1.1 Introduction
In order to optimize a patient for any gynaecological procedure, a plan for preoperative and postoperative care must be put in place. This ensures that an individualized approach is implemented in which patients are appropriately counselled prior to surgery regarding their specific risks; all medical issues are taken into account; and the surgery is carried out safely with all team members being aware of and able to plan for anticipated issues. In terms of postoperative management, a detailed plan with consideration of pain relief, fluid balance, mobilization and thromboprophylaxis will reduce perioperative morbidity and identify and treat any potential complications. Consideration of all the above factors is necessary to achieve a successful procedure for the patient, safe and timely discharge from the hospital and good patient satisfaction [1].

1.2 Preoperative Care

1.2.1 Patient Education and Consent

For any surgical procedure, careful patient selection is crucial. A well-informed patient who has had detailed counselling regarding the procedure itself, indications for the procedure, the implications of not undergoing the procedure, any alternative treatments and the risks and benefits of the procedure will have more realistic expectations of the outcome and recovery. In terms of patient education, often written information in the form of leaflets/diagrams can aid in explanation of complex procedures, and clinicians must involve authorized medical interpreters where necessary. Some patients find it helpful to contact patient support groups where they have the opportunity to meet patients who have had similar procedures for their condition and to take account of their experience.

The process of obtaining valid consent is one in which the professional provides adequate and accurate information concerning a procedure to a patient, which allows them to reach a considered decision [2]. Ensuring the patient has the capacity to consent to the procedure is the first step and requires a patient to be considered competent to consent, to understand the information given and to be able to communicate their decision. It is also advisable that the patient has enough time between the process of consent and the procedure itself to reconsider their decision, clarify any uncertainties and have the chance to discuss these with their surgeon. In particular, it is considered good practice to also discuss the potential for unexpected findings and what might be done intraoperatively if these are encountered. For hysterectomy, the discussion regarding total or subtotal procedure and the need for unanticipated oophorectomy in the event of bleeding or finding of abnormalities should be discussed well in advance. In addition, should there be mild endometriosis or adhesions seen at laparoscopy, it would be sensible to treat these at the time of a diagnostic procedure as long as this is explained to the patient beforehand and the conversation documented in the notes.

1.2.2 Clinical History and Examination

In modern gynaecological practice, it is not uncommon for the patient to undergo a procedure that is carried out by a surgeon who did not initially list the patient for surgery. This makes it particularly important that the clinical history is reviewed and a clinical examination is performed prior to surgery by the operating surgeon.

Details of previous surgery, reaction to anaesthetics as well as general medical history will have an impact on the planning of surgery. In addition, clarifying the indication for the surgery and reviewing information regarding symptoms as well as a thorough obstetric review will also inform the decision for surgery on the day. Details of menstrual history (cycle length, duration, menstrual flow, dysmenorrhoea, intermenstrual bleeding, postcoital bleeding) or postmenopausal symptoms including bleeding, vasomotor symptoms and hormone replacement are necessary. For those of childbearing age it is important to discuss contraception, any previous fertility treatment, pelvic infection history and fertility wishes, as this will need to be considered in light of surgical findings.

In terms of the physical examination, although the patient requires a full assessment of general wellbeing, a thorough examination of the abdomen and pelvis will inform the surgical procedure. In modern gynaecological practice, it is not uncommon for the patient to undergo a procedure that is carried out by a surgeon who did not initially list the patient for surgery. This makes it particularly important that the clinical history is reviewed and a clinical examination is performed prior to surgery by the operating surgeon.

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1.2.3 Investigations
Preoperative investigations for surgery will be necessary, depending on the nature of the procedure and the age and medical condition of the patient.

In general, determination of blood group with presence or absence of atypical antibodies, as well as a recent full blood count should be available. This will allow correction of anaemia prior to surgery if needed, including iron supplementation, treatment...
of abnormal uterine bleeding and/or blood transfusion. In addition, for patients with relevant medical history or those with advanced age, baseline renal function, liver function and thyroid status should be considered. In diabetics, an assessment of recent diabetic control with HbA1c measurement may impact suitability for surgery.

Results of imaging studies should also be available for review by the operating surgeon, as this may inform the route and nature of the surgery. On the day of surgery, it is important that a pregnancy test is carried out in all women of childbearing age to ensure they are not pregnant prior to proceeding with surgery.

1.2.4 Risk Assessment

Preoperative risk assessment is a combined process between surgical and anaesthetic teams. For assessment of anaesthetic risk, this is based on the evaluation of physical status as created by the American Society of Anesthesiology (ASA), which determines whether a patient is fit for surgery based on ASA groups I–VI, with increasing severity of systemic disease.

With an increase in the number of obese patients being operated on, it has become increasingly important to consider the impact of obesity on surgery. An operation in the obese population comes with added risks in the form of airway implications and tolerance of anaesthetic, but additionally theatre staff will need to consider the potential requirement for modified equipment. This includes consideration of specialist hoists for transfer of patients, theatre tables that are able to handle additional loads and also manual handling considerations for the safety of theatre staff. It may also be necessary to have specialized instruments for the surgery itself in the form of retractors or trocars designed for patients with a high BMI.

1.2.5 Medication Management

A number of medications may have perioperative effects and it is therefore important for a number of measures to be considered prior to surgery. A complete medication history should be obtained and verified by the patient to ensure accuracy of drugs being taken and their dose/frequency. As part of this history, clinicians should also pay attention to any over-the-counter, herbal or illicit drug use [3].

The patient may be taking medications that would be associated with worsening of their health should they be stopped abruptly. Therefore, it may be necessary to taper these medications or continue them during the perioperative process, while also bearing in mind that the metabolism of these medications may be altered by surgery or by interactions of other medications given during and after the procedure.

Specific considerations should be made for patients receiving anticoagulant treatment as the balance between the increased thromboembolic risk of discontinuing medication and the increased risk of bleeding by continuing should be addressed as part of surgical planning. In these cases, seeking the advice of the patient’s haematology team and joint discussion between anaesthetist and surgeons will be beneficial in optimizing the plan for anticoagulation. The indication for anticoagulation and a patient’s individualized risk for having a thromboembolic event, as well as the individualized risk of bleeding depending on the nature of the surgery, should be kept in mind. In some cases, if an anticoagulant is withheld, the timing of this will depend on the specific agent used.

Bridging anticoagulation involves the use of a short-acting anticoagulant (most often a low molecular weight heparin (LMWH)) while a longer-acting agent (such as warfarin) is discontinued in order to reduce the risk of perioperative bleeding [4]. The use of this method should be discussed with a haematologist, and a detailed postoperative plan of restarting the anticoagulant treatment should be put in place. Most hospitals will have a well-defined protocol for perioperative anticoagulation.

1.2.6 Antibiotic Prophylaxis

Surgical site infection (SSI) is one of the most common healthcare-associated infections resulting in significant morbidity and mortality.

Studies have shown that the administration of prophylactic antibiotics after wound closure does not reduce infection rates further and can result in harm. Perioperative antibiotics are most effective when given ≤30 min before skin is incised and specific recommendations exist with respect to gynaecological procedures [5].

Certain patient groups may have additional risk factors that might predispose them to SSI and therefore require additional consideration for antibiotic treatment. These comprise patient factors and operative factors (Table 1.1).

Administration of antibiotics also increases the prevalence of antibiotic-resistant bacteria and predisposes the patient to infection with organisms such as Clostridium difficile, a cause of antibiotic-associated colitis. This risk increases with the duration that antibiotics are given for and is higher in the elderly, immunosuppressed and patients who have a prolonged hospital stay or those who have had gastrointestinal surgery.

Various local treatment policies exist specific to gynaecological surgery. However, in general it is accepted that for patients undergoing hysterectomy (abdominal, laparoscopic or vaginal) a standard single dose of intravenous antibiotics is sufficient. Patients who experience major blood loss (greater than 1500 ml) should have fluid resuscitation, followed by re-dosing with the recommended prophylaxis regimen for that operation [5]. In addition, procedures lasting more than 4 h may require re-dosing [6].

1.3 Postoperative Care

A key component of postoperative care is identifying the deteriorating patient and recognizing early signs/symptoms of postoperative complications. Although there were a number of early warning scores (EWS) in use, the Royal College of Physicians noted a lack of consistency in the detection of and response to acute illness.

The National Early Warning Score (NEWS) was created in 2012 to standardize the process of recording, scoring and
responding to changes in routinely measured physiological parameters in acutely ill patients. The NEWS was founded on the premise that (1) early detection, (2) timeliness and (3) competency of the clinical response comprise a triad of determinants of clinical outcome in people with acute illness [7]. It is based on a simple aggregate scoring system in which a score is allocated to physiological measurements, already recorded in routine practice, when patients present to or are being monitored in hospital. Six simple physiological parameters form the basis of the scoring system: respiration rate, oxygen saturation, systolic blood pressure, pulse rate, level of consciousness or new confusion, and temperature. In hospitals, the NEWS should be used for initial assessment of acute illness and for continuous monitoring of a patient’s wellbeing throughout their stay in hospital. By recording a patient’s NEWS score on a regular basis, the trends in their clinical responses can be tracked to provide early warning of potential clinical deterioration and provide a trigger for escalation of clinical care [7]. This is particularly important in the postoperative setting, and it has been noted that recording a patient’s NEWS regularly provides guidance about the patient’s recovery and return to stability [7].

1.3.1 Pain Management

Pain postoperatively should be anticipated and appropriate analgesia prescribed. The operating and anaesthetic team caring for the patient should decide which type of analgesia should be given. The World Health Organization (WHO) Analgesia Ladder [8] approach should be used: regular paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) with weak opioids for breakthrough pain, such as codeine, and if needed stronger opioids such as subcutaneous morphone/epidural or patient-controlled analgesia (PCA). A daily review of ‘as required’ medication should be considered when prescribing further regular analgesia.

Poorly controlled postoperative pain can lead to reduced mobility, thus increasing the risk of venous thromboembolism, and can have a negative impact on patients’ mental wellbeing. It is therefore of the utmost importance that this is not overlooked.

Common side effects of analgesia should be anticipated, such as gastritis for NSAIDs and nausea/constipation for opioids; medication to reduce these side effects should be co-prescribed – for example, proton pump inhibitors, antiemetics and laxatives.

1.3.2 Fluid Balance

The fluid status of a patient can easily become deranged following surgery. Patients may become dehydrated prior to surgery when asked to fast if they do not receive intravenous (IV) fluid replacement. Conversely, patients who are given too much may become fluid overloaded, resulting in peripheral oedema, and in severe cases pulmonary oedema.

To ensure that a patient has a neutral fluid balance, an input–output chart can be used. Inputs include: IV fluids, oral fluids and medications that have a high fluid volume. Outputs include: urine, stool if diarrhoea, vomit and surgical drainage. Ways in which the fluid status of a patient can be assessed are outlined in Table 1.2.

Blood tests can be performed to assess the renal function and electrolytes (U+Es) for a patient with fluid imbalance. Electrolytes have a narrow window within which they must be maintained. Hyper/hypokalaemia may result from dehydration or over-hydration; similarly, hyponatraemia may also be a result of this or secondary to gynaecological procedures resulting in intravascular absorption with hyposmolar solutions such as glycine (e.g. transcervical resection of fibroids). Patients with electrolyte imbalances should have an electrocardiogram (ECG), IV fluid infusion or fluid restriction and/or electrolyte replacement with close serum monitoring. There may also be a role for diuretic medication in patients with fluid overload. The drug chart should also be reviewed to ensure there are no medications that may further contribute to fluid and electrolyte imbalance.

<table>
<thead>
<tr>
<th>Table 1.1 Risk factors that increase the rate of SSI [6]</th>
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<tr>
<td><strong>Patient factors</strong></td>
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<tr>
<td>• Age</td>
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<tr>
<td>• Nutritional status</td>
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<tr>
<td>• Diabetes</td>
</tr>
<tr>
<td>• Smoking</td>
</tr>
<tr>
<td>• Obesity</td>
</tr>
<tr>
<td>• Coexistent infections at a remote body site</td>
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<tr>
<td>• Colonization with microorganism (e.g. Staph. aureus)</td>
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<tr>
<td>• Immunosuppression (inc. taking glucocorticoid steroids</td>
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<tr>
<td>or immuno suppressant drugs)</td>
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<td>• Length of preoperative stay</td>
</tr>
<tr>
<td>• Coexistent severe disease that either limits activity</td>
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<tr>
<td>or is incapacitating</td>
</tr>
<tr>
<td>• Malignancy</td>
</tr>
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</table>
1.3.3 Hypotension

Hypotension postoperatively is not uncommon and is contributed to by opioid use, dehydration and general anaesthetics. It may, however, also be an indicator of haemorrhage or sepsis, and should therefore always be investigated and managed appropriately. Low blood pressure may also be the result of administration of antihypertensives, and these medications should be reviewed pre- and postoperatively.

A hypotensive patient should prompt a clinical review for signs and symptoms of bleeding and infection. The drug chart and fluid balance should be reviewed, a thorough history taken and a full clinical examination of the patient performed. Blood pressure can often be raised with IV fluids; a fluid challenge of 500 ml of crystalloid solution for 15 min is recommended. In the elderly/those with poor reserve, 250 ml of crystalloid solution for 15 min should be given [9].

1.3.4 Bladder Care

Consideration of whether to leave in the bladder an indwelling catheter should be made at the end of a surgical procedure. The benefits are that it allows for accurate urine output measurement and spares the patient having to mobilize initially after the surgery. A decision to leave a catheter in the bladder should be weighed against the risk of infection, and it should not be left in situ for longer than is clinically necessary. However, some catheters may need to remain for a longer period of time if there is concern over bladder injury, for example. These patients should have individualized postoperative bladder care plans with a date for trial without catheter and consideration of involvement of urologists if required. The rate of postoperative urinary retention is high in gynaecological surgery, especially in urogynaecology procedures, and has been quoted in the literature to occur in 2.5–24% of cases [10].

Once a catheter has been removed, it is important that the patient passes urine 4–6 hours later. Failure to do so may result in the need for recatheterization if there is a high residual volume. Residual volume is best checked with a portable bladder scanner. Patients who require recatheterization should also have a mid-stream urine (MSU) sample sent to exclude a urine infection. If negative, a repeat trial without catheter should take place 24 h after the repeat catheter was inserted. If the patient is still unable to pass urine 4–6 h later or there is a post void residual volume of more than 150 ml on two occasions, a catheter should be inserted for the third time for 1 week, and these patients should be followed up with input from a urogynaecologist.

1.3.5 Feeding

Nutrition is required for postoperative healing. Patients should be encouraged to drink water and to build up their diet as tolerated. When reviewing a patient postoperatively, it is important to ask whether they are eating and drinking, and also to assess for signs of postoperative ileus. Ileus may present as abdominal distension, absence of passing flatus/stool, hyper-resonant abdomen to percussion and reduced bowel sounds.

Patients with a suspected postoperative ileus or bowel obstruction should be made nil by mouth or restricted to clear fluids only, with IV fluid replacement. An abdominal X-ray should be performed and laxatives should be considered. Constipating medications should be ceased (e.g. opioids). If the patient’s symptoms are associated with nausea or vomiting, a nasogastric tube may need to be passed and advice should be sought from the general surgeons.

Patients with an unsafe swallow reflex should be assessed by speech and language therapists, and dieticians should consider the need for enteral or parenteral feeding.

1.3.6 Infection

Infections postoperatively commonly present with fever (temperature ≥38 °C) and may be associated with systemic signs such as tachycardia, hypotension and a high respiratory rate. All patients presenting like this should have a septic screen and tests for blood cultures and a serum lactate, as well as full blood count, U+Es and C-reactive protein should be taken. In addition, IV fluids should be given promptly, hourly urine output should be measured with a catheter and a urine sample should be sent for microscopy, culture and sensitivity. Oxygen saturations should be kept ≥94% and IV broad-spectrum antibiotics should be administered as per local guidelines within 1 h if no clear source of infection is identified. Paracetamol should also be given to control the pyrexia. Consideration should also be given as to whether a chest X-ray should be performed if there are any chest signs. In patients with severe infections not responding to initial antibiotic therapy, early involvement of microbiology specialists and the intensive care team is essential in successful treatment of postoperative sepsis. Common sources of infection are discussed in the following subsections.

1.3.6.1 Wound Infections and Collections

Erythema, swelling and discharge from a wound are signs of an infection. A wound swab should be sent to microbiology and a line should be drawn to demarcate the area of infection, to assess whether it is worsening or improving with time. A collection may present with a swinging fever and may require further imaging, such as ultrasound or CT scan, if the patient does not respond to antibiotic therapy. Some patients may require radiologically guided drainage of a collection or alternatively may need evacuation of a wound and to allow for it to close by secondary intention. A tissue viability
specialist should be involved in the patient’s care to allow for a multidisciplinary approach to providing the best patient care.

1.3.6.2 Urinary Tract Infection
Dysuria, frequency, hesitancy and nocturia may all be signs of a urinary tract infection. Patients should be treated with appropriate antibiotics after an MSU has been sent.

1.3.6.3 Lower Respiratory Tract Infection
A productive cough with associated coarse crackles on auscultation, high respiratory rate or low oxygen saturations are signs of a postoperative chest infection. Postoperative atelectasis may also occur, increasing the risk of a chest infection developing. A chest X-ray, sputum sample, arterial blood gas (ABG) and consideration of flu swabs should be performed and antibiotics ± antivirals should be given. Chest physiotherapists should also be asked to see the patient to aid with their recovery and improving saturations.

1.3.7 Consideration of Intensive Care
Unwell patients requiring further support should be discussed with the relevant medical/surgical teams and, if necessary, should be reviewed by outreach nurses/ICU. These patients require close observation and immediate review.

1.3.8 Venous Thromboembolism and Mobilization
Early mobilization has been shown to reduce the risk of venous thromboembolism (VTE) in postoperative patients. Should patients struggle with their mobility, physiotherapy should be involved in their recovery.

Venous thromboembolism is a serious risk for patients, not just in the immediate postoperative period but also for the months following surgery. A VTE risk assessment should be performed for every patient when they are admitted to hospital and repeated daily if risk factors have changed. Thromboembolic deterrent stockings (TEDS) should be worn by all surgical patients, provided there are no contraindications such as peripheral vascular disease or friable skin conditions. Thromboembolic deterrent stockings should be sized appropriately to ensure they are not too tight, which could potentially cause more harm. Should TEDs not be suitable, intermittent pneumatic compression devices should be considered. An individualized patient assessment for subcutaneous thromboprophylaxis should be performed and VTE prophylaxis should be prescribed as necessary.

Patients who present with symptoms of a deep vein thrombosis (i.e. red/swollen/painful calf) should have a lower limb ultrasound Doppler. While awaiting imaging if clinical suspicion is high, treatment dose thromboprophylaxis should be prescribed based on the patient’s weight and renal clearance.

Similarly, if a patient presents with symptoms of a pulmonary embolism (PE) – that is, pleuritic chest pain/shortness of breath/tachycardia/haemoptysis/low oxygen saturations, particularly on mobilizing, a chest X-ray, an ABG and an ECG should be performed. If no other obvious cause for the symptoms is identified, further imaging such as a CT pulmonary angiography or a ventilation/perfusion scan should be arranged. While awaiting the scan, the patient should be anticoagulated with a therapeutic dose of subcutaneous LMWH.

If the patient is haemodynamically unstable, an ABCDE approach should be taken and an urgent medical review should be sought to assess for thrombolysis.

1.3.9 Discharge
A timely and safe discharge should be the aim for all patients. It is important to ask about home environment and whether the patient will need any additional support. If patients require help, it is important to involve occupational therapists, physiotherapists and the discharge planning team as necessary. All patients should be discharged with the necessary medications, thromboprophylaxis and discharge summary outlining the events of their hospital admission. Patients should also be given ‘safety-netting’ information of symptoms to look out for and when and where they should seek medical attention if unwell or if they have further queries.

A copy of the discharge letter should remain with the patient for their records, another copy should be kept in the hospital notes and a final one should be sent to the patient’s general practitioner.

References
4. Douketis JD, Lip GYH. Perioperative management of patients receiving anticoagulants. Up to Date, September 2018.
Gynaecological emergencies are conditions of the female reproductive system that threaten the woman’s life, her sexual function or her fertility. Common gynaecological emergencies present as acute abdomen, abnormal vaginal bleeding or a combination of both.

In this chapter, we present an overview of the main gynaecological emergencies:

- early pregnancy problems:
  - ectopic pregnancy
  - miscarriage
- gynaecologic causes of severe pelvic pain
  - acute pelvic inflammatory disease
  - pelvic endometriosis
  - torsion and rupture of an ovarian neoplasm
  - torsion or degeneration of a uterine leiomyoma
  - ovarian hyperstimulation syndrome
- severe vaginal bleeding
- vulvar abscesses
- toxic shock syndrome
- sexual violence

2.1 Early Pregnancy Problems

2.1.1 Ectopic Pregnancy

2.1.1.1 Epidemiology [1–4]

It is very difficult to estimate the true incidence of ectopic pregnancy around the world. According to the literature, the incidence varies between 6 and 20 per 1000 pregnancies. The incidence increases with maternal age and is more common in black women (1.5-fold increased risk).

The prevalence of ectopic pregnancy among women presenting to an emergency department with first-trimester vaginal bleeding, abdominal pain or both has been reported to be as high as 18%.

2.1.1.2 Risk Factors [4–7]

The major cause of ectopic pregnancy is disruption of the normal tubal anatomy and/or function. All sexually active women are at risk of an ectopic pregnancy. One-half of all women who receive a diagnosis of an ectopic pregnancy do not have any known risk factors. The risk factors that may be associated with an ectopic pregnancy are described below.

- Previous tubal pregnancy: this represents the highest risk for recurrence. The risk of ectopic pregnancy in women with a prior ectopic gestation is approximately 3–8-fold higher compared with other pregnant women.
- Previous tubal surgery: as an example, the risk of ectopic pregnancy after sterilization failure is 5–19-fold higher compared with other pregnant women.
- Pelvic inflammatory disease is a major cause of tubal pathology and, therefore, increases the risk of ectopic pregnancy.
- Current intrauterine contraceptive device users: in general, women with intrauterine devices are at very low risk of conceiving any pregnancy. However, if they conceive, the probability of an ectopic pregnancy is generally higher than in women not using contraception.
- Assisted conception: the incidence of ectopic pregnancy is approximately 2–3-fold higher in women with infertility, which could reflect the high prevalence of tubal disease in this group. In vitro fertilization has been associated with increased risk of both tubal ectopic and heterotopic pregnancy.
- Cigarette smoking during the periconceptional period is associated with a dose-dependent increase in the risk of ectopic pregnancy.
- Diethylnstilboestrol: women with a history of diethylstilboestrol exposure have a 4-fold increased risk of ectopic pregnancy.
- Factors such as oral contraceptive use, emergency contraception failure, previous elective pregnancy termination, pregnancy loss and caesarean delivery have not been associated with an increased risk of ectopic pregnancy.

2.1.1.3 Clinical Presentation [8]

There are no pathognomonic symptoms for ectopic pregnancy.

The most common clinical presentation is first-trimester vaginal bleeding and/or abdominal pain. Clinical manifestations of ectopic pregnancy typically appear at 6–8 weeks of amenorrhea.

It is important to know that ectopic pregnancy may also be asymptomatic or the symptoms may occur later, especially if the pregnancy is at an extraterine site other than the fallopian tube (Figure 2.1).
Ectopic pregnancy rupture can result in life-threatening haemorrhage.

2.1.1.4 Diagnosis [4,6,8,9]

There should be a high index of suspicion for early diagnosis and treatment.

Ultrasoundography can definitively diagnose an ectopic pregnancy when a gestational sac with a yolk sac, embryo or both is noted in the adnexa. An intrauterine gestational sac with a yolk sac should be visible between 5 and 6 weeks of gestation, regardless of whether there are one or multiple gestations.

The ultrasound finding of a mass separate from the ovary should raise diagnostic suspicion; however, its positive predictive value is only 80%. If there is a gestational sac inside the uterine cavity, we can exclude ectopic pregnancy, except in the rare case of heterotopic pregnancy or the hypoechogenic ‘sac-like’ intrauterine image that represents a pseudogestational sac (fluid or blood).

The human chorionic gonadotrophin (βHCG) discriminatory zone, defined as the serum level above which an intrauterine gestational sac should be visualized by transvaginal scan, is very important in the diagnosis (the βHCG level of the discriminatory zone varies, but in most institutions it is 2000 IU/L; according to the American College of Obstetrics and Gynaecology the value should be conservatively high: 3500 IU/L).

Women with multiple gestations have higher βHCG levels than those with a single gestation at any given gestational age, and may have βHCG levels above traditional discriminatory βHCG levels before ultrasonography recognition.

When clinical findings suggest an abnormal gestation and the ultrasound is non-diagnostic, a second βHCG value measurement is recommended 48–72 h after the initial measurement. A normal pregnancy is suggested if the βHCG level doubles every 48–72 h. In ectopic pregnancies, mean βHCG levels are generally lower than in healthy pregnancies and usually increase much less in level over time. If the βHCG serum level decreases 21–35% in 48 h, a spontaneous pregnancy loss is considered.

When the serum βHCG is above the discriminatory zone, the diagnosis is made based on the absence of an intrauterine gestational sac or findings at an extraterine site that confirm an ectopic pregnancy.

The diagnosis of ruptured ectopic pregnancy is clinical. The typical findings include acute abdomen, free fluid in the transvaginal ultrasound or direct visualization of the rupture within surgery.

2.1.1.5 Treatment [4,6,10,11]

As previously mentioned, 96% of all extrauterine pregnancies occur in the fallopian tube. Knowing that, we focus here on the treatment of tubal ectopic pregnancy.

The surgical procedures are considered gold-standard treatment. Surgical management is carried out preferentially by laparoscopy. There are two surgical choices: salpingostomy or salpingectomy, which has been the standard procedure. The advantages of surgical treatment are less time for resolution of the ectopic pregnancy and avoidance of the need for prolonged monitoring. Surgery is required when emergency treatment is indicated or medical therapy is contraindicated or unlikely to be successful.

Approximately 30% of women with ectopic pregnancies are candidates for medical treatment using methotrexate. In properly selected women, the medical treatment success can reach 90%. Treatment with methotrexate does not appear to compromise ovarian reserve and the fertility rate after treatment is similar to that of surgical treatment.

It is important to mention that there are cases where expectant management is also an option, but it is possible only for a small proportion of women.

2.1.2 Miscarriage

2.1.2.1 Introduction [12,13]

The term abortion refers to a termination of a pregnancy either naturally or induced. The World Health Organization defined abortion, preferably termed as miscarriage, as the termination of pregnancy prior to 20 weeks of gestation, or the birth of a fetus weighing less than 500 g if the period of gestation is not known. Abortions, mostly unsafe ones, are a leading cause of maternal mortality worldwide, accounting for a global average of 13% of fatalities related to pregnancy. Overall, 98% of unsafe abortions occur in developing countries.

The abortion could be natural or induced, complete or incomplete, threatened abortion (the diagnostic criteria for spontaneous abortion have not been met, but vaginal bleeding has occurred and the cervical os is closed), missed abortion...
(the products of conception are not expelled spontaneously from the uterus) or a septic abortion (a complicated form of abortion, more often associated with induced abortion).

2.1.2.2 Epidemiology [12,14]

Miscarriage is a very common complication of early pregnancy. The incidence of spontaneous miscarriage is greatest within the first trimester.

2.1.2.3 Aetiology and Risk Factors [13–16]

Approximately 50% of all spontaneous miscarriages are due to fetal chromosomal abnormalities. It is often difficult to determine the exact cause of a miscarriage. Before 8 weeks of gestation no embryo or yolk sac is observed in the gestational sac in 30% of cases. Risk of early pregnancy loss decreases with increasing gestational age and is relatively low after 15 weeks' gestation in a genetically normal fetus.

Numerous risk factors are associated with an increased risk of pregnancy loss. The best-documented risk factors for spontaneous miscarriage are advanced maternal age, previous spontaneous miscarriage and maternal smoking.

- Maternal age: in women aged 20–30 years the frequency of miscarriage is 9–17%. This increases to 20% at age 35, 40% at age 40 and 80% at age 45.
- Obstetric history: the risk of miscarriage in future pregnancy is approximately 20% after one miscarriage, 28% after two consecutive miscarriages and 43% after three or more consecutive miscarriages.
- Maternal smoking: heavy smoking (more than 10 cigarettes per day) is associated with an increased risk of pregnancy loss.
- Others: cocaine consumption, use of non-steroidal anti-inflammatory drugs around the time of conception, extremes of maternal weight, trauma, celiac disease, uterine structural issues (e.g. uterine septum), maternal hypertension, thrombophilia and antiphospholipid antibody syndrome.

2.1.2.4 Clinical Presentation [14]

Spontaneous miscarriage usually presents as vaginal bleeding or pelvic pain. It is important to note that these findings can often be confused with complications of normal gestation or signs of ectopic or molar pregnancy. There are cases in which the abortion is an incidental finding on a pelvic ultrasound performed in an asymptomatic patient.

2.1.2.5 Diagnosis [17]

We can make a highly certain diagnosis using a combination of medical history, physical examination, ultrasonography and serum βhCG testing.

In some cases, the diagnosis of miscarriage is easily made with limited testing or imaging (e.g. a woman who presents with significant vaginal bleeding and absence of intrauterine gestational sac on ultrasound who had a previously ultrasound documented intrauterine pregnancy). However, there are cases when the diagnosis is not so easy, and a close serum βhCG and ultrasound follow up are necessary to confirm the diagnosis.

There are some criteria for exclusion of a viable intrauterine pregnancy:
- crown–rump length of 7 mm or greater and no heartbeat;
- mean sac diameter of 25 mm or greater and no embryo;
- absence of embryo with heartbeat 2 weeks or more after a scan that showed a gestational sac without a yolk sac;
- absence of embryo with heartbeat 11 days or more after a scan that showed a gestational sac with a yolk sac.

2.1.2.6 Treatment [13,14]

Treatment options for miscarriage include expectant management, medication or surgical evacuation. There is no evidence that any approach results in different long-term outcomes, as long as patients are asymptomatic and do not require urgent treatment. Overall, serious complications after early pregnancy loss treatment are rare and are comparable across treatment types.

2.1.2.7 Expectant management

- Generally, should be limited to gestations within the first trimester.
- Complete expulsion in approximately 80% of cases (a commonly used criterion is the absence of a gestational sac and an endometrial thickness of less than 30 mm).
- Women on expectant management may experience moderate or heavy bleeding and pelvic pain.

2.1.2.8 Medical Treatment

- Misoprostol-based regimens have been extensively studied.
- Vaginal or sublingual administration is more effective than oral administration.
- The addition of a dose of mifepristone (200 mg orally) 24 h before misoprostol administration may significantly improve treatment efficacy and should be considered.
- Most women will achieve complete expulsion within 3 days, and very few need subsequent uterine curettage.

2.1.2.9 Surgical Evacuation

- Suction curettage or sharp curettage.
- The suction curettage could be done in an office setting under local anaesthesia and is safer. This should be the elective surgical procedure.
- Surgical evacuation is preferred in the presence of medical comorbidities (such as severe anaemia, bleeding disorders, cardiovascular disease) or in cases in which urgent treatment is required (haemorrhage, haemodynamic instability or signs of infection).
- Clinically important intrauterine adhesion formation is a rare complication after surgical evacuation.
- The use of a single preoperative dose of doxycycline is recommended to prevent infection after surgical management of early pregnancy loss.

2.1.2.10 Other Medications

Rh(D)-immune globulin 50 μg: administered in all Rh(D)-negative women who experience miscarriage and have not been administered in all Rh(D)-negative women who experience miscarriage and have not been
sensitized to prevent alloimmunization. This medication should be administered as early as possible, within 72 h, of diagnosis of miscarriage and immediately following surgical intervention.

2.1.2.11 Prevention [13,14]
To date, there exists no proven strategy to prevent spontaneous abortions of the first trimester. Suggestions such as pelvic rest and hormone administration have not been proven. However, some physicians advocate progesterin administration early to women who have experienced at least three previous miscarriages. Anticoagulants or aspirin administration have only been proven to be beneficial in women with antiphospholipid antibody syndrome.

In cases of cervical incompetence resulting in second-trimester miscarriages, prophylactic cerclage is an option with good prognosis.

No workup is generally recommended until after the second consecutive clinical early pregnancy loss.

2.2 Severe Pelvic Pain [18]
Pelvic pain is a common presenting complaint in women. The differential diagnosis includes gynaecologic and non-gynaecologic pathologies. A thorough history and physical examination are usually necessary to narrow the possible diagnoses and focus the workup. The nature of the pain, whether cyclical or non-cyclical, acute or chronic if present for months or more, severity and exacerbating and relieving factors should be noted. Further findings that should be noted include vaginal discharge, abnormal vaginal bleeding, dyspareunia, urinary or gastrointestinal symptoms, constitutional symptoms like weight loss and anorexia.

The physical exam is of paramount importance, and includes the systemic, abdominal and gynaecologic examination. In the investigation, the pelvic ultrasound plays a key role, as it gives the physician the opportunity to confirm or exclude pelvic masses, check for free fluid in the abdominal cavity or exclude complications of initial pregnancy. Blood tests are also important as they can help in the diagnosis of pelvic tumours (e.g. cancer antigen 125 for ovary tumours) and also in the diagnosis of infectious diseases involving the genital tract (complete blood count and C-reactive protein).

The most common gynaecological causes of acute pelvic pain are:
- acute pelvic inflammatory disease
- pelvic endometriosis
- torsion or rupture of an ovarian neoplasm
- torsion or degeneration of a uterine leiomyoma
- ovarian hyperstimulation syndrome in women undergoing gonadotrophin treatment for infertility.

2.2.1 Acute Pelvic Inflammatory Disease [19]

2.2.1.1 Introduction
Pelvic inflammatory disease (PID) refers to acute and/or subclinical infection of the upper genital tract in women; this is often accompanied by involvement of the neighbouring pelvic organs. It results in endometritis, salpingitis, oophoritis, peritonitis, perihepatitis and/or tubo-ovarian abscess.

There is a worldwide increase in the incidence of this disease. Usually it does not represent an emergency, because in the majority of the cases it does not necessarily require immediate lifesaving treatment. However, early diagnosis and proper treatment are required to minimize the long-term consequences (fertility issues, chronic pelvic pain, ectopic pregnancy).

2.2.1.2 Aetiology and Risk Factors
Sexually transmitted organisms, particularly Neisseria gonorrhoeae and Chlamydia trachomatis, are implicated in many cases. However, recent studies suggest that the proportion of PID cases attributable to these microorganisms is declining. Organisms of the vaginal flora are also responsible for this disease, which is often polymicrobial.

2.2.1.3 Diagnosis
Many cases of PID go unrecognized or are subclinical. The diagnosis of PID usually is based on imprecise clinical findings. Presumptive treatment for PID should be initiated in sexually active young women and other women at risk for sexually transmitted diseases if they are experiencing pelvic or lower abdominal pain with one or more of the following:
- cervical motion tenderness
- uterine tenderness
- adnexal tenderness.

To enhance the specificity of the diagnosis, we can use one or more of the following additional criteria:
- oral temperature >101 °F (>38.3 °C);
- abnormal cervical mucopurulent discharge or cervical friability;
- presence of abundant numbers of white blood cell on saline microscopy of vaginal fluid;
- elevated erythrocyte sedimentation rate;
- elevated C-reactive protein;
- laboratory documentation of cervical infection with N. gonorrhoeae or C. trachomatis.

The most specific criteria for diagnosing PID include:
- endometrial biopsy with histopathologic evidence of endometritis – recommended in symptomatic women undergoing laparoscopy who do not have visual evidence of salpingitis;
- transvaginal sonography or MRI techniques suggesting pelvic infection (e.g. thickened, fluid-filled tubes with or without free pelvic fluid);
- laparoscopic findings consistent with PID (Figure 2.2) (e.g. overt hyperaemia of the tubal surface, oedema of the tubal wall and sticky exudates on the tubal surface or fimbria ends).

2.2.1.4 Treatment
The treatment of PID is essentially empirical, with use of broad-spectrum antibiotics. The treatment can be done on...
either an outpatient or inpatient basis. All regimens used to treat PID should also be effective against *N. gonorrhoeae* and *C. trachomatis* because negative endocervical screening for these organisms does not rule out upper reproductive tract infection. The duration of the treatment should not be less than 14 days. There is a recommendation for sex-partner treatment.

The decision regarding whether hospitalization is necessary is clinical. In the presence of tubo-ovarian abscess, pregnancy, severe illness, vomiting, high fever, unable to follow/tolerate an outpatient oral regimen or no clinical response to intramuscular/oral antimicrobial therapy within 72 h, hospitalization is required. The transition to oral therapy should be initiated within 24–48 h of clinical improvement.

### 2.2.1.5 Recommended Parenteral Regimens

The recommended parenteral regimens include (according to the Centers for Disease Control and Prevention):

- cefotetan 2 g IV every 12 h PLUS doxycycline 100 mg orally or IV every 12 h;
- cefoxitin 2 g IV every 6 h PLUS doxycycline 100 mg orally or IV every 12 h;
- clindamycin 900 mg IV every 8 h PLUS gentamicin loading dose IV or IM (2 mg/kg), followed by a maintenance dose (1.5 mg/kg) every 8 h. Single daily dosing (3–5 mg/kg) can be substituted.

### 2.2.1.6 Recommended Intramuscular/Oral Treatment

The recommended intramuscular/oral treatment includes (according to the CDC):

- ceftriaxone 250 mg IM in a single dose PLUS doxycycline 100 mg orally twice a day for 14 days; consider association with metronidazole 500 mg orally twice a day for 14 days (to provide anaerobic coverage).

### 2.2.1.7 Women with Intrauterine Contraceptive Devices

There is no need to remove the device to do the therapy. If no clinical improvement occurs within 48–72 h of initiating treatment, providers should consider removing the intrauterine device.

### 2.2.2 Pelvic Endometriosis [18,20]

#### 2.2.2.1 Introduction

Endometriosis is a chronic gynaecological disorder. It is a leading cause of disability in women of reproductive age, and the pain may be mild or it may be severe enough to negatively affect health-related quality of life.

Endometriosis represents the presence of endometrial stroma and glands outside of the uterine cavity, in which the pelvis is the most common site. The pathogenesis of this disorder is complex, and there are a few theories such as retrograde menstruation or haematogenous or lymphatic transport.

Endometriosis affects almost 10% of women of reproductive age. The prevalence of pelvic endometriosis in women with chronic pelvic pain ranges between 71 and 87%.

#### 2.2.2.2 Risk Factors

Some of the risk factors described include early menarche, shorter cycles and heavy cycles. Higher parity, long lactation period and regular exercise appear to be beneficial factors.

#### 2.2.2.3 Clinical Manifestations

The main symptoms are chronic pain, dysmenorrhoea and infertility. However, there are cases of acute exacerbations of the disease. The clinical manifestations are unpredictable, and there are women who remain asymptomatic. The pelvic pain associated with endometriosis may not correlate with stage of disease. Endometriosis that involves specific organs may result in pain or physiological dysfunction of those organs. Endometriosis is a cause of frozen pelvis (Figure 2.3).

#### 2.2.2.4 Diagnosis

The definitive diagnosis of endometriosis can only be made by histology of lesions removed at surgery.

#### 2.2.2.5 Treatment

The management aim should be the illness rather than the disease. Medical suppressive (gonadotrophin-releasing hormone (GnRH) agonists or oral contraceptives) therapy...