



La-Net

OBG 505

OBSTETRIC AND GYNAECOLOGICAL EMERGENCIES



Course video is available on our app

lanetonline.com



la-NET | ONLINE LEARNING VIDEO PLATFORM FOR POST-SECONDARY & HIGHER INSTITUTION STUDENTS

Course code: OBG 505

Course title: Obstetric and Gynaecological Emergencies

Course credit load: 2 Units

Series 1: Foundations of Emergency Resuscitation

- **Part 1.1: Recognising the Critically Ill Obstetric and Gynaecological Patient**
 - Sub Part 1.1.1: Physiological changes affecting recognition of critical illness in pregnancy
 - Sub Part 1.1.2: Early warning scores in obstetrics
 - Sub Part 1.1.3: Triage and initial assessment in emergencies
- **Part 1.2: The ABCDE Approach to Resuscitation**
 - Sub Part 1.2.1: Airway and breathing assessment and management
 - Sub Part 1.2.2: Circulation assessment and management
 - Sub Part 1.2.3: Disability and exposure assessment
- **Part 1.3: Shock and Fluid Resuscitation**
 - Sub Part 1.3.1: Classification and recognition of shock
 - Sub Part 1.3.2: Principles of fluid resuscitation
 - Sub Part 1.3.3: Blood and blood product transfusion
- **Part 1.4: Team Working and Systems for Emergency Care**
 - Sub Part 1.4.1: Effective communication and escalation in emergencies
 - Sub Part 1.4.2: Simulation and drills in obstetric emergency preparedness
 - Sub Part 1.4.3: Documentation and debriefing after an emergency

Introduction



Picture a labour ward at two in the morning, when a woman who was stable minutes ago suddenly collapses. In that moment, what matters most is not the specific diagnosis, but whether the team in the room knows exactly what to do, in what order, and how to work together under pressure. This Series lays that essential foundation for the whole of this course: the general principles of recognising, resuscitating, and managing the critically unwell obstetric or gynaecological patient, skills that apply whatever the underlying emergency turns out to be, and that we will build on in every Series that follows.

The aim of this Series is to equip you with the knowledge and skills to recognise the critically ill obstetric or gynaecological patient and to lead or contribute effectively to her initial resuscitation and team-based emergency care.

We shall commence this Series by examining how to recognise the critically ill obstetric and gynaecological patient, including the use of early warning scores and effective triage. Next, we will consider the ABCDE approach to resuscitation in detail. Following that, our attention turns to shock and fluid resuscitation, including the principles of blood and blood product transfusion. Finally, we will conclude by examining team working, communication, and the systems that support safe, effective emergency care.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 1.1:** describe the physiological changes of pregnancy that affect recognition of critical illness, and the use of early warning scores,
- **SLO 1.2:** describe the principles of triage and initial assessment of an obstetric or gynaecological emergency,
- **SLO 1.3:** demonstrate the ABCDE approach to resuscitation,
- **SLO 1.4:** classify shock and describe the principles of fluid resuscitation,
- **SLO 1.5:** describe the principles of blood and blood product transfusion in emergencies, and
- **SLO 1.6:** describe the role of effective teamwork, communication, and systems in emergency care.

1.1 Recognising the Critically Ill Obstetric and Gynaecological Patient

1.1.1 Physiological changes affecting recognition of critical illness in pregnancy



The physiological adaptations of pregnancy can substantially mask the early clinical signs of critical illness, as the normal pregnancy-related increase in heart rate and cardiac output, and the physiological fall in blood pressure, mean that a pregnant woman can lose a considerable volume of blood, sometimes well over a litre, before conventional vital sign parameters cross into a range that would normally trigger clinical alarm in a non-pregnant patient, a phenomenon that has repeatedly contributed to delayed recognition of serious obstetric compromise.

This physiological reserve means that when a pregnant woman does eventually display overt signs of haemodynamic instability, she may already have lost a dangerously large volume of blood or be significantly more unwell than the vital signs alone initially suggest, making a low threshold for concern and escalation, rather than reassurance from apparently near-normal observations, an essential principle underpinning safe recognition of the critically unwell obstetric patient.

Fill in the blank: A pregnant woman can lose a considerable volume of blood before conventional _____ signs cross into an abnormal range. Because of this physiological reserve, a low threshold for concern and _____ is essential in obstetric emergencies.

1.1.2 Early warning scores in obstetrics

Modified early obstetric warning scores (MEOWS) are structured tools adapted specifically from general early warning scoring systems to account for the altered normal physiological ranges of pregnancy, tracking parameters including heart rate, blood pressure, respiratory rate, oxygen saturation, temperature, and level of consciousness, generating a composite score or trigger that prompts a defined, standardised escalation response when abnormal parameters are identified.

The genuine value of these scoring systems lies not merely in the numerical score itself, but in the standardised, structured escalation pathway they trigger, ensuring that any member of the care team who identifies concerning observations has a clear, unambiguous mechanism to escalate that concern promptly to senior clinical staff, removing reliance on individual clinical judgement or confidence alone to recognise and act upon early warning signs of deterioration.

Fill in the blank: Modified early obstetric warning scores are adapted from general early warning systems to account for the altered normal _____ ranges of pregnancy. The genuine value of these scoring systems lies in the standardised _____ pathway they trigger.

1.1.3 Triage and initial assessment in emergencies

Effective triage of a woman presenting with a potential obstetric or gynaecological emergency requires rapid, structured initial assessment, typically completed within minutes of arrival, prioritising the identification of immediately life-threatening features (such as heavy vaginal bleeding, severe abdominal pain, reduced consciousness, or signs of shock) over a comprehensive, detailed history, which can and should follow once the immediate priority of stabilisation has begun.



A structured approach to initial assessment (commonly following the same ABCDE framework used in general emergency medicine) ensures that no immediately life-threatening problem is missed while a more detailed, sequential history and examination are obtained, and that appropriate senior staff and resources are mobilised early, in parallel with the initial assessment itself, rather than only once a full clinical picture has first been fully established.

Fill in the blank: Effective triage prioritises identification of immediately life-threatening features over a comprehensive, detailed _____. Senior staff and resources should be mobilised _____ with the initial assessment, not only afterwards.

Parameter	Example Trigger Thresholds
Heart Rate	<50 bpm or >120 bpm
Blood Pressure	Systolic <90 mmHg or >160 mmHg; Diastolic >100 mmHg
Respiratory Rate	<10 breaths/min or >30 breaths/min
Oxygen Saturation	<95%
Temperature	<35°C or >38°C
Level of Consciousness	New confusion, drowsiness, or unresponsiveness

Box 1.1: Parameters and example trigger thresholds of a modified early obstetric warning score.

Pilot questions 1.1

1. Explain why the physiological changes of pregnancy can mask the early signs of critical illness. (Linked to SLO 1.1)
2. Explain the concept of physiological reserve in pregnancy and its clinical significance. (Linked to SLO 1.1)
3. Describe the purpose and parameters of a modified early obstetric warning score. (Linked to SLO 1.1)
4. Explain the genuine value of early warning scoring systems in obstetric emergencies. (Linked to SLO 1.1)
5. Describe the principles of effective triage and initial assessment in an obstetric emergency. (Linked to SLO 1.2)

1.2 The ABCDE Approach to Resuscitation

1.2.1 Airway and breathing assessment and management



Airway assessment is always the first priority in any resuscitation, checking for patency and any obstruction, with simple manoeuvres such as head tilt and chin lift or jaw thrust used to open the airway where needed, before assessment of breathing, which includes respiratory rate, oxygen saturation, chest movement, and auscultation, with supplemental oxygen given to any acutely unwell woman regardless of the specific underlying cause, pending further assessment and definitive treatment.

In pregnancy specifically airway management can be more challenging because of physiological changes including increased mucosal vascularity and oedema, particularly in pre-eclampsia, and reduced functional residual capacity from the elevated diaphragm, meaning that a pregnant woman desaturates more rapidly during any period of inadequate oxygenation, an important practical consideration when managing airway and breathing problems in the acutely unwell pregnant patient.

Fill in the blank: Airway assessment is always the _____ priority in any resuscitation. A pregnant woman desaturates more rapidly during inadequate oxygenation because of reduced functional residual _____.

1.2.2 Circulation assessment and management

Circulation assessment includes pulse rate and character, blood pressure, capillary refill time, skin colour and temperature, and, where relevant, visible or estimated blood loss, with intravenous access (ideally two large-bore cannulae) established promptly in any woman with suspected haemorrhage or significant haemodynamic compromise, alongside sending blood for full blood count, coagulation studies, and cross-matching as clinically indicated.

Aortocaval compression (compression of the aorta and inferior vena cava by the gravid uterus when a pregnant woman lies supine, reducing venous return and cardiac output) is a specific and important consideration unique to pregnancy, addressed by positioning the woman in a left lateral tilt or manually displacing the uterus to the left during resuscitation, a simple intervention that can meaningfully improve maternal cardiac output and, in cardiac arrest, the effectiveness of chest compressions.

Fill in the blank: Circulation assessment should include establishing intravenous access with ideally two _____ cannulae. Aortocaval compression is addressed by positioning the woman in a _____ lateral tilt.

1.2.3 Disability and exposure assessment

Disability assessment evaluates conscious level (using the AVPU scale or Glasgow Coma Scale) and blood glucose, as hypoglycaemia is a rapidly reversible cause of reduced consciousness that must never be overlooked in the acutely unwell woman, alongside assessment of pupillary response and any focal neurological signs, particularly relevant when eclampsia or another neurological cause of collapse is suspected.



Exposure involves a full, systematic examination of the woman with appropriate dignity and privacy maintained wherever the clinical situation allows, looking specifically for concealed sources of bleeding, rash, or other clues to the underlying diagnosis, and ensuring the woman is kept warm throughout, as hypothermia can worsen coagulopathy and further compromise an already critically unwell patient.

Fill in the blank: Disability assessment includes conscious level and blood _____, as hypoglycaemia is a rapidly reversible cause of reduced consciousness. Hypothermia during exposure assessment can worsen _____, further compromising a critically unwell patient.

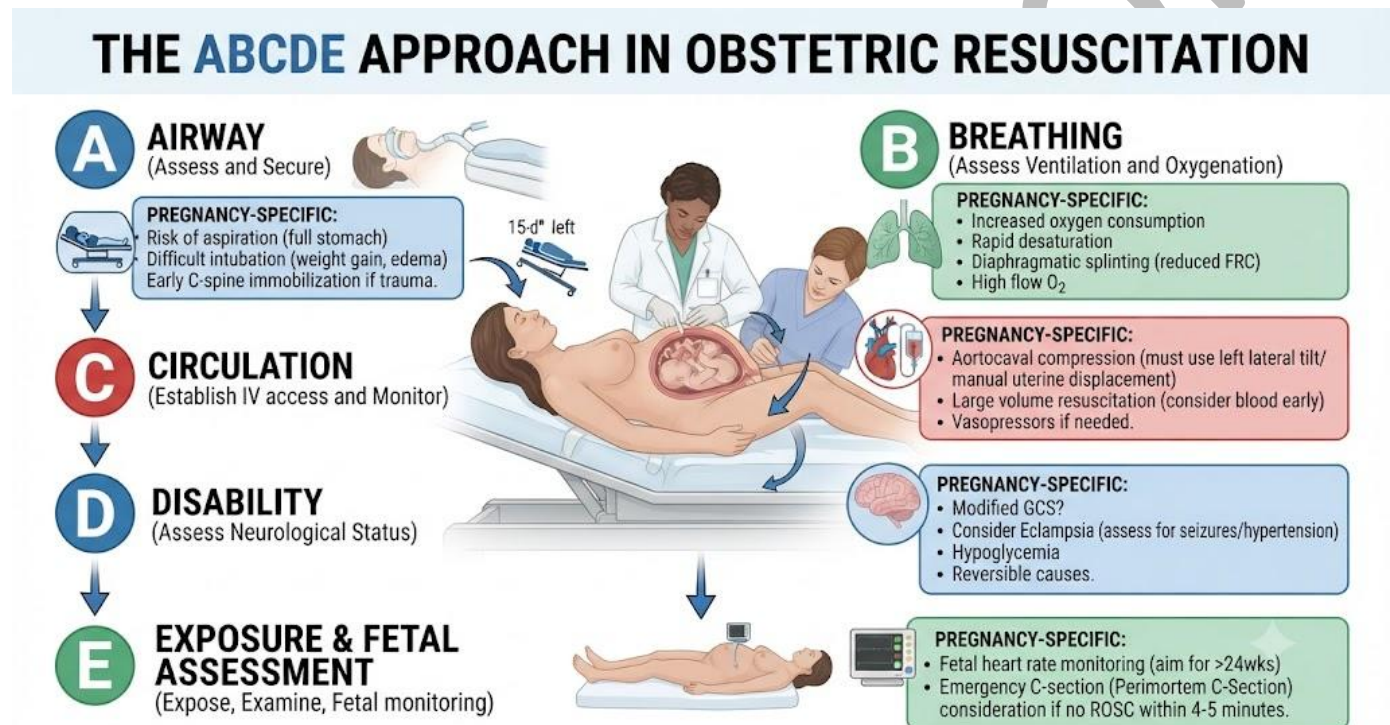


Figure 1.2: The ABCDE approach to resuscitation with pregnancy-specific considerations.

Pilot questions 1.2

1. Describe the assessment and management of airway and breathing in resuscitation. (Linked to SLO 1.3)
2. Explain why airway management can be more challenging in pregnancy. (Linked to SLO 1.3)
3. Describe the key components of circulation assessment and management. (Linked to SLO 1.3)
4. Explain the mechanism and management of aortocaval compression. (Linked to SLO 1.3)
5. Describe the components of disability and exposure assessment in resuscitation. (Linked to SLO 1.3)



1.3 Shock and Fluid Resuscitation

1.3.1 Classification and recognition of shock

Shock is defined as inadequate tissue perfusion to meet metabolic demand, classified by underlying mechanism as hypovolaemic (the most common cause in obstetric emergencies, from haemorrhage), septic (from severe infection, particularly relevant in septic abortion and puerperal sepsis), cardiogenic (from primary cardiac dysfunction), and anaphylactic or neurogenic, with accurate classification directly guiding the specific priorities of subsequent management.

Clinical recognition of shock in its early, compensated stage can be subtle, particularly given the physiological reserve of pregnancy discussed earlier, with tachycardia often the earliest and most reliable clinical sign, while hypotension, a comparatively late and more ominous sign in the pregnant patient, indicates that compensatory mechanisms have already begun to fail, underscoring why waiting for hypotension to develop before recognising and acting on shock represents a genuinely dangerous delay in obstetric practice.

Fill in the blank: Shock is classified by mechanism as hypovolaemic, septic, cardiogenic, and anaphylactic or _____. In the pregnant patient, tachycardia is often the earliest sign of shock, while _____ is a comparatively late, more ominous sign.

1.3.2 Principles of fluid resuscitation

Initial fluid resuscitation in hypovolaemic shock uses warmed crystalloid solution, administered rapidly through wide-bore intravenous access while further definitive treatment (such as identifying and controlling the source of haemorrhage) is urgently pursued in parallel, with the response to this initial fluid challenge, assessed by improvement in vital signs and clinical status, guiding the need for further fluid or, where haemorrhage is significant, escalation to blood product transfusion.

Excessive crystalloid administration should nonetheless be avoided, particularly in significant obstetric haemorrhage, as large-volume crystalloid infusion can cause dilutional coagulopathy, worsening rather than improving the underlying bleeding problem, reinforcing the principle that fluid resuscitation is a genuine bridge to definitive haemorrhage control and blood product transfusion, rather than a substitute for either of these more definitive interventions.

Fill in the blank: Initial fluid resuscitation in hypovolaemic shock uses warmed _____ solution through wide-bore intravenous access. Excessive crystalloid administration can cause dilutional _____, worsening the underlying bleeding problem.

1.3.3 Blood and blood product transfusion

Blood transfusion is indicated in significant obstetric haemorrhage once initial crystalloid resuscitation has been given, with major haemorrhage protocols in most centres providing pre-defined ratios of red cells, fresh frozen plasma, and platelets, reflecting growing recognition that early, balanced blood product replacement, rather than red cells alone, improves outcomes in



major haemorrhage by addressing the coagulopathy that so often develops alongside ongoing blood loss.

Where cross-matched blood is not immediately available and haemorrhage is life-threatening, uncross-matched group O rhesus-negative blood should be given without delay while formal cross-matching proceeds in parallel, as the delay involved in waiting for fully cross-matched blood in a genuinely life-threatening haemorrhage represents a far greater risk to the patient than the very small risk associated with uncross-matched emergency blood in this specific, time-critical situation.

Fill in the blank: Major haemorrhage protocols provide pre-defined ratios of red cells, fresh frozen plasma, and _____. Where cross-matched blood is unavailable in life-threatening haemorrhage, group O rhesus-_____ blood should be given without delay.

Stage	Estimated Blood Loss (% of total volume)	Clinical Signs
Stage I	<15%	Normal blood pressure, slight tachycardia, patient alert.
Stage II	15–30%	Heart rate >100 bpm, narrowed pulse pressure, mild tachypnoea, anxious mental state.
Stage III	30–40%	Heart rate >120 bpm, marked hypotension, tachypnoea, confusion or agitation.
Stage IV	>40%	Heart rate >140 bpm, profound hypotension, negligible urine output, lethargy or unconsciousness.

Table 1.3: Classification of hypovolaemic shock by estimated blood loss and clinical signs.

Pilot questions 1.3

1. Classify shock by underlying mechanism. (Linked to SLO 1.4)
2. Explain why tachycardia is a more reliable early sign of shock than hypotension in pregnancy. (Linked to SLO 1.4)
3. Describe the principles of initial fluid resuscitation in hypovolaemic shock. (Linked to SLO 1.4)
4. Explain why excessive crystalloid administration should be avoided in significant obstetric haemorrhage. (Linked to SLO 1.4)
5. Describe the principles of blood and blood product transfusion in major obstetric haemorrhage. (Linked to SLO 1.5)

1.4 Team Working and Systems for Emergency Care



1.4.1 Effective communication and escalation in emergencies

Effective communication during an obstetric emergency relies on clear, structured handover, commonly using a format such as SBAR (situation, background, assessment, recommendation), ensuring that critical information is conveyed accurately and efficiently between team members and across shift changes, particularly important in a fast-moving emergency where information may otherwise be lost, distorted, or delayed as it passes between multiple individuals.

Closed-loop communication (in which an instruction is explicitly acknowledged and confirmed as completed by the person carrying it out) reduces the risk of a critical action being missed, forgotten, or duplicated during the inherent confusion of a genuine emergency, and should be actively practised and reinforced as a routine team behaviour during training and drills, not simply expected to emerge spontaneously under the pressure of a real crisis.

Fill in the blank: SBAR stands for situation, background, assessment, and _____. Closed-loop communication ensures an instruction is explicitly _____ by the person carrying it out.

1.4.2 Simulation and drills in obstetric emergency preparedness

Regular simulation training and multidisciplinary drills for common obstetric emergencies, such as postpartum haemorrhage, shoulder dystocia, and eclampsia, have been shown to improve both individual clinical skill and, critically, overall team performance, communication, and role clarity during a genuine emergency, translating into measurably improved outcomes in units that embed regular, realistic drills into routine practice.

Effective simulation training should closely replicate the physical environment, available equipment, and interprofessional team composition of a genuine emergency, including structured debriefing after each drill to identify both what went well and specific, actionable areas for improvement, as debriefing without this structured, constructive focus offers considerably less genuine learning value than a well-facilitated, deliberately reflective session.

Fill in the blank: Regular simulation training and multidisciplinary drills improve individual skill and overall team performance, communication, and role _____. Effective simulation should closely replicate the physical environment, equipment, and _____ team composition of a genuine emergency.

1.4.3 Documentation and debriefing after an emergency

Contemporaneous, accurate documentation during and immediately after an obstetric emergency is essential, recording the timeline of events, clinical findings, interventions performed and their timing, and the individuals involved, both to support ongoing clinical care and because such records may later be required for clinical governance review, audit, or, occasionally, legal proceedings arising from the event.

Structured post-event debriefing with the involved clinical team, ideally conducted within a short period after the event while recollection remains accurate, serves both an educational



function (identifying genuine learning points for individual and system improvement) and a psychological support function for staff involved in a genuinely difficult or traumatic emergency, with hot debriefing (immediately after the event) and cold debriefing (at a later, more reflective point) each serving a distinct and complementary purpose.

Fill in the blank: Contemporaneous documentation should record the timeline of events, clinical findings, and interventions performed and their _____. Post-event debriefing serves both an educational function and a psychological _____ function for involved staff.

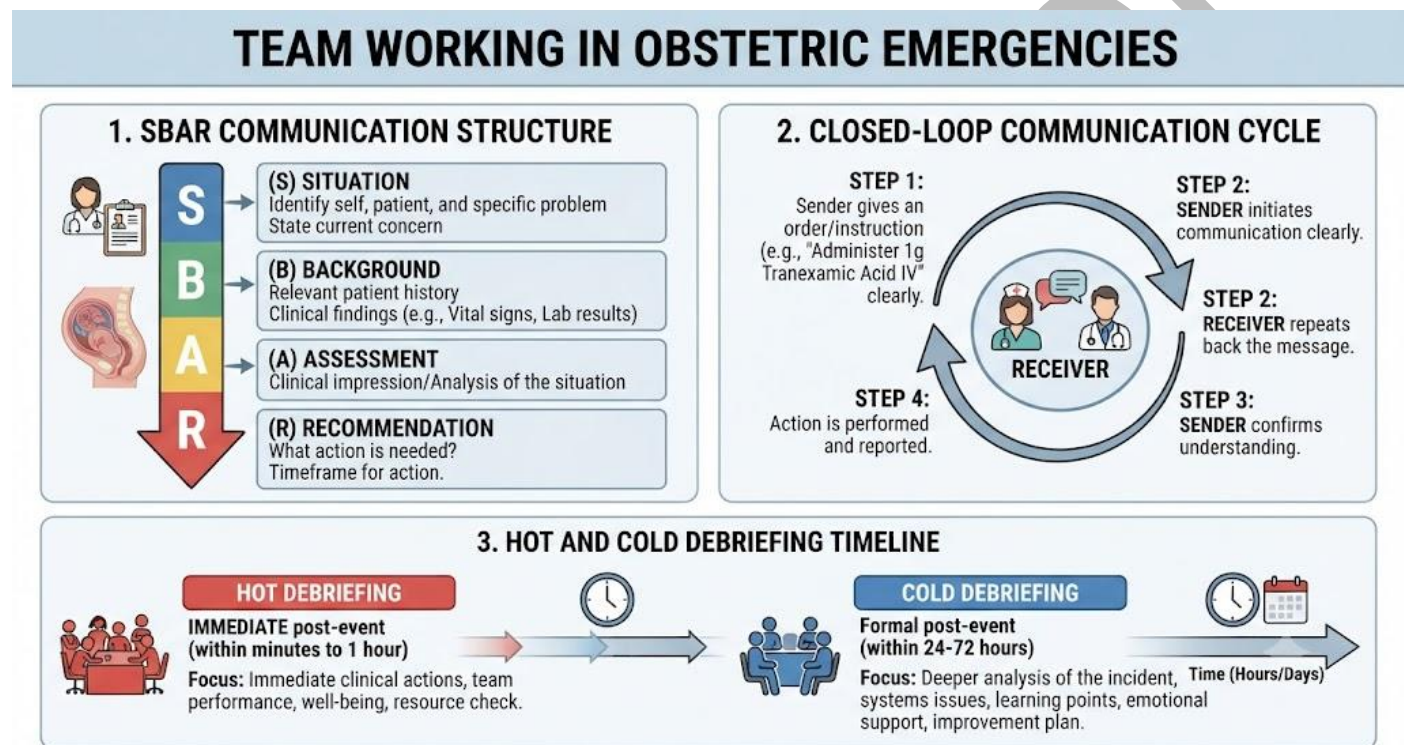


Figure 1.4: SBAR communication, closed-loop communication, and the debriefing timeline after an obstetric emergency.

Pilot questions 1.4

1. Describe the SBAR framework for structured communication in emergencies. (Linked to SLO 1.6)
2. Explain the purpose and value of closed-loop communication. (Linked to SLO 1.6)
3. Describe the value of regular simulation training and multidisciplinary drills. (Linked to SLO 1.6)
4. Describe the components of effective post-event debriefing. (Linked to SLO 1.6)
5. Explain the importance of contemporaneous documentation during and after an obstetric emergency. (Linked to SLO 1.6)



lanetonline.com



Series Summary

This Series has covered the recognition of the critically ill obstetric and gynaecological patient, including early warning scores and effective triage, followed by the ABCDE approach to resuscitation with its important pregnancy-specific considerations. It went on to examine shock and fluid resuscitation, including the principles of blood and blood product transfusion, before concluding with team working, communication, and the systems, including simulation training and debriefing, that support safe, effective emergency care.

You should now be able to describe how the physiological changes of pregnancy affect recognition of critical illness, describe the principles of triage and initial assessment, demonstrate the ABCDE approach to resuscitation, classify shock and describe fluid and blood product resuscitation, and describe the role of effective teamwork and systems in emergency care (Linked to SLOs 1.1 to 1.6).

Glossary of Terms

- **Aortocaval compression:** compression of the aorta and inferior vena cava by the gravid uterus in the supine position, reducing venous return and cardiac output.
- **Closed-loop communication:** a communication technique in which an instruction is explicitly acknowledged and confirmed as completed by the person carrying it out.
- **Hypovolaemic shock:** shock resulting from inadequate circulating blood volume, most commonly from haemorrhage.
- **MEOWS:** modified early obstetric warning score, a structured tool tracking physiological parameters to trigger escalation in pregnancy.
- **Physiological reserve:** the capacity of the body to compensate for physiological insult before overt clinical signs of compromise appear.
- **SBAR:** situation, background, assessment, recommendation, a structured framework for clinical handover and communication.
- **Major haemorrhage protocol:** a pre-defined institutional protocol providing balanced ratios of blood products in significant haemorrhage.
- **Hot debriefing:** a debriefing conducted immediately after a clinical event, while recollection remains accurate.
- **Cold debriefing:** a debriefing conducted at a later, more reflective point after a clinical event.
- **Dilutional coagulopathy:** impaired blood clotting resulting from excessive crystalloid fluid administration diluting clotting factors.



- **AVPU scale:** a rapid assessment of conscious level: alert, responds to voice, responds to pain, unresponsive.
- **Uncross-matched blood:** blood, typically group O rhesus-negative, given in life-threatening haemorrhage before formal cross-matching is complete.

Concept Check Questions [Series 1]

Objective questions

1. Because of physiological reserve, a low threshold for concern and _____ is essential in obstetric emergencies.
2. Aortocaval compression is addressed by positioning the woman in a _____ lateral tilt.
3. In the pregnant patient, _____ is a comparatively late, more ominous sign of shock than tachycardia.
4. Where cross-matched blood is unavailable in life-threatening haemorrhage, group O rhesus-_____ blood should be given.
5. SBAR stands for situation, background, assessment, and _____.

Short-answer questions

6. Describe the purpose and parameters of a modified early obstetric warning score. (Linked to SLO 1.1)
7. Explain why airway management can be more challenging in pregnancy. (Linked to SLO 1.3)
8. Explain why excessive crystalloid administration should be avoided in significant obstetric haemorrhage. (Linked to SLO 1.4)
9. Describe the principles of blood and blood product transfusion in major obstetric haemorrhage. (Linked to SLO 1.5)
10. Explain the purpose and value of closed-loop communication. (Linked to SLO 1.6)

Long-answer questions

11. Explain why the physiological changes of pregnancy can mask early signs of critical illness, and describe the role of early warning scores. (Linked to SLO 1.1)
12. Describe the ABCDE approach to resuscitation with specific pregnancy-related considerations. (Linked to SLO 1.3)



13. Classify shock and describe the principles of fluid and blood product resuscitation. (Linked to SLO 1.4, SLO 1.5)
14. Describe the principles of effective communication and escalation during an obstetric emergency. (Linked to SLO 1.6)
15. Describe the value of simulation training, drills, and post-event debriefing in emergency preparedness. (Linked to SLO 1.6)

Answers to Concept Check Questions [Series 1]

Objective questions

1. Escalation.
2. Left.
3. Hypotension.
4. Negative.
5. Recommendation.

Short-answer questions

6. It tracks heart rate, blood pressure, respiratory rate, oxygen saturation, temperature, and consciousness, triggering a standardised escalation response when abnormal.
7. Increased mucosal vascularity and oedema, and reduced functional residual capacity, mean a pregnant woman desaturates more rapidly during inadequate oxygenation.
8. Excessive crystalloid can cause dilutional coagulopathy, worsening rather than improving the underlying bleeding problem.
9. Major haemorrhage protocols provide pre-defined balanced ratios of red cells, fresh frozen plasma, and platelets rather than red cells alone.
10. It ensures an instruction is explicitly acknowledged and confirmed as completed, reducing the risk of a critical action being missed or duplicated.

Long-answer questions



11. **Basic response:** Pregnancy's physiological adaptations can mask early critical illness, so early warning scores adapted for pregnancy trigger standardised escalation when abnormal parameters appear.

Value-added response: A low threshold for concern, rather than reassurance from near-normal observations, is essential given the substantial physiological reserve of pregnancy.

12. **Basic response:** The ABCDE approach assesses airway, breathing, circulation, disability, and exposure in sequence, with pregnancy-specific considerations at each step.

Value-added response: Left lateral tilt addresses aortocaval compression, and pregnant women desaturate more rapidly, both important pregnancy-specific modifications to standard resuscitation.

13. **Basic response:** Shock is classified by mechanism, with tachycardia often the earliest sign in pregnancy, managed initially with warmed crystalloid fluid resuscitation.

Value-added response: Balanced blood product transfusion via major haemorrhage protocols, rather than crystalloid or red cells alone, improves outcomes in major obstetric haemorrhage.

Answers to Pilot Questions [Series 1]

Part 1.1

1. Increased heart rate and cardiac output and lower blood pressure mean significant blood loss can occur before vital signs become abnormal.
2. The body can compensate for significant physiological insult before overt signs appear, meaning apparently reassuring observations can be misleading.
3. MEOWS tracks heart rate, blood pressure, respiratory rate, oxygen saturation, temperature, and consciousness, adapted for pregnancy's altered normal ranges.
4. It provides a standardised, structured escalation pathway, ensuring any team member can escalate concern promptly regardless of individual confidence.
5. Rapid, structured assessment prioritising life-threatening features over detailed history, with senior staff mobilised early and in parallel.

Part 1.2

1. Airway assessment for patency, using simple manoeuvres if needed, followed by breathing assessment including rate, saturation, and chest movement.



2. Increased mucosal vascularity and oedema, and reduced functional residual capacity, cause more rapid desaturation in pregnancy.
3. Pulse, blood pressure, capillary refill, skin colour and temperature, and estimated blood loss, with prompt intravenous access.
4. The gravid uterus compresses the aorta and vena cava in the supine position, managed with left lateral tilt or manual uterine displacement.
5. Disability assesses conscious level and glucose; exposure involves full examination for concealed bleeding while maintaining warmth and dignity.

Part 1.3

1. Hypovolaemic, septic, cardiogenic, and anaphylactic or neurogenic shock, classified by underlying mechanism.
2. Pregnancy's physiological reserve means hypotension only develops once compensatory mechanisms have already begun to fail.
3. Rapid warmed crystalloid through wide-bore access, with response assessed to guide further fluid or escalation to blood products.
4. Large-volume crystalloid can cause dilutional coagulopathy, worsening rather than improving ongoing haemorrhage.
5. Major haemorrhage protocols provide balanced ratios of red cells, plasma, and platelets, with uncross-matched blood given if life-threatening and cross-matched blood unavailable.

Part 1.4

1. Situation, background, assessment, and recommendation, ensuring accurate, efficient information transfer between team members.
2. It confirms an instruction has been acknowledged and completed, reducing the risk of a critical action being missed or duplicated.
3. They improve individual skill and team performance, communication, and role clarity, translating into improved real-world outcomes.
4. Structured debriefing after an event identifies what went well and specific improvement points, serving both educational and psychological support functions.
5. Accurate records support ongoing care and may be required for clinical governance review, audit, or legal proceedings arising from the event.



lanetonline.com



References and Attributions [Series 1]

Textual References

- Cunningham, F. G., Leveno, K. J., Dashe, J. S. et al. (2022). Williams Obstetrics (26th ed.). McGraw Hill.
- Resuscitation Council UK (2021). Adult Advanced Life Support Guidelines. Resuscitation Council UK.
- Royal College of Obstetricians and Gynaecologists (2019). Maternal Collapse in Pregnancy and the Puerperium: Green-top Guideline No. 56. RCOG Press.
- Knight, M., Bunch, K., Tuffnell, D. et al. (Eds.) (2021). Saving Lives, Improving Mothers' Care: MBRRACE-UK Confidential Enquiry into Maternal Deaths. National Perinatal Epidemiology Unit.

Figures, Plates, Tables, and Boxes

- Box 1.1: Parameters and example trigger thresholds of a modified early obstetric warning score. AI-generated using the prompt: "Create a simple single-column reference box with an outside border titled Modified Early Obstetric Warning Score, listing tracked parameters and example trigger thresholds. Clinical reference box style."
- Figure 1.2: The ABCDE approach to resuscitation with pregnancy-specific considerations. AI-generated using the prompt: "Create a professional medical diagram titled The ABCDE Approach in Obstetric Resuscitation, showing the sequential steps with pregnancy-specific considerations noted at each stage. Clean clinical educational diagram style."
- Table 1.3: Classification of hypovolaemic shock by estimated blood loss and clinical signs. AI-generated using the prompt: "Create a clean reference table titled Classification of Hypovolaemic Shock, listing stages by blood loss percentage and corresponding clinical signs. Simple clinical reference table style with outside border."
- Figure 1.4: SBAR communication, closed-loop communication, and the debriefing timeline after an obstetric emergency. AI-generated using the prompt: "Create a professional medical diagram titled Team Working in Obstetric Emergencies, showing SBAR structure, closed-loop communication, and the hot and cold debriefing timeline. Clean clinical educational diagram style."



Series 2: Ectopic Pregnancy and Miscarriage Emergencies

- **Part 2.1: Ectopic Pregnancy: Definition, Sites, and Risk Factors**
 - Sub Part 2.1.1: Definition and sites of ectopic pregnancy
 - Sub Part 2.1.2: Risk factors for ectopic pregnancy
 - Sub Part 2.1.3: Pathophysiology of tubal ectopic pregnancy
- **Part 2.2: Ectopic Pregnancy: Clinical Features and Investigation**
 - Sub Part 2.2.1: Clinical features of unruptured ectopic pregnancy
 - Sub Part 2.2.2: Clinical features of ruptured ectopic pregnancy
 - Sub Part 2.2.3: Investigation of suspected ectopic pregnancy
- **Part 2.3: Management of Ectopic Pregnancy**
 - Sub Part 2.3.1: Expectant and medical management of ectopic pregnancy
 - Sub Part 2.3.2: Surgical and laparoscopic management of ectopic pregnancy
 - Sub Part 2.3.3: Emergency management of ruptured ectopic pregnancy
- **Part 2.4: Miscarriage Emergencies**
 - Sub Part 2.4.1: Classification of miscarriage
 - Sub Part 2.4.2: Incomplete miscarriage and its management
 - Sub Part 2.4.3: Emergency management of miscarriage-related haemorrhage and sepsis

Introduction

In the last Series, we laid the foundations of emergency resuscitation, the principles of recognising and stabilising the critically unwell patient. We now apply those foundations to two of the most common gynaecological emergencies you will encounter: ectopic pregnancy and miscarriage. Both can present anywhere on a spectrum from a woman quietly worried about early bleeding to a woman collapsed in haemorrhagic shock, and knowing how to recognise, investigate, and manage both ends of that spectrum is a genuinely life-saving skill.



The aim of this Series is to equip you with the knowledge to define, recognise, investigate, and manage ectopic pregnancy and miscarriage, including their emergency presentations.

We shall commence this Series by examining the definition, sites, and risk factors of ectopic pregnancy. Next, we will consider its clinical features, both unruptured and ruptured, and the investigations used to reach a diagnosis. Following that, our attention turns to the medical, surgical, and laparoscopic management of ectopic pregnancy, including its emergency presentation. Finally, we will conclude by examining miscarriage emergencies, including the classification and management of incomplete miscarriage.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 2.1:** define ectopic pregnancy and describe its sites,
- **SLO 2.2:** list the risk factors of ectopic pregnancy,
- **SLO 2.3:** describe the clinical features of unruptured ectopic pregnancy,
- **SLO 2.4:** describe the clinical features of ruptured ectopic pregnancy,
- **SLO 2.5:** list the investigations of patients with ectopic pregnancy,
- **SLO 2.6:** explain the medical, surgical, and laparoscopic treatment of ectopic pregnancy, and
- **SLO 2.7:** classify miscarriage and describe the management of incomplete miscarriage.

2.1 Ectopic Pregnancy: Definition, Sites, and Risk Factors

2.1.1 Definition and sites of ectopic pregnancy

Ectopic pregnancy is defined as implantation of a fertilised ovum at any site outside the normal endometrial cavity of the uterus, an important and potentially life-threatening obstetric emergency because the implantation site cannot support the progressive growth of the developing pregnancy, ultimately risking rupture and life-threatening intra-abdominal haemorrhage if the pregnancy is not identified and appropriately managed before this occurs.

The overwhelming majority of ectopic pregnancies implant within the fallopian tube, most commonly the ampulla, followed by the isthmus, fimbrial end, and interstitial (cornual) portion, with rarer, non-tubal sites including the ovary, cervix, and, most dangerously, the abdominal cavity or a caesarean section scar, each with its own distinct clinical features, diagnostic



challenges, and specific management considerations that distinguish it from the more typical tubal presentation.

Fill in the blank: Ectopic pregnancy is implantation of a fertilised ovum outside the normal _____ cavity of the uterus. The most common single site of ectopic pregnancy is the _____ of the fallopian tube.

2.1.2 Risk factors for ectopic pregnancy

The principal risk factors for ectopic pregnancy relate to prior damage or dysfunction of the fallopian tube, including previous pelvic inflammatory disease (particularly from chlamydial infection, which can cause tubal scarring even when the original infection was mild or entirely asymptomatic), previous ectopic pregnancy (conferring a substantially increased risk of recurrence), previous tubal surgery, and the presence of an intrauterine device, which reduces the overall chance of any pregnancy but increases the relative proportion of pregnancies that occur that are ectopic.

Additional recognised risk factors include smoking (through impaired ciliary function and tubal motility), assisted reproduction techniques such as in vitro fertilisation, and increasing maternal age, though it is important to recognise that a substantial proportion of women who develop an ectopic pregnancy have no identifiable risk factor at all, meaning that a normal risk factor history should never be used to lower clinical suspicion in a woman presenting with symptoms genuinely suggestive of ectopic pregnancy.

Fill in the blank: Previous pelvic inflammatory disease, particularly from _____ infection, is a principal risk factor for ectopic pregnancy. A substantial proportion of women with ectopic pregnancy have no identifiable _____ factor at all.

2.1.3 Pathophysiology of tubal ectopic pregnancy

In a tubal ectopic pregnancy the trophoblast invades the thin, poorly distensible wall of the fallopian tube in a manner analogous to normal implantation within the uterine endometrium, but without the specialised decidual reaction and structural capacity of the endometrium to accommodate this invasion and the progressive growth of the developing pregnancy, meaning the tubal wall is eventually breached as the pregnancy continues to grow.

The eventual outcome of an untreated tubal ectopic pregnancy is either tubal rupture, causing sudden, often severe intraperitoneal haemorrhage as the trophoblast erodes through the tubal wall and into adjacent blood vessels, or tubal miscarriage, in which the pregnancy separates and is expelled from the fimbrial end of the tube into the peritoneal cavity, a process that can itself cause significant bleeding, though generally less acute and dramatic than frank tubal rupture.

Fill in the blank: In tubal ectopic pregnancy, the trophoblast invades the tubal wall without the specialised _____ reaction present in the uterine endometrium. Tubal rupture causes sudden intraperitoneal _____ as the tubal wall is breached.



SITES OF ECTOPIC PREGNANCY

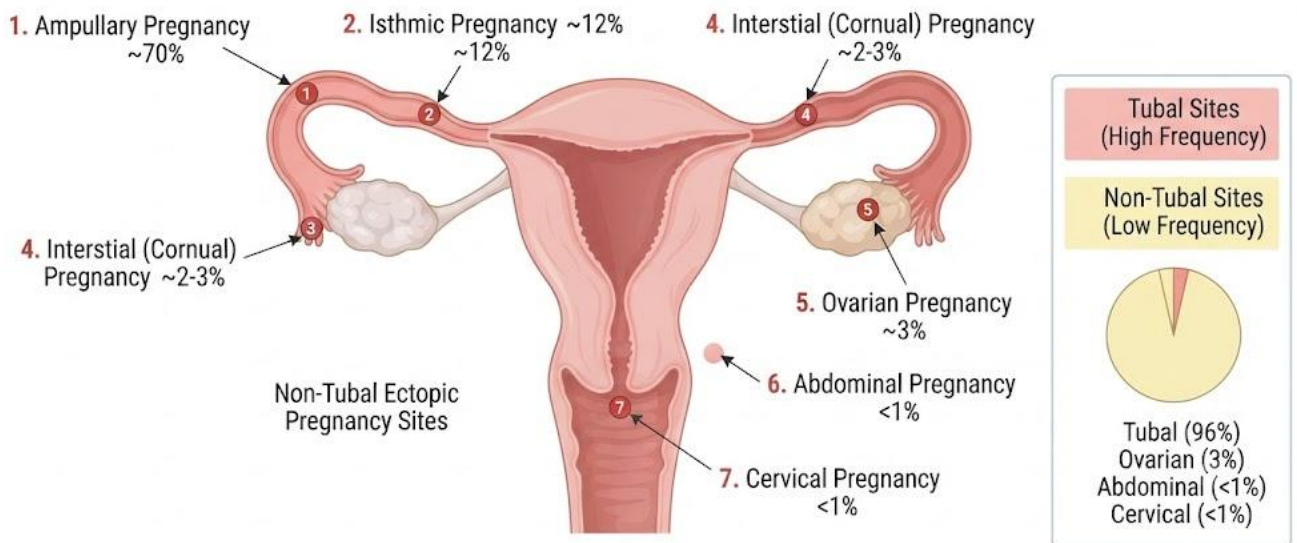


Figure 2.1: Sites of ectopic pregnancy and their relative frequency.

Pilot questions 2.1

- Define ectopic pregnancy. (Linked to SLO 2.1)
- List the sites of ectopic pregnancy in order of relative frequency. (Linked to SLO 2.1)
- List the risk factors for ectopic pregnancy. (Linked to SLO 2.2)
- Explain why a normal risk factor history should not lower clinical suspicion of ectopic pregnancy. (Linked to SLO 2.2)
- Describe the pathophysiology of tubal ectopic pregnancy and its possible outcomes. (Linked to SLO 2.1)

2.2 Ectopic Pregnancy: Clinical Features and Investigation

2.2.1 Clinical features of unruptured ectopic pregnancy

An unruptured ectopic pregnancy classically presents with the triad of amenorrhoea, lower abdominal or pelvic pain (often unilateral, though this is not a reliable distinguishing feature), and vaginal bleeding, usually light and dark in colour, though presentation can be highly variable, and a significant proportion of women present with atypical or minimal symptoms,



making a high index of suspicion essential in any woman of reproductive age with a positive pregnancy test and any degree of pain or bleeding.

Examination findings in an unruptured ectopic pregnancy may be entirely unremarkable, or may reveal mild lower abdominal tenderness, with cervical excitation and adnexal tenderness on bimanual examination sometimes present, though a palpable adnexal mass is identified in only a minority of cases and its absence should never be used to exclude the diagnosis in a woman with a suggestive history and positive pregnancy test.

Fill in the blank: The classic triad of unruptured ectopic pregnancy is amenorrhoea, pelvic pain, and vaginal _____. A palpable adnexal mass is identified in only a _____ of cases and its absence should not exclude the diagnosis.

2.2.2 Clinical features of ruptured ectopic pregnancy

Ruptured ectopic pregnancy presents with sudden, severe abdominal pain, often accompanied by shoulder tip pain (from diaphragmatic irritation by intraperitoneal blood), and features of haemodynamic compromise including tachycardia, hypotension, dizziness, or collapse, representing a genuine gynaecological emergency requiring immediate recognition and resuscitation, with any delay in diagnosis and treatment directly increasing the risk of life-threatening haemorrhage.

Examination findings in ruptured ectopic pregnancy typically reveal marked abdominal tenderness with signs of peritonism, cervical excitation, and, in significant haemoperitoneum, signs of hypovolaemic shock, and any woman of reproductive age presenting with collapse and a positive pregnancy test should be assumed to have a ruptured ectopic pregnancy until proven otherwise, with immediate resuscitation and urgent surgical assessment initiated without delay for further confirmatory investigation.

Fill in the blank: Shoulder tip pain in ruptured ectopic pregnancy results from _____ irritation by intraperitoneal blood. Any woman of reproductive age presenting with collapse and a positive pregnancy test should be assumed to have a _____ ectopic pregnancy until proven otherwise.

2.2.3 Investigation of suspected ectopic pregnancy

Serum beta-human chorionic gonadotropin (beta-hCG) combined with transvaginal ultrasound forms the cornerstone of investigation in a haemodynamically stable woman with suspected ectopic pregnancy, with a beta-hCG level above the discriminatory zone (typically around 1500 to 2000 IU per litre) without a visible intrauterine pregnancy on transvaginal ultrasound being strongly suggestive of ectopic pregnancy, though serial beta-hCG measurement over 48 hours is often required when the initial picture remains equivocal.

In a normal, viable intrauterine pregnancy beta-hCG typically rises by at least 63 percent over 48 hours, whereas a suboptimal rise, plateau, or fall in serial beta-hCG measurement, in the absence of a visible intrauterine pregnancy, raises significant concern for either ectopic



pregnancy or a failing intrauterine pregnancy, with the specific pattern of change, combined with ultrasound findings, together guiding the diagnostic pathway and the timing of further intervention.

Fill in the blank: A beta-hCG level above the discriminatory zone without a visible intrauterine pregnancy on ultrasound is strongly suggestive of _____ pregnancy. In a normal viable intrauterine pregnancy, beta-hCG typically rises by at least _____ percent over 48 hours.

Feature	Unruptured Ectopic Pregnancy	Ruptured Ectopic Pregnancy
Symptom Onset	Gradual onset, often mild or intermittent	Sudden, severe onset
Pain Character	Localized pelvic or abdominal pain	Sharp, generalized abdominal pain, shoulder-tip pain (due to diaphragmatic irritation)
Examination Findings	Adnexal tenderness, possible palpable mass	Abdominal rigidity, rebound tenderness, signs of peritonitis
Haemodynamic Status	Usually stable	Hypotension, tachycardia, shock due to intra-abdominal bleeding

Table 2.2: Comparison of unruptured and ruptured ectopic pregnancy.

Pilot questions 2.2

1. Describe the classic triad of symptoms of unruptured ectopic pregnancy. (Linked to SLO 2.3)
2. Describe the examination findings that may be present in unruptured ectopic pregnancy. (Linked to SLO 2.3)
3. Describe the clinical features of ruptured ectopic pregnancy. (Linked to SLO 2.4)
4. Explain the mechanism of shoulder tip pain in ruptured ectopic pregnancy. (Linked to SLO 2.4)
5. Describe the investigations used in a haemodynamically stable woman with suspected ectopic pregnancy. (Linked to SLO 2.5)

2.3 Management of Ectopic Pregnancy

2.3.1 Expectant and medical management of ectopic pregnancy

Expectant management (careful observation with serial beta-hCG monitoring rather than immediate intervention) is a reasonable option for a carefully selected, haemodynamically stable,



asymptomatic woman with a low and declining beta-hCG level and no visible mass on ultrasound, reflecting the recognition that a meaningful proportion of very early ectopic pregnancies will resolve spontaneously without the need for medical or surgical intervention.

Medical management with intramuscular methotrexate (a folate antagonist that halts trophoblastic cell division) is suitable for a haemodynamically stable woman with a small, unruptured ectopic pregnancy, no significant pain, and a beta-hCG below a defined threshold, generally around 5000 IU per litre, with success monitored by serial beta-hCG measurement, and surgical intervention reserved for cases where the beta-hCG fails to fall adequately or the woman develops symptoms suggestive of rupture during treatment.

Fill in the blank: Methotrexate is a folate antagonist that halts _____ cell division. Medical management with methotrexate is generally suitable for a beta-hCG below approximately _____ IU per litre.

2.3.2 Surgical and laparoscopic management of ectopic pregnancy

Surgical management of ectopic pregnancy is indicated for haemodynamic instability, significant pain, a large ectopic mass, a high beta-hCG level unsuitable for medical management, or failed medical management, with laparoscopic surgery the preferred approach in a haemodynamically stable woman, offering shorter hospital stay, less postoperative pain, and faster recovery compared with open laparotomy.

Salpingectomy (removal of the affected fallopian tube) versus salpingotomy (incision of the tube to remove the ectopic pregnancy while preserving the tube itself) is chosen according to the condition of the contralateral tube, the woman's future fertility wishes, and the specific findings at surgery, with salpingectomy generally preferred when the contralateral tube is healthy, given the small but recognised risk of persistent trophoblastic tissue and future ectopic pregnancy in the retained tube after salpingotomy.

Fill in the blank: The preferred surgical approach for a haemodynamically stable woman with ectopic pregnancy is _____ surgery. Removal of the affected fallopian tube is called _____, while incision to preserve the tube is called salpingotomy.

2.3.3 Emergency management of ruptured ectopic pregnancy

Ruptured ectopic pregnancy with haemodynamic instability is a genuine gynaecological emergency, managed according to the ABCDE resuscitation principles introduced earlier in this course, with immediate wide-bore intravenous access, aggressive fluid and blood product resuscitation, and urgent transfer to theatre for emergency laparotomy or laparoscopy, without delay for further confirmatory investigation once the diagnosis is strongly suspected on clinical grounds.

At emergency surgery the priority is rapid control of bleeding, most commonly by salpingectomy of the ruptured tube, with the surgical team prepared for the possibility of significant intra-abdominal haemorrhage and the corresponding need for cell salvage or blood



transfusion, and close, ongoing communication between the surgical and anaesthetic teams throughout the procedure essential to match resuscitation to the pace and severity of ongoing blood loss.

Fill in the blank: Ruptured ectopic pregnancy with haemodynamic instability is managed without delay for further _____ investigation once strongly suspected clinically. At emergency surgery, the priority is rapid control of _____, most commonly by salpingectomy.

Approach	Eligibility Criteria
<u>Expectant Management</u>	Asymptomatic, haemodynamically stable, small ectopic mass (<3 cm), declining serum hCG, reliable follow-up possible.
<u>Medical Management</u>	Haemodynamically stable, no contraindications to methotrexate, ectopic mass <3.5 cm, no fetal cardiac activity, serum hCG usually <5000 IU/L.
<u>Surgical Management</u>	Haemodynamic instability, contraindications to methotrexate, large or ruptured ectopic, persistent pain, unreliable follow-up, or failed medical/expectant management.

Box 2.3: Criteria for expectant, medical, and surgical management of ectopic pregnancy.

Pilot questions 2.3

1. Describe the criteria for expectant management of ectopic pregnancy. (Linked to SLO 2.6)
2. Describe the mechanism of action and criteria for methotrexate treatment of ectopic pregnancy. (Linked to SLO 2.6)
3. Compare salpingectomy and salpingotomy in the surgical management of ectopic pregnancy. (Linked to SLO 2.6)
4. Describe the indications for surgical management of ectopic pregnancy. (Linked to SLO 2.6)
5. Describe the emergency management of a haemodynamically unstable ruptured ectopic pregnancy. (Linked to SLO 2.6)

2.4 Miscarriage Emergencies

2.4.1 Classification of miscarriage

Miscarriage (spontaneous loss of a pregnancy before viability, generally before 24 weeks of gestation) is classified according to clinical and ultrasound findings as threatened (bleeding with a closed cervix and a viable intrauterine pregnancy), inevitable (bleeding with an open cervix but



pregnancy tissue not yet passed), incomplete (some but not all pregnancy tissue has been passed), complete (all pregnancy tissue has been passed and the uterus is empty on ultrasound), and missed (the pregnancy has ceased to develop but has not yet been recognised or expelled).

This classification is of considerable practical importance as it directly determines both the urgency and the specific approach to management, with threatened miscarriage generally managed conservatively with reassurance and follow-up, while incomplete miscarriage, discussed further below, carries a particular risk of ongoing bleeding and infection that mandates more active clinical attention and, frequently, intervention.

Fill in the blank: Miscarriage is the spontaneous loss of a pregnancy before viability, generally before _____ weeks of gestation. In a missed miscarriage, the pregnancy has ceased to develop but has not yet been recognised or _____.

2.4.2 Incomplete miscarriage and its management

Incomplete miscarriage presents with vaginal bleeding, often heavy, and lower abdominal pain, with an open cervical os and retained products of conception visible on ultrasound or, sometimes, palpable at or through the cervical os on examination, a finding of particular practical importance, as removal of visible tissue from the cervical os can itself rapidly reduce ongoing bleeding and improve the woman's clinical condition while definitive management is arranged.

Management options for incomplete miscarriage include expectant management (allowing the remaining tissue to pass spontaneously, suitable for a stable woman with light bleeding), medical management with misoprostol (a prostaglandin analogue that stimulates uterine contraction to expel the remaining tissue), and surgical management (evacuation of retained products of conception, indicated for heavy bleeding, haemodynamic instability, or where expectant or medical management has failed).

Fill in the blank: Misoprostol used in medical management of incomplete miscarriage is a _____ analogue that stimulates uterine contraction. Surgical management of incomplete miscarriage is termed evacuation of retained products of _____.

2.4.3 Emergency management of miscarriage-related haemorrhage and sepsis

Heavy bleeding associated with miscarriage can occasionally be genuinely life-threatening, particularly when substantial retained tissue is present, and is managed with the same fundamental resuscitation principles applied to any significant obstetric haemorrhage, including intravenous access, fluid and, where needed, blood product resuscitation, and urgent surgical evacuation to remove the retained tissue and achieve definitive control of bleeding without unnecessary delay.

Infection complicating miscarriage (most commonly associated with retained products of conception acting as a nidus for ascending infection) presents with fever, offensive vaginal discharge, and lower abdominal pain, and, if not promptly recognised and treated with appropriate broad-spectrum antibiotics alongside evacuation of any retained tissue, carries



genuine risk of progression to severe sepsis, a serious and largely preventable complication explored in greater depth in the next Series of this course.

Fill in the blank: Heavy bleeding from miscarriage with substantial retained tissue requires urgent surgical _____ to achieve definitive control. Infection complicating miscarriage presents with fever, offensive discharge, and, if untreated, risks progression to severe _____.

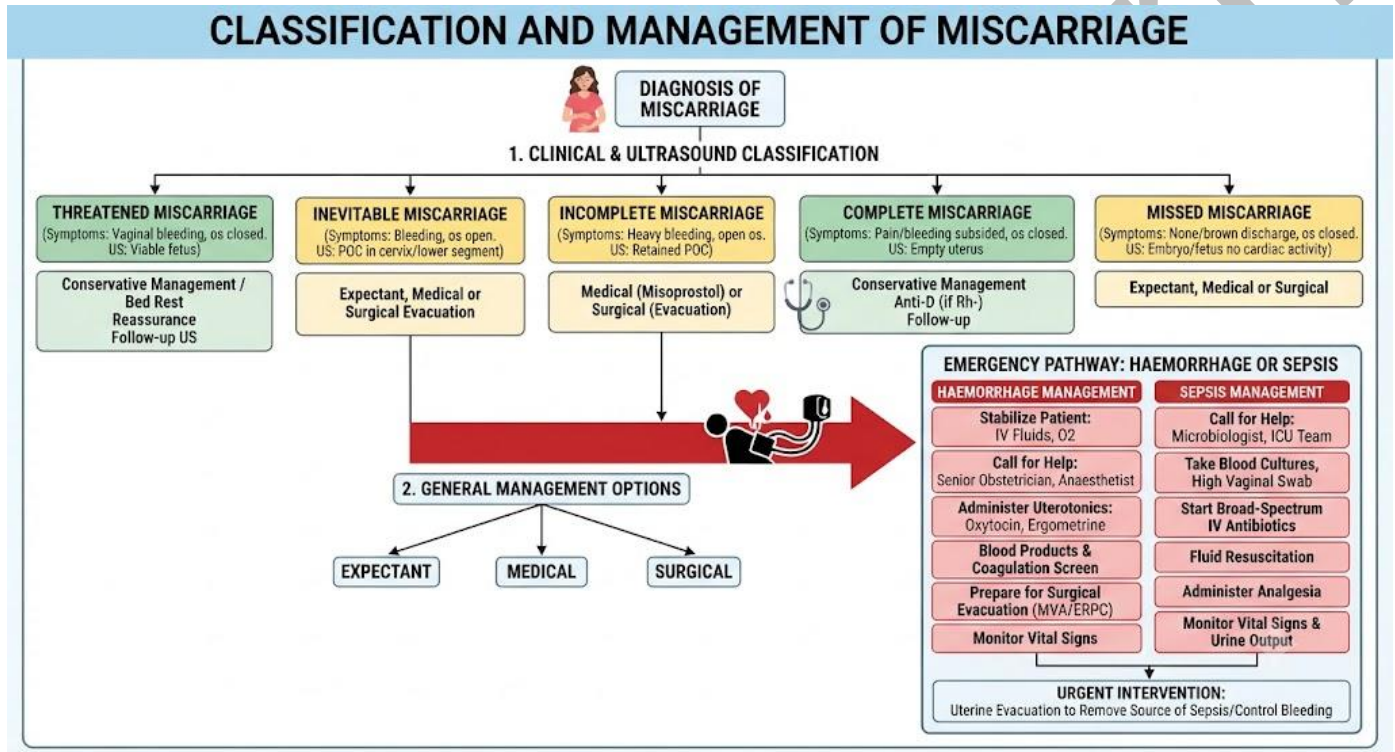


Figure 2.4: Classification of miscarriage and the emergency management pathway for haemorrhage and sepsis.

Pilot questions 2.4

1. Classify miscarriage by clinical and ultrasound findings. (Linked to SLO 2.7)
2. Describe the presentation of incomplete miscarriage. (Linked to SLO 2.7)
3. Describe the management options for incomplete miscarriage. (Linked to SLO 2.7)
4. Describe the emergency management of significant haemorrhage from miscarriage. (Linked to SLO 2.7)
5. Describe the presentation and risk of infection complicating miscarriage. (Linked to SLO 2.7)



Series Summary

This Series has covered the definition, sites, and risk factors of ectopic pregnancy, followed by its clinical features, both unruptured and ruptured, and the investigations used to reach a diagnosis. It went on to examine the medical, surgical, and laparoscopic management of ectopic pregnancy, including its emergency presentation, before concluding with miscarriage emergencies, including the classification and management of incomplete miscarriage and its complications.

You should now be able to define ectopic pregnancy and describe its sites and risk factors, describe the clinical features of unruptured and ruptured ectopic pregnancy, list the investigations used in its diagnosis, explain its medical, surgical, and laparoscopic treatment, and classify and manage miscarriage, including incomplete miscarriage (Linked to SLOs 2.1 to 2.7).

Glossary of Terms

1. **Beta-hCG:** beta-human chorionic gonadotropin, a hormone measured in serum to diagnose and monitor pregnancy, including ectopic pregnancy.
2. **Discriminatory zone:** the beta-hCG threshold above which an intrauterine pregnancy should be visible on transvaginal ultrasound if present.
3. **Ectopic pregnancy:** implantation of a fertilised ovum at any site outside the normal endometrial cavity of the uterus.
4. **Incomplete miscarriage:** miscarriage in which some but not all pregnancy tissue has been passed.
5. **Methotrexate:** a folate antagonist used in the medical management of suitable ectopic pregnancies, halting trophoblastic cell division.
6. **Misoprostol:** a prostaglandin analogue used in the medical management of miscarriage, stimulating uterine contraction.
7. **Salpingectomy:** surgical removal of the affected fallopian tube in the management of ectopic pregnancy.
8. **Salpingotomy:** surgical incision of the fallopian tube to remove an ectopic pregnancy while preserving the tube.
9. **Shoulder tip pain:** pain referred to the shoulder from diaphragmatic irritation, a feature of ruptured ectopic pregnancy.
10. **Threatened miscarriage:** vaginal bleeding with a closed cervix and a viable intrauterine pregnancy on ultrasound.



11. **Tubal rupture:** breach of the fallopian tube wall by an invading ectopic pregnancy, causing intraperitoneal haemorrhage.
12. **Evacuation of retained products of conception:** surgical removal of retained pregnancy tissue from the uterus after miscarriage.

Concept Check Questions [Series 2]

Objective questions

- The most common single site of ectopic pregnancy is the _____ of the fallopian tube.
- A palpable adnexal mass is identified in only a _____ of cases of unruptured ectopic pregnancy.
- Shoulder tip pain in ruptured ectopic pregnancy results from _____ irritation by intraperitoneal blood.
- Methotrexate is a folate antagonist that halts _____ cell division.
- Misoprostol used in the management of incomplete miscarriage is a _____ analogue.

Short-answer questions

1. Explain why a normal risk factor history should not lower clinical suspicion of ectopic pregnancy. (Linked to SLO 2.2)
2. Describe the classic triad of symptoms of unruptured ectopic pregnancy. (Linked to SLO 2.3)
3. Describe the investigations used in a haemodynamically stable woman with suspected ectopic pregnancy. (Linked to SLO 2.5)
4. Compare salpingectomy and salpingotomy in the surgical management of ectopic pregnancy. (Linked to SLO 2.6)
5. Describe the management options for incomplete miscarriage. (Linked to SLO 2.7)

Long-answer questions



6. Define ectopic pregnancy, describe its sites, and list its risk factors. (Linked to SLO 2.1, SLO 2.2)
7. Describe the clinical features of unruptured and ruptured ectopic pregnancy. (Linked to SLO 2.3, SLO 2.4)
8. Describe the investigation of suspected ectopic pregnancy. (Linked to SLO 2.5)
9. Describe the medical, surgical, and laparoscopic management of ectopic pregnancy, including emergency management. (Linked to SLO 2.6)
10. Classify miscarriage and describe the management of incomplete miscarriage and its complications. (Linked to SLO 2.7)

Answers to Concept Check Questions [Series 2]

Objective questions

11. Ampulla.
12. Minority.
13. Diaphragmatic.
14. Trophoblastic.
15. Prostaglandin.

Short-answer questions

16. A substantial proportion of women with ectopic pregnancy have no identifiable risk factor, so a normal history should never lower clinical suspicion.
17. Amenorrhoea, lower abdominal or pelvic pain, and vaginal bleeding, usually light and dark in colour.
18. Serum beta-hCG combined with transvaginal ultrasound, with serial beta-hCG measurement over 48 hours if the initial picture is equivocal.
19. Salpingectomy removes the tube and is preferred with a healthy contralateral tube; salpingotomy preserves the tube but carries a risk of persistent trophoblastic tissue.



20. Expectant management for light bleeding, medical management with misoprostol, or surgical evacuation for heavy bleeding or failed conservative management.

Long-answer questions

21. **Basic response:** Ectopic pregnancy implants outside the uterine cavity, most commonly in the fallopian tube ampulla, with risk factors relating to tubal damage.

Value-added response: A substantial proportion of women have no identifiable risk factor, so suspicion should not be lowered by a reassuring history alone.

22. **Basic response:** Unruptured ectopic pregnancy presents with amenorrhoea, pain, and bleeding, while ruptured ectopic pregnancy presents with sudden severe pain and shock.

Value-added response: Any woman of reproductive age with collapse and a positive pregnancy test should be assumed to have ruptured ectopic pregnancy until proven otherwise.

23. **Basic response:** Serum beta-hCG and transvaginal ultrasound are the cornerstone investigations, with serial measurement used when the initial picture is equivocal.

Value-added response: Management ranges from expectant and medical treatment to laparoscopic surgery, with emergency laparotomy reserved for haemodynamic instability.

Answers to Pilot Questions [Series 2]

Part 2.1

1. Implantation of a fertilised ovum at any site outside the normal endometrial cavity of the uterus.
2. Ampulla, isthmus, fimbrial end, and interstitial portion of the tube, followed by rarer ovarian, cervical, and abdominal sites.
3. Previous pelvic inflammatory disease, previous ectopic pregnancy, previous tubal surgery, intrauterine device use, smoking, and assisted reproduction.
4. A substantial proportion of women with ectopic pregnancy have no identifiable risk factor, so suspicion should remain high regardless of history.
5. Trophoblast invades the tubal wall without a decidual reaction, eventually causing tubal rupture or tubal miscarriage as the pregnancy grows.



Part 2.2

6. Amenorrhoea, lower abdominal or pelvic pain, and vaginal bleeding, usually light and dark in colour.
7. Mild tenderness, cervical excitation, and adnexal tenderness, though a palpable mass is found in only a minority of cases.
8. Sudden severe abdominal pain, shoulder tip pain, and features of haemodynamic compromise including tachycardia and collapse.
9. Diaphragmatic irritation from intraperitoneal blood refers pain to the shoulder.
10. Serum beta-hCG combined with transvaginal ultrasound, with serial measurement over 48 hours if the picture is equivocal.

Part 2.3

11. A stable, asymptomatic woman with a low, declining beta-hCG and no visible mass on ultrasound.
12. Methotrexate halts trophoblastic cell division; suitable for a small unruptured ectopic with beta-hCG below approximately 5000 IU/L.
13. Salpingectomy removes the tube and is preferred with a healthy contralateral tube; salpingotomy preserves the tube but risks persistent tissue.
14. Haemodynamic instability, significant pain, a large mass, high beta-hCG unsuitable for medical management, or failed medical management.
15. ABCDE resuscitation, wide-bore access, aggressive fluid and blood resuscitation, and urgent surgery without delay for further investigation.

Part 2.4

1. Threatened, inevitable, incomplete, complete, and missed miscarriage, classified by clinical and ultrasound findings.
2. Heavy vaginal bleeding and lower abdominal pain, with an open cervical os and retained tissue visible on ultrasound or at the os.



3. Expectant management, medical management with misoprostol, or surgical evacuation of retained products of conception.
4. The same resuscitation principles as any obstetric haemorrhage, with urgent surgical evacuation to achieve definitive control.
5. Fever, offensive discharge, and abdominal pain from retained tissue acting as a nidus for infection, risking progression to severe sepsis if untreated.

References and Attributions [Series 2]

Textual References

1. Cunningham, F. G., Leveno, K. J., Dashe, J. S. et al. (2022). Williams Obstetrics (26th ed.). McGraw Hill.
2. Royal College of Obstetricians and Gynaecologists (2016). Green-top Guideline No. 21: Diagnosis and Management of Ectopic Pregnancy. RCOG Press.
3. National Institute for Health and Care Excellence (2019). Ectopic Pregnancy and Miscarriage: NICE Guideline NG126. NICE.
4. World Health Organization (2018). Managing Complications in Pregnancy and Childbirth: A Guide for Midwives and Doctors (2nd ed.). WHO Press.

Figures, Plates, Tables, and Boxes

1. Figure 2.1: Sites of ectopic pregnancy and their relative frequency. AI-generated using the prompt: "Create a professional medical diagram titled Sites of Ectopic Pregnancy, showing tubal and non-tubal implantation sites with relative frequency. Clean clinical educational diagram style."
2. Table 2.2: Comparison of unruptured and ruptured ectopic pregnancy. AI-generated using the prompt: "Create a clean reference table titled Unruptured versus Ruptured Ectopic Pregnancy, comparing symptom onset, pain, examination findings, and haemodynamic status. Simple clinical reference table style with outside border."
3. Box 2.3: Criteria for expectant, medical, and surgical management of ectopic pregnancy. AI-generated using the prompt: "Create a simple single-column reference box with an outside border titled Management Options for Ectopic Pregnancy, listing eligibility criteria for expectant, medical, and surgical management. Clinical reference box style."



4. Figure 2.4: Classification of miscarriage and the emergency management pathway for haemorrhage and sepsis. AI-generated using the prompt: "Create a professional medical flowchart titled Classification and Management of Miscarriage, showing the miscarriage types and an emergency management branch for haemorrhage and sepsis. Clean clinical educational diagram style."



Series 3: Septic Abortion and Vaginal Trauma

- **Part 3.1: Septic Abortion: Causes and Pathophysiology**
 - Sub Part 3.1.1: Definition and causes of septic abortion
 - Sub Part 3.1.2: Pathophysiology of septic abortion
 - Sub Part 3.1.3: Clinical features and staging of septic abortion
- **Part 3.2: Septic Abortion: Investigation and Management**
 - Sub Part 3.2.1: Investigation of septic abortion
 - Sub Part 3.2.2: Medical management of septic abortion
 - Sub Part 3.2.3: Surgical management and complications of septic abortion
- **Part 3.3: Vaginal Trauma**
 - Sub Part 3.3.1: Post-coital vaginal laceration
 - Sub Part 3.3.2: Assessment and management of vaginal trauma
 - Sub Part 3.3.3: Obstetric and other causes of genital tract trauma
- **Part 3.4: Bartholin's Cyst and Abscess**
 - Sub Part 3.4.1: Anatomy and pathophysiology of Bartholin's gland disease
 - Sub Part 3.4.2: Clinical features and diagnosis of Bartholin's cyst and abscess
 - Sub Part 3.4.3: Management of Bartholin's cyst and abscess

Introduction

In the last Series, we explored ectopic pregnancy and miscarriage emergencies. We now turn to three further presentations that bring women to gynaecological emergency care: septic abortion, one of the most serious and largely preventable causes of maternal death in Nigerian practice, vaginal trauma, which demands both careful surgical assessment and genuine sensitivity, and Bartholin's cyst and abscess, a common and often acutely painful presentation encountered across gynaecological practice.

The aim of this Series is to equip you with the knowledge to recognise, investigate, and manage septic abortion, genital tract trauma, and Bartholin's cyst and abscess.



We shall commence this Series by examining the causes and pathophysiology of septic abortion. Next, we will consider its investigation and medical and surgical management. Following that, our attention turns to vaginal trauma, including post-coital laceration and other causes of genital tract injury. Finally, we will conclude by examining Bartholin's cyst and abscess, their presentation and management.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 3.1:** describe the causes and pathophysiology of septic abortion,
- **SLO 3.2:** describe the clinical features and staging of septic abortion,
- **SLO 3.3:** describe the investigation of septic abortion,
- **SLO 3.4:** describe the medical and surgical management of septic abortion,
- **SLO 3.5:** describe the presentation and management of post-coital vaginal laceration and other genital tract trauma,
- **SLO 3.6:** describe the pathophysiology and clinical features of Bartholin's cyst and abscess, and
- **SLO 3.7:** describe the management of Bartholin's cyst and abscess.

3.1 Septic Abortion: Causes and Pathophysiology

3.1.1 Definition and causes of septic abortion

Septic abortion is defined as miscarriage or termination of pregnancy complicated by infection of the uterus and, potentially, the surrounding pelvic structures, most commonly arising following unsafe or incomplete abortion performed outside a safe clinical setting, with retained products of conception acting as a nidus for ascending bacterial infection from the vagina and cervix into an already vulnerable, partially open uterine cavity.

In Nigerian practice specifically septic abortion remains a major, largely preventable contributor to maternal morbidity and mortality, reflecting the considerable burden of unsafe abortion performed outside the restrictive legal framework governing abortion in Nigeria, discussed in an earlier course in this programme, with causative organisms typically polymicrobial, including both aerobic and anaerobic vaginal and bowel flora ascending into the uterine cavity.



Fill in the blank: Septic abortion is miscarriage or termination of pregnancy complicated by _____ of the uterus and surrounding structures. Retained products of conception act as a _____ for ascending bacterial infection.

3.1.2 Pathophysiology of septic abortion

Infection in septic abortion typically begins as localised endometritis, confined to the uterine cavity and lining, but can progress, if not promptly recognised and treated, to myometritis (infection extending into the uterine muscle wall), parametritis (spread to the surrounding pelvic connective tissue), and, in severe cases, generalised peritonitis or septicaemia, with each successive stage carrying progressively greater severity and risk to the woman's life.

Uterine perforation is a particularly serious complication that can occur either as a direct consequence of the original unsafe procedure itself, especially where sharp or blunt instrumentation was used outside a safe clinical setting, or during subsequent surgical evacuation of an already infected, softened uterus, and should always be considered when a woman with septic abortion fails to improve as expected despite what appears to be adequate initial treatment.

Fill in the blank: Infection in septic abortion typically begins as localised _____, confined to the uterine cavity and lining. _____ perforation should be considered when a woman with septic abortion fails to improve despite apparently adequate treatment.

3.1.3 Clinical features and staging of septic abortion

Septic abortion typically presents with fever, lower abdominal pain, and offensive vaginal discharge or bleeding, with examination revealing uterine and adnexal tenderness, an open cervical os, and, in more severe cases, signs of peritonism or systemic sepsis, including tachycardia, hypotension, and altered mental state, reflecting the same physiological deterioration pattern seen in sepsis from any other cause.

A recognised staging system (sometimes referred to by the mnemonic of increasing severity) classifies septic abortion from grade one (infection confined to the uterus) through grade two (spread to the parametrium, tubes, and ovaries) to grade three (generalised peritonitis or septicaemia), with the specific grade at presentation directly informing the urgency and, particularly for grade three disease, the intensity of the resuscitation and surgical response required.

Fill in the blank: Septic abortion presents with fever, lower abdominal pain, and offensive vaginal _____. In staging, grade three septic abortion involves generalised peritonitis or _____.



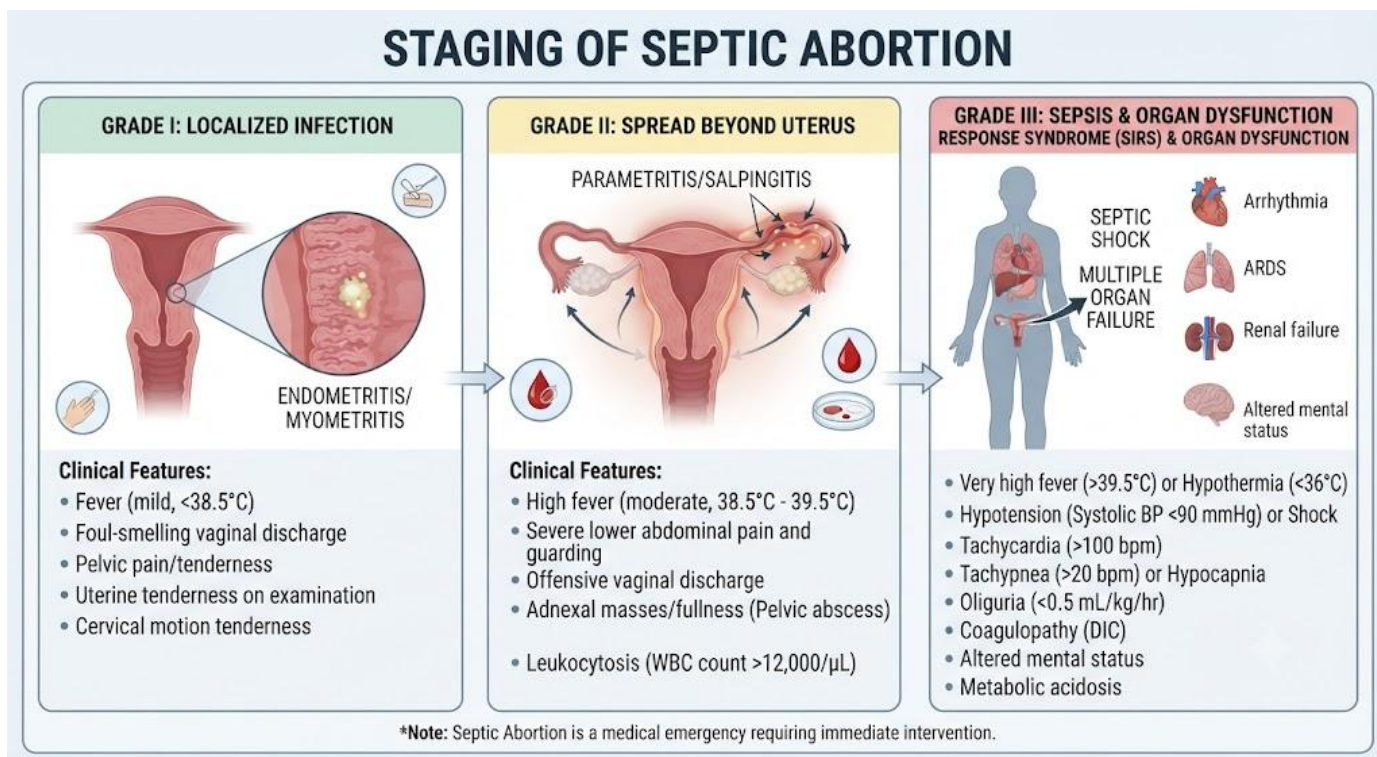


Figure 3.1: Staging and progression of septic abortion.

Pilot questions 3.1

- Define septic abortion and describe its causes. (Linked to SLO 3.1)
- Explain why septic abortion remains a major contributor to maternal mortality in Nigeria. (Linked to SLO 3.1)
- Describe the pathophysiological progression of infection in septic abortion. (Linked to SLO 3.1)
- Describe the clinical features of septic abortion. (Linked to SLO 3.2)
- Describe the staging system used to grade the severity of septic abortion. (Linked to SLO 3.2)

3.2 Septic Abortion: Investigation and Management

3.2.1 Investigation of septic abortion

Initial investigation of suspected septic abortion includes full blood count (assessing for leucocytosis and anaemia from associated bleeding), blood cultures (particularly important where systemic sepsis is suspected), high vaginal and endocervical swabs to identify the



causative organism and guide antibiotic therapy, and serum electrolytes and renal function, given the recognised risk of acute kidney injury in severe sepsis.

Pelvic ultrasound is valuable to identify retained products of conception, assess for any pelvic collection or abscess, and, where uterine perforation is suspected clinically, to look for supporting evidence such as free intraperitoneal fluid, though the definitive diagnosis of perforation is often made clinically or at the time of surgical exploration rather than through imaging findings alone.

Fill in the blank: Blood cultures are particularly important in septic abortion where systemic _____ is suspected. Pelvic _____ is valuable to identify retained products of conception and any pelvic collection.

3.2.2 Medical management of septic abortion

Initial medical management of septic abortion follows the general principles of sepsis resuscitation, with prompt intravenous fluid resuscitation, broad-spectrum intravenous antibiotics covering the likely polymicrobial, aerobic, and anaerobic organisms involved, commenced without delay for microbiological confirmation, and close monitoring of vital signs and urine output to detect early evidence of deteriorating sepsis.

Antibiotic therapy is typically continued and, where indicated, adjusted according to microbiological culture results and clinical response, though the single most important step in managing septic abortion, discussed further in the next sub-part, is prompt surgical evacuation of any retained infected tissue, as antibiotics alone are rarely sufficient to control the underlying source of infection while infected tissue remains within the uterine cavity.

Fill in the blank: Broad-spectrum intravenous antibiotics in septic abortion should be commenced without delay for _____ confirmation. Antibiotics alone are rarely sufficient while infected _____ remains within the uterine cavity.

3.2.3 Surgical management and complications of septic abortion

Surgical evacuation of retained infected products of conception, once the woman has been adequately resuscitated and commenced on appropriate antibiotics, represents the single most important step in achieving source control in septic abortion, generally undertaken as soon as reasonably possible rather than delayed, as ongoing retained infected tissue continues to drive the septic process regardless of how effectively antibiotic therapy alone is administered.

Serious complications of septic abortion include uterine perforation (which may require laparotomy and, in severe cases, hysterectomy if the uterus cannot be safely repaired or preserved), pelvic abscess formation requiring drainage, disseminated intravascular coagulation, acute kidney injury, and, in the most severe cases, death, underscoring why early recognition and prompt, decisive combined medical and surgical management genuinely saves lives in this condition.



Fill in the blank: Surgical evacuation represents the single most important step in achieving source _____ in septic abortion. Uterine perforation may require laparotomy and, in severe cases, _____ if the uterus cannot be safely preserved.

Complication	Brief Description
<u>Uterine Perforation</u>	Trauma to the uterine wall during instrumentation, leading to bleeding and risk of peritonitis.
<u>Pelvic Abscess</u>	Localized collection of pus in the pelvis due to infection spread.
<u>Disseminated Intravascular Coagulation (DIC)</u>	Widespread activation of clotting cascade causing bleeding and microthrombi.
<u>Acute Kidney Injury</u>	Secondary to septic shock, hypotension, or DIC, leading to renal failure.
<u>Death</u>	Resulting from overwhelming sepsis, multi-organ failure, or uncontrolled haemorrhage.

Table 3.2: Complications of septic abortion.

Pilot questions 3.2

1. Describe the initial investigations performed in suspected septic abortion. (Linked to SLO 3.3)
2. Explain the role of pelvic ultrasound in the investigation of septic abortion. (Linked to SLO 3.3)
3. Describe the principles of medical management of septic abortion. (Linked to SLO 3.4)
4. Explain why surgical evacuation is the single most important step in managing septic abortion. (Linked to SLO 3.4)
5. Describe the serious complications of septic abortion. (Linked to SLO 3.4)

3.3 Vaginal Trauma

3.3.1 Post-coital vaginal laceration

Post-coital vaginal laceration is a genital tract injury sustained during sexual intercourse, occurring more commonly in circumstances of reduced vaginal elasticity or lubrication, including in postmenopausal women, during first intercourse, or where the intercourse was particularly vigorous or non-consensual, presenting with vaginal bleeding, sometimes significant, and pain, and requiring careful, sensitive assessment given the potential overlap with sexual assault presentations discussed elsewhere in this programme.



The posterior fornix is a particularly common site for laceration given its relatively fixed position and proximity to the pouch of Douglas, and a deep laceration in this location carries a small but genuine risk of extending into the peritoneal cavity, causing intraperitoneal haemorrhage or, rarely, bowel injury, making thorough examination to establish the full depth and extent of any laceration identified an essential part of assessment.

Fill in the blank: Post-coital vaginal laceration occurs more commonly with reduced vaginal _____ or lubrication. The _____ fornix is a particularly common site for laceration given its fixed position.

3.3.2 Assessment and management of vaginal trauma

Assessment of vaginal trauma requires good lighting, adequate analgesia, and, where the extent of injury is unclear or the woman's condition does not allow adequate assessment in the outpatient setting, examination under anaesthesia, systematically identifying the full extent, depth, and site of any laceration, and specifically excluding extension into the peritoneal cavity, bladder, urethra, or rectum, each of which would substantially change the required management approach.

Management depends on the severity and site of injury: small, superficial lacerations with minimal bleeding may not require formal repair, while larger or actively bleeding lacerations require surgical repair under appropriate analgesia or anaesthesia, and any laceration extending into the peritoneal cavity or involving the bladder, urethra, or rectum requires specialist surgical involvement and, frequently, laparotomy to fully assess and repair the extent of injury.

Fill in the blank: Examination under _____ may be required where the extent of vaginal injury is unclear. Lacerations extending into the peritoneal cavity, bladder, urethra, or rectum require specialist surgical _____.

3.3.3 Obstetric and other causes of genital tract trauma

Beyond coital injury the genital tract can be traumatised by childbirth (perineal and vaginal tears, discussed in the context of normal labour management elsewhere in this programme), instrumentation (including from cervical dilatation or hysteroscopy), sexual assault, and, in some settings, female genital mutilation, each with a distinct mechanism of injury but sharing common principles of careful, systematic assessment before proceeding with any repair.

Regardless of the specific cause of genital tract trauma, the fundamental priorities remain consistent: control of any significant bleeding, thorough assessment of the full extent and depth of injury before repair is attempted, careful attention to the psychological as well as physical needs of the woman, particularly where the mechanism of injury was traumatic or non-consensual, and, where clinically or legally relevant, appropriate documentation of findings.

Fill in the blank: Regardless of the cause of genital tract trauma, control of significant _____ and thorough assessment before repair remain fundamental priorities. Careful



attention to _____ as well as physical needs is essential, particularly where the injury was non-consensual.

Cause / Priority	Key Details
<u>Coital Trauma</u>	Injury sustained during sexual intercourse.
<u>Obstetric Trauma</u>	Tears or lacerations during childbirth (perineal, cervical, vaginal).
<u>Instrumentation</u>	Trauma from medical procedures (forceps, vacuum, dilatation and curettage).
<u>Sexual Assault</u>	Injuries resulting from non-consensual sexual activity.
<u>Female Genital Mutilation</u>	Deliberate cutting or alteration of female genitalia.
<u>Assessment Priorities</u>	Rapid haemodynamic stabilization, pain control, thorough examination, documentation.
<u>Management Priorities</u>	Control bleeding, repair injuries, prevent infection, provide psychological support, ensure safeguarding.

Box 3.3: Causes of genital tract trauma and fundamental priorities of management.

Pilot questions 3.3

1. Describe the circumstances that increase the risk of post-coital vaginal laceration. (Linked to SLO 3.5)
2. Explain why the posterior fornix is a particularly important site to assess in vaginal laceration. (Linked to SLO 3.5)
3. Describe the key components of assessment of vaginal trauma. (Linked to SLO 3.5)
4. Describe the management of vaginal lacerations according to severity and site. (Linked to SLO 3.5)
5. List the causes of genital tract trauma beyond coital injury. (Linked to SLO 3.5)

3.4 Bartholin's Cyst and Abscess

3.4.1 Anatomy and pathophysiology of Bartholin's gland disease

The Bartholin's glands are paired mucus-secreting glands located at the posterior aspect of the vaginal introitus, at approximately the four and eight o'clock positions, normally contributing to vaginal lubrication through ducts that open onto the vestibule, with obstruction of this duct, from inflammation, trauma, or infection, resulting in accumulation of secretions and formation of a Bartholin's cyst.



A Bartholin's abscess develops when an obstructed, cystic gland becomes secondarily infected, most commonly with mixed vaginal flora or, less commonly, a specific sexually transmitted organism, causing acute inflammation, pain, and collection of pus within the obstructed gland, a common and often acutely painful gynaecological presentation, particularly in women of reproductive age.

Fill in the blank: The Bartholin's glands are located at approximately the _____ and eight o'clock positions of the vaginal introitus. A Bartholin's abscess develops when an obstructed cystic gland becomes secondarily _____.

3.4.2 Clinical features and diagnosis of Bartholin's cyst and abscess

A Bartholin's cyst typically presents as a painless or mildly uncomfortable, soft, fluctuant vulval swelling, often noticed incidentally or during a routine examination, whereas a Bartholin's abscess presents acutely with significant pain, often severe enough to make walking or sitting uncomfortable, alongside a tender, fluctuant, erythematous vulval swelling, sometimes with associated fever if infection is more extensive.

Diagnosis of Bartholin's cyst or abscess is generally clinical, based on the characteristic site and appearance of the swelling, though in an older woman, particularly over 40 years of age, or where the swelling has an atypical or irregular appearance, biopsy should be considered to exclude the rare possibility of Bartholin's gland carcinoma, a diagnosis that should not be overlooked simply because Bartholin's disease is overwhelmingly benign in younger women.

Fill in the blank: A Bartholin's abscess presents acutely with significant pain and a tender, fluctuant, _____ vulval swelling. In women over _____ years of age, biopsy should be considered to exclude Bartholin's gland carcinoma.

3.4.3 Management of Bartholin's cyst and abscess

A small, asymptomatic Bartholin's cyst may be managed conservatively with observation alone, while a larger or symptomatic cyst, or any Bartholin's abscess, requires drainage, with simple incision and drainage carrying a high risk of recurrence as the incision typically heals over and re-obstructs the duct, making marsupialisation (creating a permanent, open drainage pathway by suturing the edges of the incised cyst or abscess wall to the adjacent skin) the preferred definitive surgical approach.

Word catheter insertion (placement of a small balloon-tipped catheter into the drained cavity, left in place for several weeks to allow formation of a permanent epithelialised tract) is an alternative, less invasive approach to marsupialisation, particularly suited to the outpatient setting, with recurrent Bartholin's abscess despite appropriate initial treatment sometimes warranting complete surgical excision of the gland itself as a more definitive, if more invasive, final option.



Fill in the blank: Marsupialisation creates a permanent, open drainage pathway to reduce the risk of _____ after simple incision. A Word catheter is left in place for several weeks to allow formation of a permanent epithelialised _____.

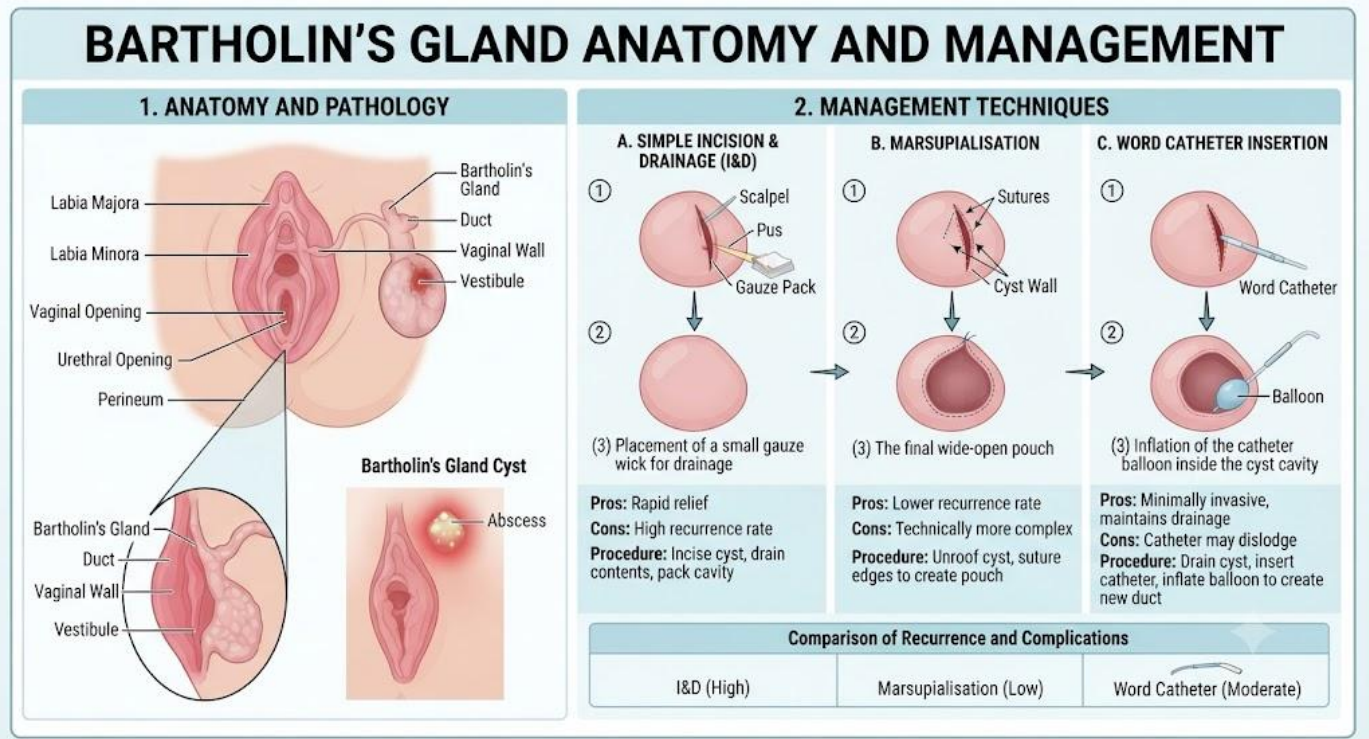


Figure 3.4: Bartholin's gland anatomy and comparison of drainage techniques.

Pilot questions 3.4

1. Describe the anatomy and location of the Bartholin's glands. (Linked to SLO 3.6)
2. Explain the pathophysiology of Bartholin's cyst and abscess formation. (Linked to SLO 3.6)
3. Distinguish the clinical presentation of a Bartholin's cyst from a Bartholin's abscess. (Linked to SLO 3.6)
4. Explain when biopsy should be considered in a woman with a Bartholin's swelling. (Linked to SLO 3.6)
5. Compare simple incision and drainage, marsupialisation, and Word catheter insertion for Bartholin's abscess. (Linked to SLO 3.7)



Series Summary

This Series has covered the causes and pathophysiology of septic abortion, followed by its investigation and medical and surgical management. It went on to examine vaginal trauma, including post-coital laceration and other causes of genital tract injury, before concluding with Bartholin's cyst and abscess, their presentation and management.

You should now be able to describe the causes, pathophysiology, and staging of septic abortion, describe its investigation and management, describe the assessment and management of genital tract trauma, and describe the pathophysiology, presentation, and management of Bartholin's cyst and abscess (Linked to SLOs 3.1 to 3.7).

Glossary of Terms

1. **Bartholin's abscess:** a collection of pus within an obstructed, secondarily infected Bartholin's gland.
2. **Bartholin's cyst:** accumulation of secretions within an obstructed Bartholin's gland duct.
3. **Endometritis:** infection confined to the uterine cavity and lining, the earliest stage of septic abortion.
4. **Marsupialisation:** a surgical technique creating a permanent, open drainage pathway for a Bartholin's cyst or abscess.
5. **Parametritis:** spread of infection to the pelvic connective tissue surrounding the uterus, a more advanced stage of septic abortion.
6. **Septic abortion:** miscarriage or termination of pregnancy complicated by infection of the uterus and surrounding structures.
7. **Source control:** elimination of the underlying cause of infection, achieved in septic abortion by surgical evacuation of infected tissue.
8. **Uterine perforation:** a breach of the uterine wall, a serious complication of unsafe abortion or subsequent surgical evacuation.
9. **Word catheter:** a small balloon-tipped catheter used to maintain drainage of a Bartholin's cyst or abscess while a permanent tract forms.
10. **Post-coital vaginal laceration:** genital tract injury sustained during sexual intercourse.



11. **Posterior fornix:** the deepest part of the vagina behind the cervix, a common and clinically significant site of laceration.
12. **Polymicrobial infection:** infection involving multiple organisms, typical of septic abortion.

Concept Check Questions [Series 3]

Objective questions

- Retained products of conception act as a _____ for ascending bacterial infection.
- Grade three septic abortion involves generalised peritonitis or _____.
- Surgical evacuation represents the single most important step in achieving source _____ in septic abortion.
- The _____ fornix is a particularly common site for post-coital vaginal laceration.
- The Bartholin's glands are located at approximately the four and _____ o'clock positions.

Short-answer questions

1. Explain why septic abortion remains a major contributor to maternal mortality in Nigeria. (Linked to SLO 3.1)
2. Describe the staging system used to grade the severity of septic abortion. (Linked to SLO 3.2)
3. Explain why surgical evacuation is the single most important step in managing septic abortion. (Linked to SLO 3.4)
4. Describe the key components of assessment of vaginal trauma. (Linked to SLO 3.5)
5. Compare simple incision and drainage, marsupialisation, and Word catheter insertion for Bartholin's abscess. (Linked to SLO 3.7)

Long-answer questions



6. Describe the causes, pathophysiology, and staging of septic abortion. (Linked to SLO 3.1, SLO 3.2)
7. Describe the investigation and management of septic abortion. (Linked to SLO 3.3, SLO 3.4)
8. Describe the assessment and management of vaginal trauma, including post-coital laceration. (Linked to SLO 3.5)
9. Describe the pathophysiology, clinical features, and management of Bartholin's cyst and abscess. (Linked to SLO 3.6, SLO 3.7)
10. Describe the complications of septic abortion and the priorities of management following genital tract trauma. (Linked to SLO 3.4, SLO 3.5)

Answers to Concept Check Questions [Series 3]

Objective questions

11. Nidus.
12. Septicaemia.
13. Control.
14. Posterior.
15. Eight.

Short-answer questions

16. Septic abortion reflects the substantial burden of unsafe abortion outside Nigeria's restrictive legal framework, remaining a major preventable cause of maternal death.
17. Grade one is confined to the uterus, grade two spreads to the parametrium and adnexa, and grade three involves generalised peritonitis or septicaemia.
18. Antibiotics alone are rarely sufficient while infected tissue remains within the uterine cavity, continuing to drive the septic process.
19. Good lighting, adequate analgesia, systematic identification of extent and depth, and exclusion of extension into the peritoneum, bladder, urethra, or rectum.



20. Simple incision and drainage carries high recurrence risk; marsupialisation and Word catheter both create a permanent drainage tract, reducing recurrence.

Long-answer questions

21. **Basic response:** Septic abortion follows unsafe or incomplete abortion, progressing from endometritis through parametritis to generalised peritonitis or septicaemia if untreated.

Value-added response: Staging directly guides the urgency of management, with grade three disease requiring the most intensive resuscitation and surgical response.

22. **Basic response:** Investigation includes full blood count, blood cultures, vaginal swabs, and pelvic ultrasound, with management combining resuscitation, antibiotics, and surgical evacuation.

Value-added response: Surgical evacuation achieves source control and is the single most important management step, as antibiotics alone cannot control infected retained tissue.

23. **Basic response:** Vaginal trauma assessment requires good lighting, analgesia, and systematic evaluation of extent and depth, with management guided by severity and site.

Value-added response: Lacerations extending into the peritoneal cavity or adjacent organs require specialist surgical involvement, alongside attention to the woman's psychological needs.

Answers to Pilot Questions [Series 3]

Part 3.1

1. Miscarriage or termination complicated by infection, most commonly following unsafe or incomplete abortion.
2. It reflects the substantial burden of unsafe abortion outside Nigeria's restrictive legal framework governing abortion.
3. Progresses from endometritis to myometritis, parametritis, and, if untreated, generalised peritonitis or septicaemia.
4. Fever, lower abdominal pain, offensive discharge or bleeding, with uterine and adnexal tenderness on examination.



5. Grade one (confined to uterus), grade two (parametrial and adnexal spread), and grade three (generalised peritonitis or septicaemia).

Part 3.2

6. Full blood count, blood cultures, high vaginal and endocervical swabs, and renal function tests.
7. It identifies retained products of conception, pelvic collections, and supporting evidence of perforation such as free fluid.
8. Fluid resuscitation and broad-spectrum antibiotics commenced without delay for microbiological confirmation, with close monitoring.
9. Antibiotics alone cannot control the underlying source while infected tissue remains within the uterine cavity.
10. Uterine perforation, pelvic abscess, disseminated intravascular coagulation, acute kidney injury, and death.

Part 3.3

11. Reduced vaginal elasticity or lubrication, postmenopausal status, first intercourse, or vigorous or non-consensual intercourse.
12. It has a fixed position near the pouch of Douglas, and a deep laceration can extend into the peritoneal cavity.
13. Good lighting, adequate analgesia, and systematic identification of the extent, depth, and site of injury.
14. Small superficial lacerations may not need repair; larger or bleeding lacerations require surgical repair; complex injuries need specialist involvement.
15. Childbirth, instrumentation, sexual assault, and female genital mutilation.

Part 3.4

1. Paired mucus-secreting glands at approximately the four and eight o'clock positions of the vaginal introitus.



2. Duct obstruction causes cyst formation; secondary infection of the obstructed gland causes abscess formation.
3. A cyst is typically painless and soft; an abscess presents acutely with significant pain and a tender, erythematous swelling.
4. In women over 40 or with an atypical or irregular swelling, to exclude the rare possibility of Bartholin's gland carcinoma.
5. Simple incision has high recurrence; marsupialisation and Word catheter both create a lasting drainage tract, reducing recurrence risk.



References and Attributions [Series 3]

Textual References

1. Cunningham, F. G., Leveno, K. J., Dashe, J. S. et al. (2022). Williams Obstetrics (26th ed.). McGraw Hill.
2. World Health Organization (2018). Managing Complications in Pregnancy and Childbirth: A Guide for Midwives and Doctors (2nd ed.). WHO Press.
3. Royal College of Obstetricians and Gynaecologists (2012). Green-top Guideline No. 64b: Bacterial Sepsis Following Pregnancy. RCOG Press.
4. Berek, J. S. and Berek, D. L. (2019). Berek and Novak's Gynecology (16th ed.). Wolters Kluwer.

Figures, Plates, Tables, and Boxes

1. Figure 3.1: Staging and progression of septic abortion. AI-generated using the prompt: "Create a professional medical diagram titled Staging of Septic Abortion, showing progression through three grades with key clinical features at each stage. Clean clinical educational diagram style."
2. Table 3.2: Complications of septic abortion. AI-generated using the prompt: "Create a clean reference table titled Complications of Septic Abortion, listing key complications with a brief description of each. Simple clinical reference table style with outside border."
3. Box 3.3: Causes of genital tract trauma and fundamental priorities of management. AI-generated using the prompt: "Create a simple single-column reference box with an outside border titled Genital Tract Trauma: Causes and Priorities, listing causes and fundamental management priorities. Clinical reference box style."
4. Figure 3.4: Bartholin's gland anatomy and comparison of drainage techniques. AI-generated using the prompt: "Create a professional medical diagram titled Bartholin's Gland Anatomy and Management, showing gland location and comparing incision and drainage, marsupialisation, and Word catheter techniques. Clean clinical educational diagram style."



Series 4: Postpartum Haemorrhage and Uterine Rupture

- **Part 4.1: Postpartum Haemorrhage: Definitions and Causes**
 - Sub Part 4.1.1: Definitions and classification of postpartum haemorrhage
 - Sub Part 4.1.2: Causes of postpartum haemorrhage (the four Ts)
 - Sub Part 4.1.3: Risk factors and prevention of postpartum haemorrhage
- **Part 4.2: Impact and Prevention of Postpartum Haemorrhage**
 - Sub Part 4.2.1: Contribution of PPH to maternal mortality
 - Sub Part 4.2.2: Complications of postpartum haemorrhage
 - Sub Part 4.2.3: Active management of the third stage of labour in preventing PPH
- **Part 4.3: Management of Postpartum Haemorrhage**
 - Sub Part 4.3.1: Principles of managing postpartum haemorrhage
 - Sub Part 4.3.2: Role of uterotonics including misoprostol
 - Sub Part 4.3.3: Escalation: surgical and radiological management of PPH
- **Part 4.4: Uterine Rupture**
 - Sub Part 4.4.1: Causes and risk factors for uterine rupture
 - Sub Part 4.4.2: Clinical features and diagnosis of uterine rupture
 - Sub Part 4.4.3: Management and complications of ruptured uterus

Introduction

In the last Series, we explored septic abortion, vaginal trauma, and Bartholin's cyst and abscess. We now turn to two of the most acutely life-threatening emergencies in obstetric practice: postpartum haemorrhage, the world's leading direct cause of maternal death, and uterine rupture, a catastrophic event that can turn an apparently normal labour into a genuine race against time. Both demand the same qualities we have built throughout this course: rapid recognition, structured resuscitation, and confident, decisive team-based action.

The aim of this Series is to equip you with the knowledge to define, prevent, recognise, and manage postpartum haemorrhage and uterine rupture.



We shall commence this Series by examining the definitions and causes of postpartum haemorrhage. Next, we will consider its contribution to maternal mortality, its complications, and the role of active management of the third stage in its prevention. Following that, our attention turns to the management of postpartum haemorrhage, including the role of uterotonics and surgical escalation. Finally, we will conclude by examining uterine rupture, its causes, features, and management.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 4.1:** list the various definitions of postpartum haemorrhage,
- **SLO 4.2:** describe the causes and risk factors of postpartum haemorrhage,
- **SLO 4.3:** explain the contribution of postpartum haemorrhage to maternal mortality and enumerate its complications,
- **SLO 4.4:** enumerate the principles of managing postpartum haemorrhage,
- **SLO 4.5:** discuss the role of uterotonics, including misoprostol, in the management of postpartum haemorrhage,
- **SLO 4.6:** describe the role of active management of the third stage of labour in preventing postpartum haemorrhage, and
- **SLO 4.7:** list the complications of ruptured uterus.

4.1 Postpartum Haemorrhage: Definitions and Causes

4.1.1 Definitions and classification of postpartum haemorrhage

Postpartum haemorrhage (PPH) is traditionally defined as blood loss of 500 millilitres or more following vaginal delivery, or 1000 millilitres or more following caesarean section, though this widely used definition has recognised limitations, as visual estimation of blood loss is notoriously inaccurate and tends to significantly underestimate true blood loss, particularly at higher volumes, prompting some authorities to favour definitions based on a clinically significant fall in haemoglobin or on the presence of haemodynamic instability instead.

PPH is further classified as primary (occurring within 24 hours of delivery, the great majority of cases) or secondary (occurring from 24 hours up to six weeks postpartum, generally from retained products of conception or endometritis), and, by severity, as minor (500 to 1000 millilitres) or major (over 1000 millilitres), with major PPH further subdivided into moderate



(1000 to 2000 millilitres) and severe (over 2000 millilitres), a classification of considerable practical importance as it directly guides the intensity of the required clinical response.

Fill in the blank: Postpartum haemorrhage is traditionally defined as blood loss of _____ millilitres or more following vaginal delivery. Secondary PPH occurs from 24 hours up to _____ weeks postpartum.

4.1.2 Causes of postpartum haemorrhage (the four Ts)

The causes of postpartum haemorrhage are traditionally summarised by the mnemonic of the four Ts: tone (uterine atony, failure of the uterus to contract adequately after delivery, by far the most common cause, accounting for the great majority of cases), tissue (retained placental fragments or membranes preventing adequate uterine contraction), trauma (laceration of the genital tract, uterus, or, rarely, uterine rupture or inversion), and thrombin (an underlying or acquired coagulation disorder).

Uterine atony occurs when the myometrium fails to contract effectively around the spiral arteries supplying the placental bed after delivery, a mechanism that normally achieves rapid, effective haemostasis, meaning that any factor impairing this contractile mechanism, whether uterine overdistension from multiple pregnancy or polyhydramnios, prolonged labour, or grand multiparity, substantially increases the risk of significant postpartum bleeding from this most common underlying cause.

Fill in the blank: The four Ts summarising the causes of postpartum haemorrhage are tone, tissue, trauma, and _____. Uterine atony occurs when the myometrium fails to contract effectively around the _____ arteries supplying the placental bed.

4.1.3 Risk factors and prevention of postpartum haemorrhage

Recognised risk factors for postpartum haemorrhage include a previous history of PPH, multiple pregnancy, polyhydramnios, prolonged labour, grand multiparity, placenta praevia or accreta spectrum disorders, and pre-eclampsia, with antenatal identification of these risk factors allowing appropriate advance planning, including delivery at an appropriately resourced facility and, where indicated, cross-matching of blood in anticipation of potential haemorrhage.

Although risk factor identification is valuable for planning, it is important to recognise that a substantial proportion of postpartum haemorrhage occurs in women with no identifiable antenatal risk factor at all, meaning that every delivery, regardless of the presence or absence of recognised risk factors, should be managed with genuine preparedness for the possibility of significant haemorrhage, including immediate availability of uterotonic drugs and a clear local protocol for escalation.

Fill in the blank: Recognised risk factors for PPH include previous history of PPH, multiple pregnancy, and placenta _____ or accreta spectrum disorders. Every delivery should be managed with genuine _____ for the possibility of significant haemorrhage, regardless of risk factors.



Category	Definition / Blood Loss Volume	Key Details
<u>Primary PPH</u>	Occurs within 24 hours of delivery	Commonly due to uterine atony, trauma, retained tissue, or coagulopathy.
<u>Secondary PPH</u>	Occurs between 24 hours and 12 weeks postpartum	Often due to retained products of conception or infection.
<u>Minor PPH</u>	500–1000 mL blood loss	Usually manageable with uterotonics and supportive care.
<u>Moderate PPH</u>	1000–1500 mL blood loss	Requires active resuscitation and close monitoring.
<u>Major PPH</u>	1500–2000 mL blood loss	Associated with haemodynamic instability; urgent intervention needed.
<u>Severe PPH</u>	>2000 mL blood loss	Life-threatening; requires massive transfusion and surgical measures.

Table 4.1: Classification of postpartum haemorrhage by timing and severity.

Pilot questions 4.1

- List the various definitions used for postpartum haemorrhage. (Linked to SLO 4.1)
- Explain the limitations of visual estimation of blood loss in defining PPH. (Linked to SLO 4.1)
- Distinguish primary from secondary postpartum haemorrhage. (Linked to SLO 4.1)
- Describe the causes of postpartum haemorrhage summarised by the four Ts. (Linked to SLO 4.2)
- List the risk factors for postpartum haemorrhage. (Linked to SLO 4.2)

4.2 Impact and Prevention of Postpartum Haemorrhage

4.2.1 Contribution of PPH to maternal mortality

Postpartum haemorrhage remains the single leading direct cause of maternal death worldwide and in Nigeria, contributing disproportionately to maternal mortality in low-resource settings where timely access to blood products, skilled emergency obstetric care, and appropriately equipped facilities for surgical or radiological intervention cannot always be guaranteed, reflecting the interplay between a fundamentally treatable clinical condition and the health system barriers that so often prevent that treatment being delivered in time.



The great majority of deaths from postpartum haemorrhage are considered preventable with timely, appropriate care, and the disproportionate burden borne by Nigerian women, and by women in similarly resourced settings globally, reflects a combination of factors including delayed recognition, inadequate blood product availability, delays in reaching an appropriately resourced facility, and, in some cases, delayed escalation once a woman has arrived, echoing the three delays framework discussed elsewhere in this programme.

Fill in the blank: Postpartum haemorrhage remains the single leading _____ cause of maternal death worldwide and in Nigeria. The great majority of deaths from PPH are considered _____ with timely, appropriate care.

4.2.2 Complications of postpartum haemorrhage

Significant postpartum haemorrhage can result in hypovolaemic shock, disseminated intravascular coagulation from consumption of clotting factors during massive haemorrhage and replacement, acute kidney injury from prolonged hypoperfusion, and, in the most severe cases, death, with survivors of major PPH also at risk of longer-term complications including anaemia, prolonged hospital stay, and, rarely, Sheehan's syndrome (pituitary infarction from severe hypotension causing subsequent hypopituitarism).

Emergency peripartum hysterectomy performed as a last resort to control life-threatening haemorrhage that has not responded to less invasive measures represents a further, life-altering complication of severe PPH, ending future fertility, and, alongside the psychological impact of a genuinely life-threatening emergency during childbirth, underscores why prevention and prompt, effective initial management of PPH matter so greatly for both immediate survival and long-term maternal wellbeing.

Fill in the blank: Pituitary infarction from severe hypotension during major PPH, causing subsequent hypopituitarism, is termed _____ syndrome. Emergency peripartum _____ may be required as a last resort to control life-threatening haemorrhage.

4.2.3 Active management of the third stage of labour in preventing PPH

Active management of the third stage of labour comprises prophylactic administration of a uterotonic agent immediately after delivery of the baby (before delivery of the placenta), controlled cord traction to assist delivery of the placenta, and, traditionally, early cord clamping, though the latter component is now typically modified to allow brief delayed clamping where the baby does not require immediate resuscitation, without compromising the overall haemorrhage-preventing benefit of the package as a whole.

Robust evidence consistently demonstrates that active management of the third stage substantially reduces the risk of postpartum haemorrhage compared with expectant, physiological management, and is now recommended as routine practice for essentially all deliveries, making it, alongside skilled attendance at every birth, one of the single most effective and genuinely preventive interventions available for reducing the global and Nigerian burden of postpartum haemorrhage.



Fill in the blank: Active management of the third stage comprises uterotonic administration, controlled cord traction, and, traditionally, early cord _____. Robust evidence shows active management substantially reduces the risk of _____ compared with expectant management.

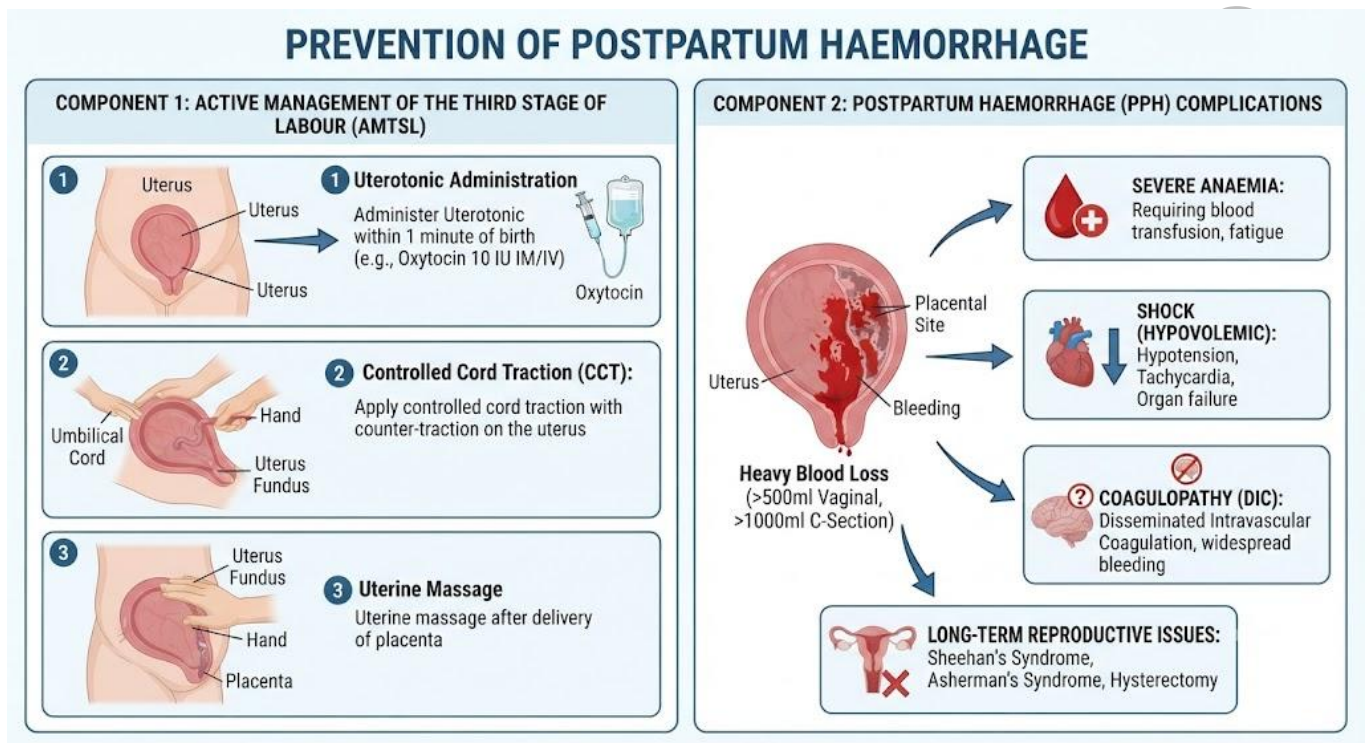


Figure 4.2: Active management of the third stage of labour and the complications of major postpartum haemorrhage.

Pilot questions 4.2

1. Explain the contribution of postpartum haemorrhage to maternal mortality in Nigeria. (Linked to SLO 4.3)
2. Explain why the majority of deaths from postpartum haemorrhage are considered preventable. (Linked to SLO 4.3)
3. Enumerate the complications of postpartum haemorrhage. (Linked to SLO 4.3)
4. Describe the components of active management of the third stage of labour. (Linked to SLO 4.6)
5. Explain the evidence supporting active management of the third stage in preventing PPH. (Linked to SLO 4.6)

4.3 Management of Postpartum Haemorrhage



4.3.1 Principles of managing postpartum haemorrhage

The general principles of managing postpartum haemorrhage follow a structured, simultaneous approach: call for help immediately, resuscitate (following the ABCDE approach with wide-bore intravenous access and fluid or blood product resuscitation as needed), monitor (vital signs, blood loss, and urine output), and, in parallel rather than sequentially, identify and treat the specific underlying cause according to the four Ts framework, with all of these actions genuinely occurring simultaneously by different members of a well-coordinated team rather than one after another.

Uterine massage (firm, bimanual massage of the uterine fundus through the abdominal wall) is a simple, immediate first step to stimulate uterine contraction while other members of the team establish intravenous access, prepare uterotonic drugs, and call for additional senior help, reflecting the genuinely time-critical nature of the initial minutes of major postpartum haemorrhage management.

Fill in the blank: The general principles of managing PPH include calling for help, resuscitating, monitoring, and identifying and treating the underlying _____. Uterine massage is a simple, immediate first step to stimulate uterine _____.

4.3.2 Role of uterotonics including misoprostol

Uterotonic drugs are central to the management of postpartum haemorrhage from uterine atony, with oxytocin generally the first-line agent given its rapid onset and favourable side-effect profile, followed by ergometrine (contraindicated in hypertension) and carboprost (a prostaglandin analogue, used with caution in asthma) as second and third-line options where bleeding continues despite initial treatment.

Misoprostol (a prostaglandin E1 analogue) is a particularly valuable uterotonic agent in resource-limited settings, given its low cost, stability at room temperature without requiring refrigeration, and oral or sublingual route of administration not requiring injection equipment or trained personnel to administer intravenously, making it an important and practical option for both prevention and treatment of postpartum haemorrhage in settings where injectable oxytocin may not always be readily available.

Fill in the blank: Oxytocin is generally the first-line uterotonic given its rapid onset and favourable _____ profile. Misoprostol is particularly valuable in resource-limited settings given its low cost and _____ at room temperature.

4.3.3 Escalation: surgical and radiological management of PPH

Where bleeding continues despite uterotonic drugs and correction of any other identified cause, escalation includes bimanual uterine compression, uterine balloon tamponade (a relatively simple, effective technique using an inflated balloon catheter to apply direct pressure to the placental bed from within the uterine cavity), and, if bleeding still continues, surgical options



including compression sutures (such as the B-Lynch suture), uterine artery ligation, and, as a last resort to save the woman's life, hysterectomy.

Interventional radiology (uterine artery embolisation) is a further, less invasive escalation option where available, avoiding the need for laparotomy while achieving effective haemostasis in appropriately selected, haemodynamically stable patients, though its availability remains limited in many Nigerian centres, meaning surgical escalation, from balloon tamponade through compression sutures to hysterectomy, remains the more universally accessible escalation pathway in most settings.

Fill in the blank: Uterine balloon tamponade applies direct pressure to the _____ bed from within the uterine cavity. Interventional radiology for PPH uses uterine artery _____, though availability remains limited in many Nigerian centres.

Step	Key Details
Uterine Massage	First-line measure to stimulate uterine contraction and reduce bleeding.
Uterotonics	Administer oxytocin, ergometrine, misoprostol, or carboprost to enhance uterine tone.
Balloon Tamponade	Insert intrauterine balloon (e.g., Bakri balloon) to apply pressure and control bleeding.
Compression Sutures	Surgical techniques (e.g., B-Lynch suture) to mechanically compress the uterus.
Hysterectomy	Last resort when bleeding is uncontrolled and life-threatening despite other measures.

Box 4.3: Stepwise escalation pathway for postpartum haemorrhage management.

Pilot questions 4.3

1. Enumerate the general principles of managing postpartum haemorrhage. (Linked to SLO 4.4)
2. Describe the role of uterine massage in the immediate management of PPH. (Linked to SLO 4.4)
3. Describe the first, second, and third-line uterotonic drugs used in PPH. (Linked to SLO 4.5)
4. Explain why misoprostol is particularly valuable in resource-limited settings. (Linked to SLO 4.5)
5. Describe the surgical escalation pathway when bleeding continues despite uterotonic drugs. (Linked to SLO 4.4)



4.4 Uterine Rupture

4.4.1 Causes and risk factors for uterine rupture

Uterine rupture (complete or partial disruption of the uterine wall) most commonly occurs at the site of a previous caesarean section scar, particularly during a trial of labour after caesarean section, though it can occur in an unscarred uterus, particularly in the context of obstructed labour, especially in settings with limited access to timely emergency obstetric care, injudicious oxytocin use causing uterine hyperstimulation, or grand multiparity.

Other recognised risk factors include a short interval between pregnancies following a previous caesarean section, a classical (vertical) rather than lower segment (transverse) uterine incision at previous caesarean section, which carries a substantially higher rupture risk, and any form of uterine instrumentation or trauma, with careful antenatal and intrapartum risk assessment essential in any woman with one or more of these recognised risk factors present.

Fill in the blank: Uterine rupture most commonly occurs at the site of a previous _____ section scar. A classical, vertical uterine incision at previous caesarean section carries a substantially _____ rupture risk than a lower segment incision.

4.4.2 Clinical features and diagnosis of uterine rupture

Uterine rupture classically presents with sudden, severe abdominal pain, sometimes described as a tearing sensation, that may paradoxically improve as uterine contractions cease following the rupture, alongside cessation of previously established contractions, vaginal bleeding (which may be less than expected given the severity of the underlying event, as bleeding is often predominantly intra-abdominal), and acute foetal compromise or foetal death.

Additional clinical features include loss of the previously engaged foetal presenting part on abdominal or vaginal examination (as the foetus may partially or completely extrude through the ruptured uterine wall into the abdominal cavity), maternal tachycardia and hypotension progressing to overt hypovolaemic shock, and, on abdominal palpation, easily palpable foetal parts directly beneath the maternal abdominal wall, reflecting the loss of the normal uterine muscular covering.

Fill in the blank: Uterine rupture pain may paradoxically improve as uterine _____ cease following the rupture. Loss of the previously engaged foetal presenting part occurs because the foetus may partially extrude through the ruptured uterine _____.

4.4.3 Management and complications of ruptured uterus

Uterine rupture is a genuine obstetric emergency requiring immediate resuscitation following ABCDE principles and emergency laparotomy without delay, with the specific surgical approach, repair of the rupture versus hysterectomy, determined by the extent and site of the rupture, the woman's haemodynamic stability, and her future fertility wishes where these can



reasonably be balanced against the immediate priority of controlling life-threatening haemorrhage.

The complications of ruptured uterus include massive haemorrhage and hypovolaemic shock, disseminated intravascular coagulation, injury to adjacent structures such as the bladder or ureters if the rupture extends or during the course of emergency surgical repair, hysterectomy with resulting loss of future fertility, foetal death, and, in the most severe cases, maternal death, together representing one of the most acutely life-threatening emergencies encountered in obstetric practice.

Fill in the blank: Uterine rupture requires immediate resuscitation and emergency _____ without delay. Complications of ruptured uterus include massive haemorrhage, injury to adjacent structures, and _____ death.

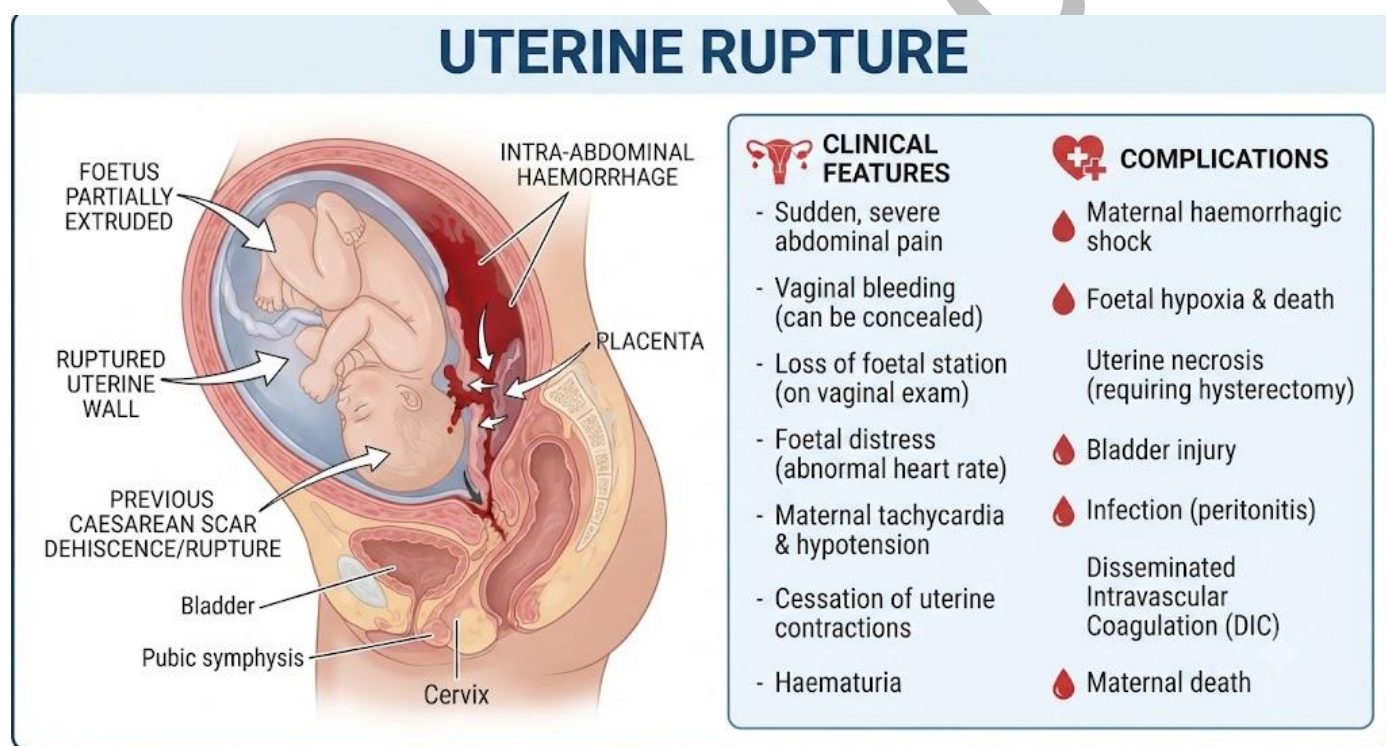


Figure 4.4: Uterine rupture anatomy and its clinical features and complications.

Pilot questions 4.4

1. Describe the causes and risk factors for uterine rupture. (Linked to SLO 4.7)
2. Explain why a classical uterine incision carries a higher risk of subsequent rupture than a lower segment incision. (Linked to SLO 4.7)
3. Describe the clinical features of uterine rupture. (Linked to SLO 4.7)
4. Describe the emergency management of uterine rupture. (Linked to SLO 4.7)



5. List the complications of ruptured uterus. (Linked to SLO 4.7)

Series Summary

This Series has covered the definitions and causes of postpartum haemorrhage, followed by its contribution to maternal mortality, its complications, and the role of active management of the third stage in its prevention. It went on to examine the management of postpartum haemorrhage, including the role of uterotonics and surgical escalation, before concluding with uterine rupture, its causes, features, management, and complications.

You should now be able to list the definitions of postpartum haemorrhage, describe its causes and risk factors, explain its contribution to maternal mortality and its complications, enumerate the principles of its management, discuss the role of uterotonics, describe active management of the third stage, and list the complications of ruptured uterus (Linked to SLOs 4.1 to 4.7).

Glossary of Terms

1. **Active management of the third stage:** a package of care comprising uterotonic administration, controlled cord traction, and cord clamping, reducing PPH risk.
2. **Carboprost:** a prostaglandin analogue used as a third-line uterotonic in the management of postpartum haemorrhage.
3. **Ergometrine:** a uterotonic drug used in postpartum haemorrhage, contraindicated in hypertension.
4. **Misoprostol:** a prostaglandin E1 analogue used as a uterotonic, valued for its stability and ease of administration in resource-limited settings.
5. **Postpartum haemorrhage:** blood loss of 500 millilitres or more after vaginal delivery, or 1000 millilitres or more after caesarean section.
6. **Primary postpartum haemorrhage:** postpartum haemorrhage occurring within 24 hours of delivery.
7. **Secondary postpartum haemorrhage:** postpartum haemorrhage occurring from 24 hours up to six weeks after delivery.



8. **Sheehan's syndrome:** pituitary infarction resulting from severe hypotension during major postpartum haemorrhage, causing subsequent hypopituitarism.
9. **Uterine atony:** failure of the uterus to contract adequately after delivery, the most common cause of postpartum haemorrhage.
10. **Uterine balloon tamponade:** a technique using an inflated balloon catheter to apply direct pressure to the placental bed from within the uterine cavity.
11. **Uterine rupture:** complete or partial disruption of the uterine wall, most commonly at the site of a previous caesarean section scar.
12. **Trial of labour after caesarean section:** an attempt at vaginal delivery in a woman with a previous caesarean section, carrying a specific risk of uterine rupture.

Concept Check Questions [Series 4]

Objective questions

- Secondary postpartum haemorrhage occurs from 24 hours up to _____ weeks postpartum.
- The four Ts summarising the causes of postpartum haemorrhage are tone, tissue, trauma, and _____.
- Postpartum haemorrhage remains the single leading direct cause of maternal _____ worldwide and in Nigeria.
- Misoprostol is particularly valuable in resource-limited settings given its low cost and stability at room _____.
- Uterine rupture most commonly occurs at the site of a previous _____ section scar.

Short-answer questions

1. Explain the limitations of visual estimation of blood loss in defining PPH. (Linked to SLO 4.1)
2. Enumerate the complications of postpartum haemorrhage. (Linked to SLO 4.3)
3. Describe the components of active management of the third stage of labour. (Linked to SLO 4.6)



4. Explain why misoprostol is particularly valuable in resource-limited settings. (Linked to SLO 4.5)
5. Describe the clinical features of uterine rupture. (Linked to SLO 4.7)

Long-answer questions

6. Define postpartum haemorrhage and describe its causes and risk factors. (Linked to SLO 4.1, SLO 4.2)
7. Explain the contribution of postpartum haemorrhage to maternal mortality and describe its complications. (Linked to SLO 4.3)
8. Enumerate the principles of managing postpartum haemorrhage, including the role of uterotonics. (Linked to SLO 4.4, SLO 4.5)
9. Describe the role of active management of the third stage of labour in preventing postpartum haemorrhage. (Linked to SLO 4.6)
10. Describe the causes, features, management, and complications of uterine rupture. (Linked to SLO 4.7)

Answers to Concept Check Questions [Series 4]

Objective questions

11. Six.
12. Thrombin.
13. Death.
14. Temperature.
15. Caesarean.

Short-answer questions

16. Visual estimation is notoriously inaccurate and tends to significantly underestimate true blood loss, particularly at higher volumes.



17. Hypovolaemic shock, disseminated intravascular coagulation, acute kidney injury, Sheehan's syndrome, emergency hysterectomy, and death.
18. Prophylactic uterotonic administration, controlled cord traction, and cord clamping, though the latter is now often briefly delayed.
19. It is low cost, stable at room temperature without refrigeration, and can be given orally or sublingually without injection equipment.
20. Sudden severe pain that may improve as contractions cease, cessation of contractions, bleeding, and acute foetal compromise.

Long-answer questions

21. **Basic response:** PPH is defined by blood loss volume, though this is limited by inaccurate visual estimation, with causes summarised by the four Ts.

Value-added response: Risk factors allow antenatal planning, but a substantial proportion of PPH occurs with no identifiable risk factor, requiring universal preparedness.

22. **Basic response:** PPH is the leading direct cause of maternal death worldwide and in Nigeria, with complications including shock, coagulopathy, and death.

Value-added response: Most PPH deaths are preventable with timely care, reflecting health system barriers rather than an inherently untreatable condition.

23. **Basic response:** Management follows calling for help, resuscitation, monitoring, and treating the cause, with oxytocin first-line and misoprostol valuable where resources are limited.

Value-added response: Active management of the third stage substantially reduces PPH risk and is recommended as routine practice for essentially all deliveries.

Answers to Pilot Questions [Series 4]

Part 4.1

1. 500 mL or more for vaginal delivery, or 1000 mL or more for caesarean section, though definitions vary given limitations of visual estimation.



2. Visual estimation tends to significantly underestimate true blood loss, particularly at higher volumes.
3. Primary PPH occurs within 24 hours of delivery; secondary PPH occurs from 24 hours up to six weeks postpartum.
4. Tone (uterine atony, most common), tissue (retained products), trauma (laceration or rupture), and thrombin (coagulation disorder).
5. Previous PPH, multiple pregnancy, polyhydramnios, prolonged labour, grand multiparity, placenta praevia or accreta, and pre-eclampsia.

Part 4.2

6. It is the leading direct cause of maternal death, disproportionately affecting low-resource settings with limited access to timely care.
7. Delayed recognition, inadequate blood product availability, delayed access to care, and delayed escalation are largely addressable factors.
8. Hypovolaemic shock, disseminated intravascular coagulation, acute kidney injury, Sheehan's syndrome, hysterectomy, and death.
9. Prophylactic uterotonic administration, controlled cord traction, and, traditionally, early cord clamping.
10. Robust evidence shows it substantially reduces PPH risk compared with expectant management, now recommended for essentially all deliveries.

Part 4.3

11. Call for help, resuscitate, monitor, and simultaneously identify and treat the underlying cause according to the four Ts.
12. Firm bimanual massage stimulates uterine contraction as an immediate first step while other resuscitation measures are arranged.
13. Oxytocin first-line, ergometrine second-line (avoided in hypertension), and carboprost third-line (used with caution in asthma).
14. It is low cost, stable without refrigeration, and can be given orally or sublingually without specialist equipment.



15. Bimanual compression, balloon tamponade, compression sutures, uterine artery ligation, and hysterectomy as a last resort.

Part 4.4

1. Previous caesarean scar, especially during trial of labour after caesarean, obstructed labour, oxytocin misuse, and grand multiparity.
2. A classical vertical incision is more prone to rupture under the stress of labour than a lower segment transverse incision.
3. Sudden severe pain that may paradoxically improve, cessation of contractions, bleeding, and acute foetal compromise or death.
4. Immediate ABCDE resuscitation and emergency laparotomy without delay, with repair or hysterectomy depending on findings.
5. Massive haemorrhage, coagulopathy, injury to adjacent structures, hysterectomy, foetal death, and maternal death.



References and Attributions [Series 4]

Textual References

1. Cunningham, F. G., Leveno, K. J., Dashe, J. S. et al. (2022). Williams Obstetrics (26th ed.). McGraw Hill.
2. World Health Organization (2018). WHO Recommendations for the Prevention and Treatment of Postpartum Haemorrhage. WHO Press.
3. Royal College of Obstetricians and Gynaecologists (2016). Green-top Guideline No. 52: Prevention and Management of Postpartum Haemorrhage. RCOG Press.
4. Knight, M., Bunch, K., Tuffnell, D. et al. (Eds.) (2021). Saving Lives, Improving Mothers' Care: MBRRACE-UK Confidential Enquiry into Maternal Deaths. National Perinatal Epidemiology Unit.

Figures, Plates, Tables, and Boxes

1. Table 4.1: Classification of postpartum haemorrhage by timing and severity. AI-generated using the prompt: "Create a clean reference table titled Classification of Postpartum Haemorrhage, showing timing and severity categories with blood loss volumes. Simple clinical reference table style with outside border."
2. Figure 4.2: Active management of the third stage of labour and the complications of major postpartum haemorrhage. AI-generated using the prompt: "Create a professional medical diagram titled Prevention of Postpartum Haemorrhage, showing active third stage management components and PPH complications. Clean clinical educational diagram style."
3. Box 4.3: Stepwise escalation pathway for postpartum haemorrhage management. AI-generated using the prompt: "Create a simple single-column reference box with an outside border titled PPH Escalation Pathway, listing steps from uterine massage through hysterectomy. Clinical reference box style."
4. Figure 4.4: Uterine rupture anatomy and its clinical features and complications. AI-generated using the prompt: "Create a professional medical diagram titled Uterine Rupture, showing a cross-section of a ruptured uterine scar with the foetus and a panel of clinical features and complications. Clean clinical educational diagram style."



Series 5: Acute Gynaecological Conditions and Complications

- **Part 5.1: Ovarian Cyst Accidents**
 - Sub Part 5.1.1: Ovarian cyst torsion
 - Sub Part 5.1.2: Ruptured ovarian cyst and haemorrhage into a cyst
 - Sub Part 5.1.3: Investigation and management of ovarian cyst accidents
- **Part 5.2: Pelvic Inflammatory Disease and Tubo-Ovarian Abscess**
 - Sub Part 5.2.1: Pelvic inflammatory disease
 - Sub Part 5.2.2: Tubo-ovarian abscess
 - Sub Part 5.2.3: Management of pelvic inflammatory disease and tubo-ovarian abscess
- **Part 5.3: Acute Pelvic Pain: Differential Diagnosis and Assessment**
 - Sub Part 5.3.1: Differential diagnosis of acute pelvic pain
 - Sub Part 5.3.2: Structured assessment of acute pelvic pain
 - Sub Part 5.3.3: Red flags requiring urgent surgical intervention
- **Part 5.4: Complications of Gynaecological Surgery**
 - Sub Part 5.4.1: Intraoperative complications of gynaecological surgery
 - Sub Part 5.4.2: Early postoperative complications
 - Sub Part 5.4.3: Recognition and management of the acutely unwell postoperative patient

Introduction

In the last Series, we explored postpartum haemorrhage and uterine rupture. We conclude this course, and this journey through Obstetric and Gynaecological Emergencies, with a Series that brings together the remaining acute gynaecological conditions every emergency clinician must recognise: ovarian cyst accidents, pelvic inflammatory disease and tubo-ovarian abscess, and the



broader challenge of acute pelvic pain and postoperative deterioration. Throughout, you will notice the same principles from Series 1 reappearing again and again, recognition, resuscitation, and decisive action working in parallel rather than in sequence.

The aim of this Series is to equip you with the knowledge to recognise and manage ovarian cyst accidents, pelvic inflammatory disease and tubo-ovarian abscess, acute pelvic pain, and the complications of gynaecological surgery.

We shall commence this Series by examining ovarian cyst accidents, including torsion, rupture, and intracystic haemorrhage. Next, we will consider pelvic inflammatory disease and its severe complication, tubo-ovarian abscess. Following that, our attention turns to a structured approach to the differential diagnosis and assessment of acute pelvic pain. Finally, we will conclude by examining the complications of gynaecological surgery and the recognition of the acutely unwell postoperative patient, bringing this course to a close.

Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 5.1:** describe the causes, clinical features, and management of ovarian cyst torsion,
- **SLO 5.2:** describe the presentation and management of ruptured ovarian cyst and haemorrhage into a cyst,
- **SLO 5.3:** describe the causes, presentation, and complications of pelvic inflammatory disease,
- **SLO 5.4:** describe the presentation, investigation, and management of tubo-ovarian abscess,
- **SLO 5.5:** describe a structured approach to the differential diagnosis and assessment of acute pelvic pain,
- **SLO 5.6:** describe the intraoperative and early postoperative complications of gynaecological surgery, and
- **SLO 5.7:** describe the recognition and management of the acutely unwell postoperative gynaecological patient.

5.1 Ovarian Cyst Accidents

5.1.1 Ovarian cyst torsion



Ovarian torsion occurs when the ovary, often enlarged by an underlying cyst or, less commonly, a normal ovary in a young woman with a longer than usual ovarian ligament, twists on its vascular pedicle, compromising first venous and lymphatic drainage and, if the torsion is not promptly relieved, arterial supply, ultimately threatening the viability of the ovary and, in severe or prolonged cases, requiring its surgical removal.

Torsion presents with sudden onset, severe, often unilateral pelvic or lower abdominal pain, frequently accompanied by nausea and vomiting, with the pain sometimes intermittent in early or partial torsion as the ovary twists and partially untwists, and examination revealing adnexal tenderness and, sometimes, a palpable mass, making torsion a genuine surgical emergency in which delay in diagnosis and treatment directly threatens the viability of the affected ovary.

Fill in the blank: Ovarian torsion compromises first venous and lymphatic drainage and, if not relieved, _____ supply to the ovary. Pain in early or partial torsion may be intermittent as the ovary twists and partially _____.

5.1.2 Ruptured ovarian cyst and haemorrhage into a cyst

A **ruptured ovarian cyst** typically presents with sudden onset unilateral pelvic pain, often occurring around the time of ovulation (a ruptured corpus luteal or follicular cyst) or following sexual intercourse or physical exertion, with the severity of pain and any associated haemodynamic disturbance depending largely on the volume of intraperitoneal blood or cyst fluid released at the time of rupture.

Haemorrhage into an ovarian cyst (without frank rupture) causes sudden distension and stretching of the cyst wall, producing acute pain that can closely mimic torsion or rupture clinically, and, in either rupture or intracystic haemorrhage, significant intraperitoneal bleeding can occasionally cause genuine haemodynamic instability requiring urgent resuscitation and, where bleeding does not settle with conservative management, surgical intervention to achieve haemostasis.

Fill in the blank: A ruptured ovarian cyst often presents around the time of _____, from a ruptured corpus luteal or follicular cyst. Haemorrhage into an ovarian cyst causes acute pain from sudden _____ and stretching of the cyst wall.

5.1.3 Investigation and management of ovarian cyst accidents

Transvaginal ultrasound with Doppler assessment is the key investigation in suspected ovarian cyst accident, with reduced or absent blood flow to the ovary supporting a diagnosis of torsion, though it is important to recognise that normal Doppler flow does not reliably exclude torsion, particularly in its early or partial stages, meaning that ongoing strong clinical suspicion should still prompt surgical exploration even when initial Doppler findings appear reassuring.

Suspected torsion requires urgent surgical exploration, generally by laparoscopy, with the ovary untwisted and its viability assessed, preserving the ovary wherever it appears viable, as the historical practice of routinely removing a twisted ovary has been replaced by a more



conservative, ovary-preserving approach given evidence that many ovaries recover function even after appearing significantly compromised at initial surgery, provided torsion is relieved reasonably promptly.

Fill in the blank: Normal Doppler flow does not reliably exclude ovarian torsion, particularly in its early or _____ stages. Modern practice favours a conservative, ovary-_____ approach at surgery for torsion wherever the ovary appears viable.

Condition	Onset	Pain Character	Examination / Ultrasound Findings	Typical Management
<u>Ovarian Torsion</u>	Sudden onset	Severe, unilateral pelvic pain, often colicky	Adnexal tenderness, enlarged ovary with reduced/absent Doppler flow	Emergency laparoscopy/laparotomy, detorsion or oophorectomy if necrotic
<u>Ruptured Ovarian Cyst</u>	Sudden onset, often after exertion or intercourse	Sharp, unilateral pain, may radiate	Free fluid in pelvis on ultrasound, localized tenderness	Conservative management if stable; analgesia, observation; surgery if unstable
<u>Haemorrhage into a Cyst</u>	Acute or subacute	Dull or sharp unilateral pain	Complex cyst with internal echoes on ultrasound, adnexal tenderness	Conservative if stable; surgical intervention if ongoing bleeding or haemodynamic compromise

Table 5.1: Comparison of ovarian torsion, ruptured cyst, and intracystic haemorrhage.

Pilot questions 5.1

- Describe the pathophysiology of ovarian torsion. (Linked to SLO 5.1)
- Describe the clinical presentation of ovarian torsion. (Linked to SLO 5.1)
- Describe the clinical presentation of a ruptured ovarian cyst. (Linked to SLO 5.2)
- Explain how haemorrhage into an ovarian cyst causes acute pain. (Linked to SLO 5.2)
- Explain why normal Doppler flow does not reliably exclude ovarian torsion. (Linked to SLO 5.1)



5.2 Pelvic Inflammatory Disease and Tubo-Ovarian Abscess

5.2.1 Pelvic inflammatory disease

Pelvic inflammatory disease (PID) is infection and inflammation of the upper female genital tract, most commonly ascending from a lower genital tract sexually transmitted infection, particularly *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, though other organisms, including those associated with bacterial vaginosis, can also be implicated, presenting with lower abdominal pain, abnormal vaginal discharge, and, on examination, cervical excitation and adnexal tenderness.

Untreated or inadequately treated PID carries substantial risk of long-term complications, including chronic pelvic pain, tubal factor infertility from resulting tubal scarring and occlusion, and a markedly increased risk of subsequent ectopic pregnancy, underscoring why prompt recognition and treatment of PID, even when the presentation is relatively mild, matters greatly for a woman's future reproductive health and not merely for resolution of the acute presenting symptoms.

Fill in the blank: Pelvic inflammatory disease most commonly ascends from a lower genital tract infection with *Chlamydia trachomatis* or *Neisseria* _____. Untreated PID carries substantial risk of tubal factor _____ from resulting tubal scarring.

5.2.2 Tubo-ovarian abscess

Tubo-ovarian abscess represents a severe complication of pelvic inflammatory disease, in which infection progresses to form a walled-off collection of pus involving the fallopian tube and ovary, presenting with more severe pain, high fever, and a palpable, tender adnexal mass, and carrying genuine risk of rupture, which would cause generalised peritonitis and life-threatening sepsis if it were to occur.

Diagnosis of tubo-ovarian abscess is supported by transvaginal ultrasound, showing a complex adnexal mass with features of a collection, alongside markedly raised inflammatory markers, and any woman with suspected tubo-ovarian abscess who deteriorates clinically, or in whom there are signs suggestive of rupture such as worsening pain, spreading peritonism, or septic shock, requires urgent surgical intervention without delay.

Fill in the blank: Tubo-ovarian abscess is a severe complication of PID in which infection forms a walled-off collection of _____ involving the tube and ovary. Rupture of a tubo-ovarian abscess would cause generalised peritonitis and life-threatening _____.

5.2.3 Management of pelvic inflammatory disease and tubo-ovarian abscess

Mild to moderate pelvic inflammatory disease is managed with broad-spectrum antibiotics covering the likely causative organisms, including chlamydial and gonococcal cover, commenced empirically without waiting for microbiological confirmation given the risk of delayed treatment to future fertility, alongside partner notification and treatment, and screening



for other sexually transmitted infections, an integral part of comprehensive management rather than an optional addition.

Tubo-ovarian abscess and severe PID require inpatient management with intravenous antibiotics, and, where a significant collection is present, drainage, either by ultrasound or CT-guided percutaneous aspiration or, where this is not available or bleeding is not adequately controlled by this approach, surgical drainage by laparoscopy or laparotomy, with response to treatment closely monitored given the potential for rapid clinical deterioration in this condition.

Fill in the blank: Mild to moderate PID is managed with empirical broad-spectrum antibiotics commenced without waiting for microbiological _____. Tubo-ovarian abscess with a significant collection may require _____ drainage, either percutaneous or surgical.

Feature / Complication	Key Details
<u>Uncomplicated PID</u>	Gradual onset pelvic pain, fever often mild, cervical motion tenderness, adnexal tenderness without mass.
<u>Tubo-Ovarian Abscess</u>	Severe pelvic pain, high fever, adnexal mass palpable, marked tenderness, systemic toxicity.
<u>Chronic Pelvic Pain</u>	Persistent pain due to adhesions and scarring.
<u>Infertility</u>	Tubal damage leading to impaired fertility.
<u>Ectopic Pregnancy Risk</u>	Increased risk due to tubal scarring and obstruction.

Box 5.2: Distinguishing features of PID and tubo-ovarian abscess, and long-term complications of untreated PID.

Pilot questions 5.2

1. Describe the causes and clinical presentation of pelvic inflammatory disease. (Linked to SLO 5.3)
2. Describe the long-term complications of untreated pelvic inflammatory disease. (Linked to SLO 5.3)
3. Describe the clinical presentation of tubo-ovarian abscess. (Linked to SLO 5.4)
4. Describe the investigation of suspected tubo-ovarian abscess. (Linked to SLO 5.4)
5. Describe the management of pelvic inflammatory disease and tubo-ovarian abscess. (Linked to SLO 5.4)



5.3 Acute Pelvic Pain: Differential Diagnosis and Assessment

5.3.1 Differential diagnosis of acute pelvic pain

Acute pelvic pain in a woman of reproductive age has a broad differential diagnosis spanning gynaecological causes (ectopic pregnancy, ovarian torsion or cyst accident, pelvic inflammatory disease, and miscarriage), gastrointestinal causes (appendicitis, a particularly important differential given its overlapping presentation with several gynaecological emergencies), and urological causes (renal colic, urinary tract infection), each requiring a structured, systematic approach to avoid diagnostic error.

A **pregnancy test** should be performed as an early, essentially universal step in any woman of reproductive age presenting with acute pelvic pain, as it immediately and substantially narrows the differential diagnosis, distinguishing pregnancy-related causes such as ectopic pregnancy and miscarriage from the wide range of non-pregnancy-related gynaecological, gastrointestinal, and urological causes that would otherwise need to be considered together.

Fill in the blank: Appendicitis is a particularly important gastrointestinal differential given its overlapping presentation with several _____ emergencies. A _____ test should be an early, essentially universal step in any woman of reproductive age with acute pelvic pain.

5.3.2 Structured assessment of acute pelvic pain

Structured assessment of acute pelvic pain combines a focused history (site, onset, character, and radiation of pain, menstrual and sexual history, and associated symptoms such as fever, vaginal discharge, or bleeding) with systematic examination (abdominal and pelvic examination, including assessment for peritonism, cervical excitation, and any palpable mass), and targeted investigation guided by the leading differential diagnoses identified.

First-line investigations typically include pregnancy testing, full blood count and inflammatory markers, urinalysis, and pelvic ultrasound, with the specific combination and sequence of further investigation tailored to the clinical picture rather than applied as a fixed, generic panel, reflecting the same principle of purposeful, risk-directed investigation established earlier in this programme.

Fill in the blank: Structured assessment of acute pelvic pain combines a focused history, systematic examination, and _____ investigation guided by the leading differentials. First-line investigations typically include pregnancy testing, full blood count, urinalysis, and pelvic _____.

5.3.3 Red flags requiring urgent surgical intervention

Certain clinical features identified during assessment of acute pelvic pain should be treated as red flags warranting urgent senior review and, frequently, surgical intervention without delay, including signs of haemodynamic instability, peritonism suggesting an intra-abdominal catastrophe, a positive pregnancy test with pain and bleeding suggesting ruptured ectopic



pregnancy, and clinical features strongly suggestive of ovarian torsion, given the time-critical nature of preserving ovarian viability.

Recognising these red flags promptly and escalating appropriately, rather than pursuing a purely sequential, step-by-step diagnostic process, reflects the same fundamental principle established throughout this course: that in a genuine emergency, resuscitation, senior involvement, and, where indicated, surgical intervention should proceed in parallel with, rather than only after, a complete and fully confirmed diagnostic work-up.

Fill in the blank: Red flags in acute pelvic pain include haemodynamic instability and _____ suggesting an intra-abdominal catastrophe. In a genuine emergency, resuscitation and surgical intervention should proceed in _____ with, not only after, a complete diagnostic work-up.

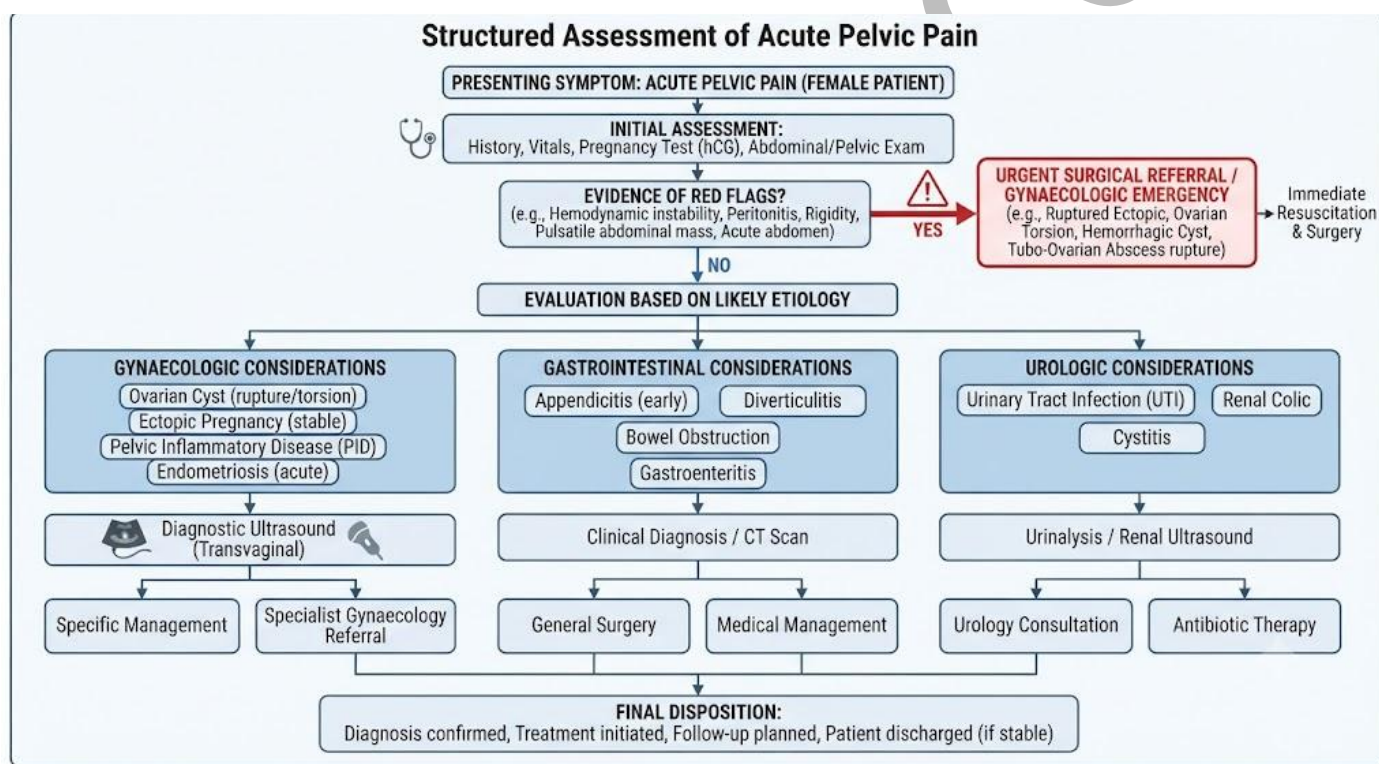


Figure 5.3: Structured assessment pathway for acute pelvic pain with red flag recognition.

Pilot questions 5.3

1. Describe the broad differential diagnosis of acute pelvic pain in a woman of reproductive age. (Linked to SLO 5.5)
2. Explain why a pregnancy test is an essentially universal early step in assessing acute pelvic pain. (Linked to SLO 5.5)
3. Describe the components of structured assessment of acute pelvic pain. (Linked to SLO 5.5)



4. List the red flag features in acute pelvic pain that warrant urgent surgical intervention. (Linked to SLO 5.5)
5. Explain why resuscitation and surgical intervention should proceed in parallel with diagnostic assessment in a genuine emergency. (Linked to SLO 5.5)

5.4 Complications of Gynaecological Surgery

5.4.1 Intraoperative complications of gynaecological surgery

Intraoperative complications of gynaecological surgery include haemorrhage (from injury to a major vessel or inadequate haemostasis), visceral injury (bladder, ureter, or bowel, particularly in the presence of dense adhesions or distorted pelvic anatomy from previous surgery or extensive disease), and anaesthetic complications, with the specific risk profile varying according to the type of surgery, the surgical approach, and individual patient factors.

Prompt intraoperative recognition of a complication, followed by immediate, appropriate corrective action, generally leads to a good outcome, while delayed recognition, particularly of visceral injury, which may not become clinically apparent until the postoperative period, is associated with substantially greater morbidity, underscoring the importance of meticulous surgical technique and a systematic, thorough check of the operative field before closure at the end of any gynaecological procedure.

Fill in the blank: Visceral injury may not become clinically apparent until the _____ period, associated with substantially greater morbidity if recognition is delayed. A systematic, thorough check of the operative field before _____ is essential at the end of any gynaecological procedure.

5.4.2 Early postoperative complications

Early postoperative complications following gynaecological surgery include haemorrhage (either from the surgical site itself or intraperitoneal), infection (wound, urinary tract, or, more seriously, intra-abdominal or pelvic collection), venous thromboembolism (a recognised risk following any pelvic surgery, particularly in the presence of additional risk factors such as malignancy, obesity, or prolonged immobility), and, less commonly, delayed presentation of a missed intraoperative visceral injury.

Appropriate perioperative measures to reduce these risks include thromboprophylaxis (mechanical, pharmacological, or both, according to individual risk assessment), prophylactic antibiotics where indicated, careful attention to surgical technique and haemostasis, and early postoperative mobilisation, all recognised, evidence-based components of routine perioperative care that meaningfully reduce the incidence of avoidable postoperative complications.



Fill in the blank: Venous thromboembolism is a recognised risk following pelvic surgery, particularly with additional risk factors such as malignancy or _____. Perioperative measures to reduce complications include thromboprophylaxis, prophylactic antibiotics, and early postoperative _____.

5.4.3 Recognition and management of the acutely unwell postoperative patient

The acutely unwell postoperative gynaecological patient should be assessed using the same structured ABCDE approach established at the beginning of this course, with early warning scores again playing a valuable role in prompting timely escalation, and a specifically broad differential diagnosis maintained, considering surgical site or intra-abdominal bleeding, infection or sepsis, venous thromboembolism, and missed visceral injury as leading possibilities in any woman who deteriorates in the postoperative period.

Investigation and management of the deteriorating postoperative patient proceeds in parallel with resuscitation, with a low threshold for senior surgical review, appropriate imaging (typically CT or ultrasound depending on the suspected cause), and, where indicated, prompt return to theatre for surgical exploration, reflecting the same fundamental principle of parallel, rather than purely sequential, assessment and action that has run consistently throughout this Series and this entire course.

Fill in the blank: The acutely unwell postoperative patient should be assessed using the same structured _____ approach established throughout this course. Investigation and management of the deteriorating postoperative patient proceed in _____ with resuscitation.

Complication Type	Timing	Preventive / Management Measure
<u>Haemorrhage</u>	Intraoperative	Careful surgical technique, haemostatic measures, transfusion if needed.
<u>Ureteric Injury</u>	Intraoperative	Identify ureter during dissection, intraoperative repair if injured.
<u>Bowel Injury</u>	Intraoperative	Gentle handling, prompt recognition and repair.
<u>Bladder Injury</u>	Intraoperative	Careful dissection, intraoperative repair, catheter drainage.
<u>Thromboembolism</u>	Early postoperative	Prophylaxis with compression stockings, anticoagulation, early mobilization.
<u>Infection</u>	Early postoperative	Antibiotic prophylaxis, aseptic technique, wound care.
<u>Anaesthetic Complications</u>	Intraoperative / immediate postoperative	Pre-op assessment, close monitoring, prompt management of airway or cardiovascular events.



Complication Type	Timing	Preventive / Management Measure
Urinary Retention	Early postoperative	Catheterization, monitor voiding, supportive care.

Table 5.4: Intraoperative and early postoperative complications of gynaecological surgery.

Pilot questions 5.4

1. Describe the intraoperative complications of gynaecological surgery. (Linked to SLO 5.6)
2. Explain why prompt intraoperative recognition of a complication is important. (Linked to SLO 5.6)
3. Describe the early postoperative complications of gynaecological surgery. (Linked to SLO 5.6)
4. Describe the perioperative measures used to reduce the risk of postoperative complications. (Linked to SLO 5.6)
5. Describe the approach to assessing the acutely unwell postoperative gynaecological patient. (Linked to SLO 5.7)



Series Summary

This Series has covered ovarian cyst accidents, including torsion, rupture, and intracystic haemorrhage, followed by pelvic inflammatory disease and its severe complication, tubo-ovarian abscess. It went on to examine a structured approach to the differential diagnosis and assessment of acute pelvic pain, before concluding with the complications of gynaecological surgery and the recognition of the acutely unwell postoperative patient, bringing this course on Obstetric and Gynaecological Emergencies to a close.

You should now be able to describe the causes and management of ovarian cyst accidents, describe the presentation and complications of pelvic inflammatory disease and tubo-ovarian abscess, apply a structured approach to acute pelvic pain, describe the complications of gynaecological surgery, and recognise and manage the acutely unwell postoperative patient (Linked to SLOs 5.1 to 5.7).

Glossary of Terms

1. **Cervical excitation:** pain elicited on movement of the cervix during bimanual examination, suggestive of pelvic inflammatory disease or ectopic pregnancy.
2. **Ovarian torsion:** twisting of the ovary on its vascular pedicle, compromising blood supply and threatening ovarian viability.
3. **Pelvic inflammatory disease (PID):** infection and inflammation of the upper female genital tract, most commonly from an ascending sexually transmitted infection.
4. **Tubal factor infertility:** infertility resulting from tubal scarring and occlusion, a long-term complication of untreated pelvic inflammatory disease.
5. **Tubo-ovarian abscess:** a walled-off collection of pus involving the fallopian tube and ovary, a severe complication of pelvic inflammatory disease.
6. **Red flag:** a clinical feature warranting urgent senior review and, frequently, surgical intervention without delay.
7. **Venous thromboembolism:** the formation of a blood clot within the venous system, a recognised risk following pelvic surgery.
8. **Thromboprophylaxis:** measures, mechanical or pharmacological, used to reduce the risk of venous thromboembolism.
9. **Visceral injury:** injury to an internal organ such as the bladder, ureter, or bowel, a recognised intraoperative surgical complication.



10. **Doppler ultrasound:** an ultrasound technique assessing blood flow, used to support the diagnosis of ovarian torsion.
11. **Ovary-preserving surgery:** a surgical approach to ovarian torsion that untwists and preserves the ovary wherever it appears viable, rather than removing it routinely.
12. **Corpus luteal cyst:** a functional ovarian cyst that can rupture around the time of ovulation, causing acute pelvic pain.

Concept Check Questions [Series 5]

Objective questions

- Pain in early or partial ovarian torsion may be intermittent as the ovary twists and partially _____.
- A ruptured ovarian cyst often presents around the time of _____.
- Pelvic inflammatory disease most commonly ascends from infection with Chlamydia trachomatis or Neisseria _____.
- Tubo-ovarian abscess is a walled-off collection of _____ involving the tube and ovary.
- A _____ test should be an essentially universal early step in assessing acute pelvic pain in a woman of reproductive age.

Short-answer questions

1. Explain why normal Doppler flow does not reliably exclude ovarian torsion. (Linked to SLO 5.1)
2. Describe the long-term complications of untreated pelvic inflammatory disease. (Linked to SLO 5.3)
3. Describe the management of pelvic inflammatory disease and tubo-ovarian abscess. (Linked to SLO 5.4)
4. List the red flag features in acute pelvic pain that warrant urgent surgical intervention. (Linked to SLO 5.5)



5. Describe the perioperative measures used to reduce the risk of postoperative complications. (Linked to SLO 5.6)

Long-answer questions

6. Describe the causes, presentation, and management of ovarian cyst accidents. (Linked to SLO 5.1, SLO 5.2)
7. Describe the presentation, complications, and management of pelvic inflammatory disease and tubo-ovarian abscess. (Linked to SLO 5.3, SLO 5.4)
8. Describe a structured approach to the differential diagnosis and assessment of acute pelvic pain. (Linked to SLO 5.5)
9. Describe the intraoperative and early postoperative complications of gynaecological surgery. (Linked to SLO 5.6)
10. Describe the approach to recognising and managing the acutely unwell postoperative gynaecological patient. (Linked to SLO 5.7)

Answers to Concept Check Questions [Series 5]

Objective questions

11. Untwist.
12. Ovulation.
13. Gonorrhoeae.
14. Pus.
15. Pregnancy.

Short-answer questions

16. Torsion can be intermittent or partial, so Doppler flow may still be present despite ongoing torsion, particularly in early presentation.
17. Chronic pelvic pain, tubal factor infertility from scarring, and a markedly increased risk of subsequent ectopic pregnancy.



18. Broad-spectrum antibiotics for mild to moderate PID, and inpatient intravenous antibiotics with drainage for tubo-ovarian abscess.
19. Haemodynamic instability, peritonism, positive pregnancy test with pain and bleeding, and features suggestive of ovarian torsion.
20. Thromboprophylaxis, prophylactic antibiotics, careful surgical technique and haemostasis, and early postoperative mobilisation.

Long-answer questions

21. **Basic response:** Ovarian torsion compromises blood supply requiring urgent surgery, while ruptured cyst and intracystic haemorrhage cause acute pain, sometimes with haemodynamic disturbance.

Value-added response: Modern practice favours ovary-preserving surgery for torsion, as many ovaries recover function once torsion is promptly relieved.

22. **Basic response:** PID ascends from sexually transmitted infection causing pain and discharge, risking chronic pain and infertility if untreated, with tubo-ovarian abscess as a severe complication.

Value-added response: Tubo-ovarian abscess requires inpatient antibiotics and drainage, with urgent surgery if rupture is suspected given the risk of life-threatening sepsis.

23. **Basic response:** Acute pelvic pain has a broad differential across gynaecological, gastrointestinal, and urological causes, assessed with structured history, examination, and investigation.

Value-added response: Red flag features should prompt resuscitation and surgical intervention in parallel with, rather than only after, a complete diagnostic work-up.

Answers to Pilot Questions [Series 5]

Part 5.1

1. The ovary twists on its vascular pedicle, compromising venous and lymphatic drainage, then arterial supply if not relieved.



2. Sudden onset, severe, often unilateral pain, sometimes intermittent, with nausea, vomiting, and adnexal tenderness.
3. Sudden onset unilateral pain, often around ovulation, with severity depending on the volume of blood or fluid released.
4. Sudden distension and stretching of the cyst wall produces acute pain that can mimic torsion or rupture.
5. Torsion can be intermittent or partial, so blood flow may still be detectable despite ongoing torsion, especially early on.

Part 5.2

6. Ascending infection, most commonly chlamydial or gonococcal, causing lower abdominal pain, discharge, and adnexal tenderness.
7. Chronic pelvic pain, tubal factor infertility, and increased risk of ectopic pregnancy in future pregnancies.
8. Severe pain, high fever, and a palpable, tender adnexal mass, with risk of rupture causing peritonitis and sepsis.
9. Transvaginal ultrasound showing a complex adnexal collection, alongside markedly raised inflammatory markers.
10. Broad-spectrum antibiotics for PID; inpatient intravenous antibiotics with percutaneous or surgical drainage for tubo-ovarian abscess.

Part 5.3

11. Gynaecological (ectopic pregnancy, torsion, PID, miscarriage), gastrointestinal (appendicitis), and urological (renal colic, UTI) causes.
12. It immediately narrows the differential by distinguishing pregnancy-related from non-pregnancy-related causes.
13. Focused history, systematic examination, and targeted investigation guided by the leading differential diagnoses.
14. Haemodynamic instability, peritonism, a positive pregnancy test with pain and bleeding, and features suggestive of torsion.



15. It reflects the principle that in a genuine emergency, action must not be delayed pending a complete, fully confirmed diagnosis.

Part 5.4

1. Haemorrhage, visceral injury (bladder, ureter, bowel), and anaesthetic complications.
2. Delayed recognition, particularly of visceral injury, is associated with substantially greater morbidity than prompt intraoperative recognition.
3. Haemorrhage, infection, venous thromboembolism, and delayed presentation of a missed intraoperative injury.
4. Thromboprophylaxis, prophylactic antibiotics, careful surgical technique, and early postoperative mobilisation.
5. The same structured ABCDE approach used throughout this course, with a broad differential and early warning scores guiding escalation.



References and Attributions [Series 5]

Textual References

1. Cunningham, F. G., Leveno, K. J., Dashe, J. S. et al. (2022). Williams Obstetrics (26th ed.). McGraw Hill.
2. Berek, J. S. and Berek, D. L. (2019). Berek and Novak's Gynecology (16th ed.). Wolters Kluwer.
3. Royal College of Obstetricians and Gynaecologists (2015). Green-top Guideline No. 62: Management of Suspected Ovarian Masses in Premenopausal Women. RCOG Press.
4. British Association for Sexual Health and HIV (2018). UK National Guideline for the Management of Pelvic Inflammatory Disease. BASHH.

Figures, Plates, Tables, and Boxes

1. Table 5.1: Comparison of ovarian torsion, ruptured cyst, and intracystic haemorrhage. AI-generated using the prompt: "Create a clean reference table titled Ovarian Cyst Accidents, comparing torsion, rupture, and haemorrhage by onset, pain, findings, and management. Simple clinical reference table style with outside border."
2. Box 5.2: Distinguishing features of PID and tubo-ovarian abscess, and long-term complications of untreated PID. AI-generated using the prompt: "Create a simple single-column reference box with an outside border titled PID and Tubo-Ovarian Abscess, listing distinguishing features and long-term complications. Clinical reference box style."
3. Figure 5.3: Structured assessment pathway for acute pelvic pain with red flag recognition. AI-generated using the prompt: "Create a professional medical flowchart titled Structured Assessment of Acute Pelvic Pain, showing the assessment pathway with a red flag branch to urgent surgical referral. Clean clinical educational diagram style."
4. Table 5.4: Intraoperative and early postoperative complications of gynaecological surgery. AI-generated using the prompt: "Create a clean reference table titled Complications of Gynaecological Surgery, listing intraoperative and postoperative complications by timing and management. Simple clinical reference table style with outside border."

