), oxytocin takes effect within 60 seconds; with IM use, it takes around 2–4 minutes to take effect, with the response lasting 30–60 minutes (TGA 2020a). Infusions containing Syntocinon are diluted in an isotonic electrolyte solution (e.g. 0.9% normal saline). IV infusions containing Syntocinon must be administered using a mechanical infusion pump.

Side effects

Syntocinon has a direct relaxing effect on vascular smooth muscle. A rapid IV bolus injection of oxytocin can cause acute short-lasting hypotension accompanied with flushing, reflex tachycardia and electrocardiograph

TABLE 44.2 UTEROTONICS FOR PREVENTION AND TREATMENT OF PRIMARY PPH

Drug	Dose and route	Side effects	Contraindications
Syntocinon (synthetic oxytocin)	Before birth of placenta: 5 IU slow IV injection (1–2 minutes) OR 5–10 IU by IM injection	Nausea, vomiting Water intoxication Transient vasodilation with undiluted IV doses	Hypersensitivity to oxytocin
	After completion of third stage 40 IU Syntocinon in 1 L warmed Hartmann's or normal saline solution over 4 hours		Do not give IV Syntocinon in a 5% dextrose solution
Syntometrine (ergometrine maleate 500 microgram/mL)	IM Syntometrine 1 mL after birth of placenta or to treat PPH Repeat after more than 2 hours Total dose should not be > 3 mL in 24 hours	Nausea, vomiting, uterine hypertonicity, abdominal pain, headache, dizziness, skin rashes, hypertension, bradycardia, cardiac arrhythmia, chest pain Anaphylactic reaction	Possible retained placenta Hypertension, eclampsia, pre-eclampsia, diastolic bp > 90 mmHg Severe or persistent sepsis Impaired hepatic or renal function
Ergometrine maleate (500 microgram/mL)	Ergometrine 250 microgram IMI OR 250 microgram IV over 1 minute or diluted to 5 mL with normal saline 0.9%	Nausea, vomiting, abdominal pain, headache dizziness, rash, peripheral vasoconstriction, hypertension, cardiac arrhythmias, chest pain, anaphylactic reaction	Must not be added to IV fluids containing any other medications
15-methyl-PGF2α (Carboprost 250 microgram/mL): Only available in Australia using the Special Access Scheme	IM injection of 250 microgram (0.25 mg) repeated at 15-minute intervals to a maximum cumulative dose of 2.0 mg **Must not be given IV**	Pulmonary hypertension, bronchospasm, pulmonary oedema, acute hypertension, usually transient, abdominal cramps, diarrhoea and vomiting	Cardiac and pulmonary disease, pulmonary hypertension, reactive airway disease, history of asthma
Tranexamic acid (100 mg/mL)	1 g IV over 10 minutes. Rapid injection can cause dizziness and/or hypertension hypersensitivity	Nausea, vomiting, dizziness, anxiety, blurred vision, chest pain, confusion, cough, tachycardia	History of thrombosis, active deep vein thrombosis (DVT), acquired defective colour vision, hypersensitivity

Sources: NSW Government: Postpartum haemorrhage (PPH), NSW Health guideline summary, July 2021. Online 5 September 2021. Available: www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2021_010.pdf; Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG): Management of post-partum haemorrhage (PPH), 2017a. Online 6 September 2021. Available: www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical-Obstetrics/Management-of-Postpartum-Haemorrhage-(C-Obs-43)-Review-July-2017.pdf?ext=.pdf; Therapeutic Goods Administration (TGA): Cytotec® (misoprostol). Australian product information, 2019b. Online 6 September 2021. Available: www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2010-PI-05416-3; Therapeutic Goods Administration (TGA): DBL™ ergometrine injection (ergometrine maleate). Australian product information, 2020b. Online 6 September 2021. Available: www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2018-PI-01920-1; Therapeutic Goods Administration (TGA): Syntocinon® (oxytocin injection). Australian product information, 2020a. Online 6 September 2021. Available: www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2018-PI-02394-1; Therapeutic Goods Administration (TGA): Syntometrine® (oxytocin/ergometrine maleate). Full product information, 2019a. Online 6 September 2018. Available: www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2014-PI-02336-1; Therapeutic Goods Administration (TGA): Tranexamic-AFT (tranexamic acid). Australian product information, 2019c. Online 6 September 2018. Available: www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2015-PI-02748-1.

changes. These rapid haemodynamic changes may result in myocardial ischaemia, particularly in women with preexisting cardiovascular disease. Therefore, Syntocinon is used with caution for women with cardiovascular conditions and long QT syndrome (TGA 2020a). Common side effects include headache, tachycardia, bradycardia, nausea and vomiting (TGA 2020a). The plasma half-life of Syntocinon ranges from 3 to 20 minutes.

Syntocinon is usually stored at temperatures of 2–8°C. However, where this is not possible it can be stored at 30°C for 3 months.

Ergometrine

Ergometrine is an amine ergot alkaloid that stimulates contraction of uterine and vascular smooth muscle, as well as the cervix. Ergometrine causes sustained tonic uterine contractions of both the upper and lower uterine

prevent and manage PPH. The midwife must act on vital signs outside the normal parameters using the **Modified Early Obstetric Warning System (MEOWS)** or the early warning system in use locally. The effect of blood loss is cumulative and calculation of ongoing blood loss is necessary. Women who died from haemorrhage in the United Kingdom did not have ongoing blood loss calculated and staff relied on a single point-of-care haemoglobin test, which gave false reassurance (Knight & Paterson-Brown 2017). Transfusion is recommended with a haemoglobin level of 70–80 g/L; however, haemoconcentration in the early stages of PPH means results should be interpreted with caution (Collis & Guasch 2017). The majority of women with life-threatening PPH had tachycardia and agitation, but were not hypotensive until they were seriously compromised. Of note, hypotension is a very late sign of haemorrhage (Tuffnell & Knight 2020). Tachycardia is often the first sign of reduced blood volume.

Midwives must be aware of the signs of PPH, which may include:

- increase in visible blood loss (blood loss may be concealed)
- tachycardia with heart rate ≥ 110 beats per minute
- downward blood pressure trend (> 15% drop)
- hypotension and/or collapse
- pallor
- agitation/restlessness
- drowsiness, altered level of consciousness
- poor uterine tone
- oliguria
- oxygen saturation less than 95%.

PRIMARY POSTPARTUM HAEMORRHAGE

Primary PPH is an acute emergency with the potential for serious consequences. Emergency management is required and the situation may deteriorate rapidly. Significant blood loss must be detected early before irreversible collapse and coagulopathy occur (Dilby 2018). Midwives must recognise and take action when abnormal blood loss is suspected in order to prevent serious consequences. Midwifery, medical and ancillary staffing needs to be adequate for monitoring women carefully and for emergencies such as PPH. Table 44.3 lists some of the signs and symptoms of shock in primary PPH.

Prompt action is required to avoid cardiovascular collapse; women may not exhibit cardiovascular signs of shock until they have lost 30–50% of their circulating blood volume (Collis & Guasch 2017). Prior haemoglobin and the size of the woman should be considered when assessing PPH as blood volume is approximately 100 mL/kg at term; therefore, a 70 kg woman would have a blood volume of around 7000 mL while a 50 kg woman's blood volume would be around 5000 mL (RANZCOG 2017a).

The goals of PPH treatment defined by Belfort (2021) are to:

- restore/maintain adequate circulatory volume to prevent organ hypoperfusion
- restore/maintain adequate tissue oxygenation
- reverse/prevent coagulopathy
- eliminate cause of PPH.

Obstetric management of PPH may include bimanual compression of the uterus (Hofmeyr et al 2016); uterine balloon tamponade; thromboelastography; tranexamic acid (Dilby 2018); haemostatic compression sutures (e.g. B-Lynch suture); and artery occlusion and aortic compression (Dey & Weeks 2020). Thromboelastography tests clotting factors and fibrinogen concentrations to determine if plasma transfusion is indicated (Collis & Guasch 2017). Early thromboelastography provides rapid results in the context of PPH and can analyse clotting time, clot firmness, rate of clot growth and lysis, as well as platelet count, activated partial thromboplastin

TABLE 44.3 SIGNS AND SYMPTOMS OF SHOCK IN PRIMARY PPH

Blood loss	Blood pressure (systolic)	Signs and symptoms	Degree of shock
500–1000 mL (10–15% of blood volume)	Normal	Palpitations, dizziness, tachycardia	Compensation
1000–1500 mL (15–25% of blood volume)	Sight decrease (80–90 mmHg)	Mild anxiety, weakness, sweating, tachycardia	Mild
1500–2000 mL (25–35% of total blood volume)	Marked decrease (70–80 mmHg)	Restlessness, anxiety, confusion, pallor, oliguria	Moderate
2000–3000 mL (35–45% of total blood volume)	Profound decrease (50–70 mmHg)	Confusion, lethargy, collapse, air hunger, anuria	Severe

Source: Adapted from National Blood Authority: Patient Blood Management Guidelines Module 1: Table 3.1, Canberra, 2011. Online 17 April 2021. Available: www.blood.gov.au/pbm-module-1; NSW Government: Postpartum haemorrhage (PPH), NSW Health guideline summary, July 2021. Online 5 September 2021. Available: www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2021_010.pdf.

time, prothrombin time, fibrinogen, antithrombin and D-dimer (Karlsson et al 2014). Laboratory testing should also include potassium and calcium levels (Dilby 2018).

Responding to a PPH requires a multidisciplinary team to work together efficiently (Collis & Guasch 2017, RANZCOG 2017a) and to communicate effectively (Cooper et al 2019). Four Rs have been described by ACOG (2017) as necessary for the management of PPH; the final step involves systems-based quality improvement:

- Readiness
- Recognition
- Response
- Reporting.

Note that the steps may not be carried out in the order below as context may vary and evidence-based management changes rapidly. This skill is a guide and local algorithms/flowcharts should be followed.

1. Call for help; activate a call for the medical emergency team (obstetrician, anaesthetist, registrar, midwives, haematologist, resuscitation team, radiologist may be required).
2. Assess airway and breathing and administer high-flow oxygen (10–15 L/min), regardless of oxygen saturation.
3. Commence resuscitation, if indicated.
4. Insert wide-bore IV cannula; two IV cannulas are optimal.
5. Send blood for a full blood count, coagulation profile, crossmatch (if not done), chemistry profile, blood gas. (Do not wait for results before treating.)
6. Commence rapid infusion of fluids (preferably warmed).
7. Restore oxygen-carrying capacity by transfusing group-specific blood or O Rh(D)-negative blood; commence with two units of red blood cells.
8. Monitor vital signs, including pulse, oxygen saturation and blood pressure (every 5–10 minutes). Monitor temperature and respiratory rate.
9. Continue to evaluate bleeding and level of consciousness/shock.
10. Allocate a team member to record vital signs, fluids, drugs and events.
11. Allocate someone to care for the neonate, partner and family.
12. Call an anaesthetist if the woman's airway is compromised.
13. Urgently order blood and fresh frozen plasma—initiate massive transfusion protocol, if indicated.
14. Keep the woman warm and in a flat position; avoid hypothermia.
15. Insert an indwelling catheter (IDC) if one is not already in place and monitor urine output.
16. Identify the cause of bleeding.
17. Treat uterine atony with uterine massage and expel uterine clots (treat all PPH as atony until proven otherwise).
    - Commence uterotonic medication in steps following local protocol; usually 5 IU oxytocin (Syntocinon) by slow IV bolus or IM injection.
    - Commence 40 units of oxytocin as an IV infusion in 500 mL or 1000 mL over 4 hours.
    - Ergometrine 250 micrograms can be given IV or by IM injection. If IV, it must be given by slow IV bolus (over at least 1 minute), or diluted to a volume of 5 mL with sodium chloride injection 0.9%.
    - Misoprostol (800–1000 micrograms) can be given per rectum,
    - Prostaglandin and prostaglandin analogues may be given (contraindicated if the patient has a history of asthma).
    - IM injection of 15-methyl-$PGF_{2}\alpha$ (Carboprost): IM injection of 250 micrograms repeated at 15-minute intervals to a maximum cumulative dose of 2 mg (eight doses) (or 500 micrograms intramyometrial).
    - Tranexamic acid 1 g IV is given over 10 minutes; early administration is preferred.
18. Retained placenta or retained products of conception: proceed to theatre for manual removal/evacuation of uterus.
19. Assess for uterine rupture or inversion, haematoma, amniotic fluid embolism.
20. Evaluate for vaginal or cervical tears and uterine rupture.
21. Repair genital tract injury.
22. Conduct point-of-care testing for platelets and clotting factors, if available.
23. Carry out emergency measures such as: bimanual compression of the uterus; uterine tamponade (e.g. Bakri balloon); haemostatic suturing (e.g. B-Lynch suture); bilateral ligation of uterine arteries or internal iliac arteries; selective arterial embolisation; and hysterectomy may be considered.
24. Continue monitoring for the next 24–48 hours.
25. Transfer to intensive care, high dependency or tertiary unit as required.
26. Postpartum VTE prophylaxis and treatment of anaemia may be required.

A PPH is a traumatic experience for a woman, her partner and family, and the health practitioners involved in her care. An opportunity to evaluate, review, discuss and debrief should be made available.

SECONDARY POSTPARTUM HAEMORRHAGE

Secondary PPH is associated with endometritis and/or retained products of conception. Conservative management with antibiotics and sometimes uterotonics is generally successful; if excessive bleeding is present, surgical evacuation of retained products may be considered (RANZCOG 2017a).

Role and responsibilities of the midwife

These can be summarised as:

- early recognition of risk factors
- assessment and recognition of PPH
- regular training and simulation to maintain skill and competence
- estimation and monitoring of blood loss
- assessment of vital signs and clinical deterioration
- competence in emergency management of PPH
- assessment of vital signs and clinical deterioration
- correct documentation.

SUMMARY

- PPH can result in severe morbidity and mortality.
- Estimation of blood loss is important and is often underestimated.
- Competent emergency management of primary PPH is essential.
- Morbidity and mortality are decreased by a timely and coordinated team response.

Self-assessment exercises

The answers to the following questions may be found in the text.

1. Discuss the signs and symptoms of PPH.
2. Describe the major risk factors for PPH.
3. Discuss the types of uterotonics available and their use.
4. Explain why the rate of PPH is increasing.
5. How is primary PPH managed?
6. Summarise the role and responsibilities of the midwife when she recognises a PPH.

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