



La-Net

ORT 603

**CLINICS, THEATRE
AND BED SIDE
TEACHING IN
ORTHOPAEDICS**

CLINICS



THEATRE



BED SIDE TEACHING



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Course code: ORT 603

Course title: Clinics, Theatre and Bed Side Teaching in Orthopaedics

Course credit load: 3 Units

Series 1: History Taking in Orthopaedic Practice

- **Part 1.1: Introduction to Orthopaedic Clinical Practice**
 - Sub Part 1.1.1: Definition and scope of orthopaedic practice
 - Sub Part 1.1.2: Epidemiology of orthopaedic conditions
 - Sub Part 1.1.3: Aetiology and classification of orthopaedic conditions
- **Part 1.2: Presenting Complaint and History of Present Illness**
 - Sub Part 1.2.1: Eliciting the presenting complaint
 - Sub Part 1.2.2: Characterising pain in orthopaedic history taking
 - Sub Part 1.2.3: History of present illness: onset, progression, and associated symptoms
- **Part 1.3: Past Medical, Surgical, Drug, and Family History**
 - Sub Part 1.3.1: Past medical and surgical history relevant to orthopaedics
 - Sub Part 1.3.2: Drug history and allergies
 - Sub Part 1.3.3: Family history in orthopaedic conditions
- **Part 1.4: Social and Functional History**
 - Sub Part 1.4.1: Social history relevant to orthopaedic practice
 - Sub Part 1.4.2: Functional history and activities of daily living
 - Sub Part 1.4.3: Occupational and recreational history
- **Part 1.5: Trauma History and Systematic Review of Systems**
 - Sub Part 1.5.1: History taking in the trauma patient
 - Sub Part 1.5.2: Mechanism of injury and its clinical significance
 - Sub Part 1.5.3: Systematic review of systems in orthopaedic clerking

Introduction



Confident bedside orthopaedic practice begins with detailed, systematic **history taking**, grounded in an understanding of the definition, epidemiology, aetiology, and classification of the conditions encountered, and extended through careful enquiry into the presenting complaint, relevant background history, and, where trauma is involved, the specific mechanism of injury. This opening Series establishes this essential clinical skill, forming the foundation for every subsequent clinical encounter examined throughout this course.

The aim of this Series is to equip you with a thorough, practical understanding of orthopaedic clinical practice, and detailed history taking covering the presenting complaint, past medical, surgical, drug, and family history, social and functional history, and trauma history.

This Series begins with an **introduction to orthopaedic clinical practice**, before examining the **presenting complaint and history of present illness**. We then turn to **past medical, surgical, drug, and family history**, followed by **social and functional history**, concluding with **trauma history and systematic review of systems**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 1.1:** define the scope of orthopaedic practice and describe the epidemiology of common orthopaedic conditions
- **SLO 1.2:** describe the aetiology and classification of orthopaedic conditions
- **SLO 1.3:** elicit a presenting complaint and characterise pain in orthopaedic history taking
- **SLO 1.4:** take a systematic history of present illness, including onset, progression, and associated symptoms
- **SLO 1.5:** take a relevant past medical and surgical history in orthopaedic practice
- **SLO 1.6:** take a drug history, including allergies, and a relevant family history
- **SLO 1.7:** take a relevant social history in orthopaedic practice
- **SLO 1.8:** take a functional history covering activities of daily living, occupation, and recreation
- **SLO 1.9:** take a systematic history from a trauma patient, including mechanism of injury, and
- **SLO 1.10:** conduct a systematic review of systems in orthopaedic clerking.



1.1 Introduction to Orthopaedic Clinical Practice

1.1.1 definition and scope of orthopaedic practice

A discipline spanning bone, joint, and soft tissue disorders

Orthopaedic practice is concerned with the diagnosis, treatment, and prevention of disorders affecting the musculoskeletal system, encompassing bones, joints, muscles, tendons, ligaments, and peripheral nerves, discussed in relation to specific anatomical structures in an earlier related course, spanning both **traumatic** and **non-traumatic** conditions.

The scope of orthopaedic practice extends across the entire **lifespan**, from congenital conditions presenting at birth, discussed in an earlier related course, through childhood growth disorders, to degenerative and traumatic conditions affecting adults and the elderly, reflecting the genuinely broad clinical territory this discipline **covers**.

Fill in the blank: Orthopaedic practice is concerned with the diagnosis, treatment, and prevention of disorders affecting the musculoskeletal system, spanning both traumatic and non-traumatic _____.

1.1.2 epidemiology of orthopaedic conditions

The **epidemiology** of orthopaedic conditions varies considerably by patient age, sex, and geographic setting, with traumatic injury representing a particularly substantial contributor to orthopaedic disease burden within many resource-limited settings, reflecting road traffic collisions and occupational injury patterns discussed in relation to trauma later in this Series.

Further important epidemiological considerations include the rising burden of degenerative joint disease with an ageing population, and the specific regional prevalence of conditions such as tuberculous arthritis, discussed in an earlier related course, and sickle cell disease-related bone complications, each relevant to understanding the local orthopaedic disease **profile**.

Fill in the blank: The epidemiology of orthopaedic conditions varies considerably by patient age, sex, and geographic setting, with traumatic injury representing a particularly substantial contributor to orthopaedic disease _____.

1.1.3 aetiology and classification of orthopaedic conditions

Orthopaedic conditions may be classified according to their underlying **aetiology**, including traumatic, discussed throughout this course, congenital, discussed in an earlier related course, infective, discussed in an earlier related course, degenerative, neoplastic, discussed in an earlier



related course, and metabolic causes, discussed in relation to bone metabolism in an earlier related course.

This aetiological classification directly informs the specific pattern of history and examination findings expected for a given condition, meaning careful attention to the likely underlying aetiology, guided by the patient's age, presentation, and relevant history, discussed further throughout this Series, supports efficient, focused clinical **assessment**.

Fill in the blank: Orthopaedic conditions may be classified according to their underlying aetiology, including traumatic, congenital, infective, degenerative, neoplastic, and _____ causes.

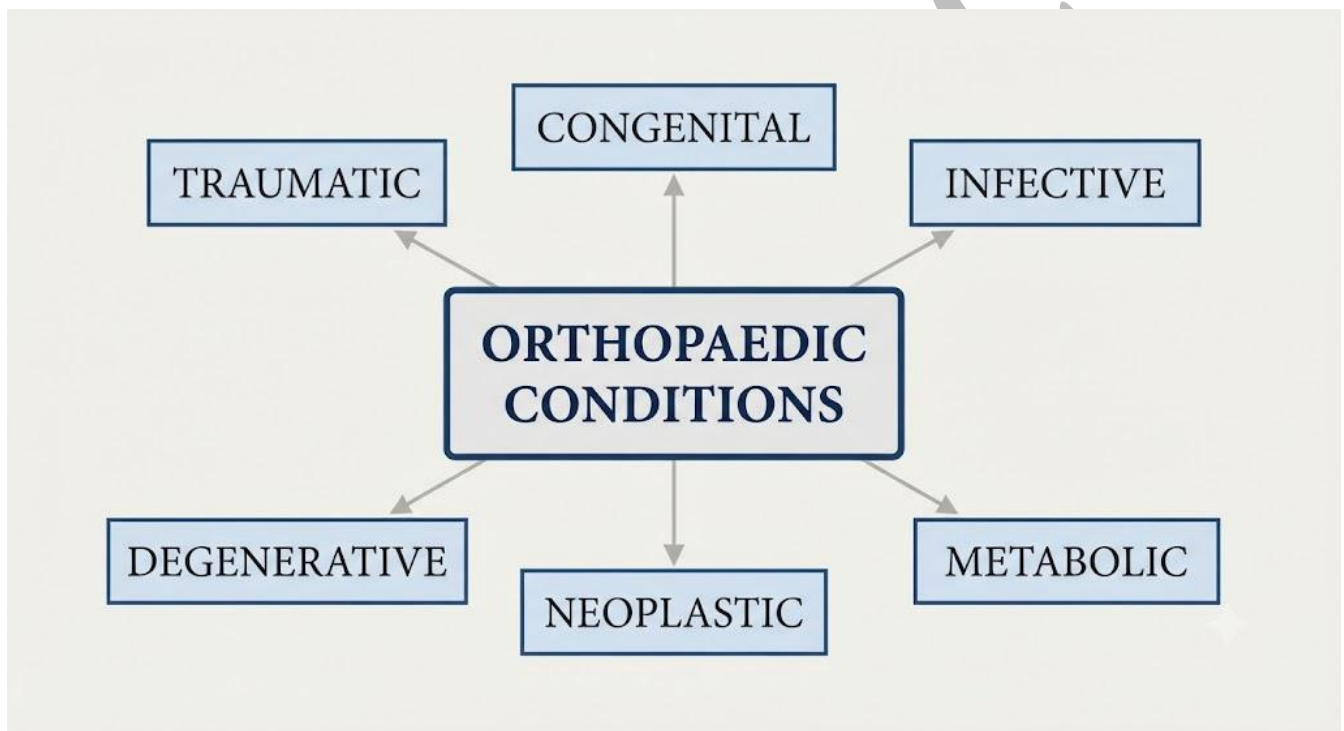


Figure 1.1: A simple classification diagram grouping orthopaedic conditions by aetiology: traumatic, congenital, infective, degenerative, neoplastic, and metabolic.

Pilot questions 1.1

1. Define the scope of orthopaedic practice. (Linked to SLO 1.1)
2. Explain why traumatic injury represents a substantial contributor to orthopaedic disease burden in many settings. (Linked to SLO 1.1)
3. List six aetiological categories used to classify orthopaedic conditions. (Linked to SLO 1.2)



4. Explain how aetiological classification supports efficient clinical assessment. (Linked to SLO 1.2)
5. Describe how the epidemiology of orthopaedic conditions varies by patient age. (Linked to SLO 1.1)

1.2 Presenting Complaint and History of Present Illness

1.2.1 eliciting the presenting complaint

Beginning with the patient's own words

The **presenting complaint** should be elicited using an open-ended initial question, allowing the patient to describe their concern in their own words, before the interviewer proceeds to more focused, specific enquiry, generally recording the presenting complaint using the patient's own **terminology** wherever practicable.

Common orthopaedic presenting complaints include **pain**, discussed further in the next sub-Part, deformity, swelling, stiffness, instability, and loss of function, with each specific complaint type directing subsequent, more detailed **enquiry** appropriate to that particular symptom.

Fill in the blank: The presenting complaint should be elicited using an open-ended initial question, generally recorded using the patient's own _____ wherever practicable.

1.2.2 characterising pain in orthopaedic history taking

Orthopaedic pain should be systematically characterised according to its precise **site** and radiation, **onset**, whether sudden or gradual, character, discussed further in the next sub-Part, severity, and any factors that specifically aggravate or relieve the pain.

Further important pain characteristics include **timing**, whether constant or intermittent, and specifically whether pain occurs at rest, during activity, or, of particular diagnostic significance, at **night**, since night pain frequently carries specific diagnostic implications relevant to inflammatory or neoplastic causes, discussed in an earlier related course.

Fill in the blank: Orthopaedic pain characterisation includes whether pain occurs at rest, during activity, or, of particular diagnostic significance, at _____.



1.2.3 history of present illness: onset, progression, and associated symptoms

The history of present illness should establish a clear **timeline**, from initial onset through to the current presentation, noting whether the condition has remained static, progressively worsened, or followed a fluctuating, relapsing-remitting **course** over time.

Associated symptoms, including systemic features such as fever or weight loss, discussed in relation to infective and neoplastic aetiology earlier in this Series, and specific neurological symptoms such as numbness or weakness, discussed in relation to nerve injury in an earlier related course, provide further essential diagnostic **information**.

Fill in the blank: The history of present illness should establish a clear timeline, noting whether the condition has remained static, progressively worsened, or followed a fluctuating, relapsing-remitting course over _____.



Figure 1.2: A clinician taking a structured pain history from a seated patient, using a body diagram to mark the site of pain.

Pilot questions 1.2



1. Describe how the presenting complaint should be elicited. (Linked to SLO 1.3)
2. List five common orthopaedic presenting complaints. (Linked to SLO 1.3)
3. List the essential characteristics used to describe orthopaedic pain. (Linked to SLO 1.3)
4. Explain the diagnostic significance of night pain. (Linked to SLO 1.3)
5. Describe what should be established when taking a history of present illness. (Linked to SLO 1.4)

1.3 Past Medical, Surgical, Drug, and Family History

1.3.1 past medical and surgical history relevant to orthopaedics

Identifying conditions and prior procedures shaping current presentation

Past medical history relevant to orthopaedic practice should specifically enquire about **diabetes mellitus**, discussed in an earlier related course, given its relevance to wound healing and infection risk, and conditions predisposing to bone fragility or fracture, discussed in relation to metabolic bone disease in an earlier related course.

Past **surgical history**, particularly any prior orthopaedic procedures, discussed throughout this course, should be documented in detail, including the specific procedure performed, approximate date, and any recognised complications, since this information directly informs interpretation of the current presentation and planning of any further **intervention**.

Fill in the blank: Past surgical history, particularly any prior orthopaedic procedures, should be documented in detail, since this information directly informs interpretation of the current presentation and planning of any further _____.

1.3.2 drug history and allergies

Drug history should document all current medications, with particular attention to **anticoagulant** or antiplatelet therapy, discussed in relation to bleeding risk in an earlier related course, and long-term corticosteroid use, given its recognised association with impaired bone density and wound healing.

Documentation of **allergies**, particularly to antibiotics or other medications likely to be used perioperatively, discussed in relation to surgical preparation in an earlier related course, represents an essential safety component of every orthopaedic clerking, regardless of the specific presenting **complaint**.



Fill in the blank: Documentation of allergies, particularly to antibiotics or other medications likely to be used perioperatively, represents an essential safety component of every orthopaedic _____.

1.3.3 family history in orthopaedic conditions

Family history carries particular relevance for certain orthopaedic conditions with a recognised genetic or familial component, including specific connective tissue disorders, certain patterns of osteoarthritis, and inherited skeletal dysplasias, discussed in relation to congenital conditions in an earlier related course.

Careful family history enquiry additionally supports identification of relevant inherited **haemoglobinopathies**, discussed in relation to sickle cell disease earlier in this Series, and other conditions carrying specific orthopaedic implications, meaning family history should not be regarded as a routine formality but as a genuinely informative component of orthopaedic **clerking**.

Fill in the blank: Family history should not be regarded as a routine formality but as a genuinely informative component of orthopaedic _____.

Table 1.3: Key elements of past medical, surgical, drug, and family history in orthopaedic clerking.

History component	Key focus	Clinical relevance
Past medical history	Diabetes and bone fragility conditions	Wound healing and fracture risk
Drug history	Anticoagulants and corticosteroids	Bleeding risk and bone/wound effects
Family history	Genetic or familial orthopaedic conditions	Diagnosis and risk assessment

Pilot questions 1.3

1. Explain why diabetes mellitus is specifically relevant to orthopaedic past medical history. (Linked to SLO 1.5)
2. Describe what should be documented regarding past surgical history. (Linked to SLO 1.5)
3. Explain why anticoagulant and corticosteroid use should be specifically documented in drug history. (Linked to SLO 1.6)
4. Explain why allergy documentation is an essential safety component of orthopaedic clerking. (Linked to SLO 1.6)



5. Describe why family history carries particular relevance in certain orthopaedic conditions. (Linked to SLO 1.6)

1.4 Social and Functional History

1.4.1 social history relevant to orthopaedic practice

Understanding the patient's living circumstances and support

Social history relevant to orthopaedic practice should establish the patient's living circumstances, including whether they live alone or with **support**, and the physical layout of their home, particularly the presence of stairs, directly relevant to planning safe discharge following significant injury or surgery.

Further important social history includes smoking and alcohol use, discussed in relation to fracture healing factors in an earlier related course, given their recognised impact on bone healing and surgical risk, and the availability of family or community support relevant to post-treatment **recovery**.

Fill in the blank: Social history should establish the patient's living circumstances, including whether they live alone or with support, directly relevant to planning safe discharge following significant injury or _____.

1.4.2 functional history and activities of daily living

Functional history assesses the patient's baseline ability to perform activities of daily living, including walking distance, use of any walking aids, and ability to manage stairs, personal care, and household tasks, providing an essential baseline against which the impact of the presenting condition can be **measured**.

Establishing this functional baseline is essential to setting realistic treatment goals and measuring subsequent treatment **response**, discussed in relation to rehabilitation principles in an earlier related course, since the same objective pathology may carry very different functional significance depending on the individual patient's baseline activity level.

Fill in the blank: Establishing a functional baseline is essential to setting realistic treatment goals and measuring subsequent treatment _____.



1.4.3 occupational and recreational history

Occupational history should establish the specific physical demands of the patient's work, including manual labour requirements, discussed in relation to occupational risk in an earlier related course, since this information directly informs realistic recovery timeframes and any necessary workplace **modification**.

Recreational history, including participation in specific sports or physical activities, provides further relevant information regarding both the likely mechanism of any presenting injury, discussed further later in this Series, and the patient's personal goals for functional **recovery**, both directly relevant to treatment planning discussions.

Fill in the blank: Recreational history provides further relevant information regarding both the likely mechanism of any presenting injury and the patient's personal goals for functional _____.



Figure 1.4: A clinician reviewing a patient's functional activities of daily living checklist during a consultation.

Pilot questions 1.4



1. Describe the key elements of social history relevant to orthopaedic practice. (Linked to SLO 1.7)
2. Explain why smoking history is relevant to orthopaedic clerking. (Linked to SLO 1.7)
3. Define functional history and describe what it assesses. (Linked to SLO 1.8)
4. Explain why establishing a functional baseline is important. (Linked to SLO 1.8)
5. Describe the relevance of occupational and recreational history to orthopaedic assessment. (Linked to SLO 1.8)

1.5 Trauma History and Systematic Review of Systems

1.5.1 history taking in the trauma patient

Rapid, focused enquiry within the constraints of the acute setting

History taking in the trauma patient, discussed in relation to ATLS principles in an earlier related course, must be adapted to the specific constraints of the acute setting, often requiring a more rapid, focused approach, and, where the patient is unable to provide a history directly, reliance on **collateral** information from witnesses or prehospital providers.

The **AMPLE** history structure, discussed in relation to the secondary survey in an earlier related course, Allergies, Medications, Past medical history, Last meal, and Events surrounding the injury, provides a structured, efficient framework for essential trauma history taking within the time constraints of acute **assessment**.

Fill in the blank: Where the trauma patient is unable to provide a history directly, history taking relies on _____ information from witnesses or prehospital providers.

1.5.2 mechanism of injury and its clinical significance

Careful documentation of the specific **mechanism of injury**, discussed in relation to fracture pattern and missile wound ballistics in an earlier related course, including the precise forces involved and the patient's position at the time of injury, provides essential information supporting prediction of the likely pattern and severity of underlying **injury**.

High-energy mechanisms, such as high-speed road traffic collisions or falls from significant height, discussed in relation to trauma severity in an earlier related course, should specifically raise suspicion for occult, less immediately apparent injury, meaning careful mechanism documentation directly informs the appropriate index of clinical **suspicion**.



Fill in the blank: High-energy mechanisms of injury should specifically raise suspicion for occult, less immediately apparent injury, meaning careful mechanism documentation directly informs the appropriate index of clinical _____.

1.5.3 systematic review of systems in orthopaedic clerking

A **systematic review of systems**, even within an orthopaedic clerking context, helps identify relevant systemic symptoms that might otherwise be overlooked, including constitutional symptoms such as fever or weight loss, discussed in relation to infective and neoplastic aetiology earlier in this Series, and neurological symptoms relevant to suspected nerve or spinal cord involvement.

This systematic review additionally supports identification of relevant comorbid conditions that might influence surgical fitness or overall treatment planning, discussed in relation to preoperative assessment in an earlier related course, reinforcing that thorough history taking extends genuinely beyond the immediate musculoskeletal presenting **complaint** alone.

Fill in the blank: A systematic review of systems supports identification of relevant comorbid conditions that might influence surgical fitness, reinforcing that thorough history taking extends genuinely beyond the immediate musculoskeletal presenting _____ alone.

Table 1.5: The AMPLE history structure for trauma patients.

Letter	Component	Purpose
A	Allergies	Identify relevant drug or other allergies before treatment
M, P	Medications, Past medical history	Inform safe, appropriate treatment decisions
L, E	Last meal, Events surrounding the injury	Guide anaesthetic timing and injury mechanism understanding

Pilot questions 1.5

- Describe how history taking in the trauma patient must be adapted to the acute setting. (Linked to SLO 1.9)
- State what the AMPLE mnemonic stands for. (Linked to SLO 1.9)
- Explain the clinical significance of documenting mechanism of injury. (Linked to SLO 1.9)
- Explain why high-energy mechanisms should raise suspicion for occult injury. (Linked to SLO 1.9)



- Describe the purpose and scope of a systematic review of systems in orthopaedic clerking. (Linked to SLO 1.10)

Series Summary

This opening Series established detailed history taking in orthopaedic practice, beginning with an **introduction to orthopaedic clinical practice**, its definition, epidemiology, aetiology, and classification, before examining the **presenting complaint and history of present illness**, eliciting the complaint and characterising pain.

We then examined **past medical, surgical, drug, and family history**, followed by **social and functional history**, concluding with **trauma history and systematic review of systems**, including the AMPLE structure and mechanism of injury. Having worked through this Series, you should now be equipped to understand physical examination in orthopaedic practice examined in the next Series of this course.

Glossary of Terms

- **Presenting complaint:** the patient's own description of their primary concern at the current consultation.
- **History of present illness:** a detailed account of the onset, progression, and associated features of the presenting complaint.
- **Night pain:** pain occurring at rest during the night, carrying specific diagnostic significance.
- **Past surgical history:** a record of prior surgical procedures relevant to the current presentation.
- **Family history:** a record of relevant conditions occurring among a patient's biological relatives.
- **Functional history:** an assessment of a patient's baseline ability to perform activities of daily living.
- **Occupational history:** information regarding the physical demands and nature of a patient's work.
- **AMPLE history:** a structured trauma history mnemonic: Allergies, Medications, Past history, Last meal, Events.



- **Mechanism of injury:** the specific forces and circumstances producing a traumatic injury.
- **Collateral history:** information obtained from a source other than the patient, such as a witness.
- **Review of systems:** a systematic enquiry covering symptoms across all major body systems.
- **Aetiology:** the underlying cause of a disease or condition.

Concept Check Questions [Series 1]

Objective questions

1. Orthopaedic conditions may be classified according to their underlying aetiology, including traumatic, congenital, infective, degenerative, neoplastic, and _____ causes.
2. Orthopaedic pain characterisation includes whether pain occurs at rest, during activity, or, of particular diagnostic significance, at _____.
3. Documentation of allergies represents an essential safety component of every orthopaedic _____.
4. Establishing a functional baseline is essential to setting realistic treatment goals and measuring subsequent treatment _____.
5. The AMPLE history structure stands for Allergies, Medications, Past medical history, Last meal, and _____ surrounding the injury.

Short-answer questions

6. List six aetiological categories used to classify orthopaedic conditions.
7. List the essential characteristics used to describe orthopaedic pain.
8. Explain why anticoagulant and corticosteroid use should be specifically documented in drug history.
9. Describe the key elements of social history relevant to orthopaedic practice.
10. Explain the clinical significance of documenting mechanism of injury.

Long-answer questions

11. Discuss the definition, epidemiology, aetiology, and classification of orthopaedic conditions. (Linked to SLO 1.1, SLO 1.2)
12. Discuss eliciting the presenting complaint, characterising pain, and taking a history of present illness. (Linked to SLO 1.3, SLO 1.4)



13. Discuss past medical, surgical, drug, and family history relevant to orthopaedic practice. (Linked to SLO 1.5, SLO 1.6)
14. Discuss social and functional history, including occupational and recreational history. (Linked to SLO 1.7, SLO 1.8)
15. Discuss trauma history, mechanism of injury, and systematic review of systems. (Linked to SLO 1.9, SLO 1.10)

Answers to Concept Check Questions [Series 1]

Objective questions

1. Metabolic.
2. Night.
3. Clerking.
4. Response.
5. Events.

Short-answer questions

6. Traumatic, congenital, infective, degenerative, neoplastic, and metabolic.
7. Site and radiation, onset, character, severity, aggravating/relieving factors, and timing.
8. Because they carry direct relevance to bleeding risk and bone/wound healing effects relevant to surgery.
9. Living circumstances and support, home layout, and smoking and alcohol use.
10. It supports prediction of the likely pattern and severity of underlying injury and raises suspicion for occult injury in high-energy cases.

Long-answer questions

11. **Basic response:** Orthopaedic practice spans traumatic and non-traumatic conditions across the lifespan, with epidemiology varying by age, sex, and setting.

Value-added response: Classification by aetiology, traumatic through metabolic, directly informs expected history and examination findings for a given condition.

12. **Basic response:** The presenting complaint should be elicited in the patient's own words, with pain systematically characterised by site, onset, character, severity, and timing.



Value-added response: The history of present illness establishes a clear timeline and associated symptoms, providing essential diagnostic context.

13. **Basic response:** Past medical and surgical history should specifically address diabetes, bone fragility, and prior orthopaedic procedures, while drug history covers anticoagulants and corticosteroids.

Value-added response: Family history carries particular relevance for genetic connective tissue disorders and haemoglobinopathies with orthopaedic implications.

14. **Basic response:** Social history addresses living circumstances and lifestyle factors relevant to healing and discharge planning, while functional history establishes a baseline for treatment goal setting.

Value-added response: Occupational and recreational history further informs realistic recovery expectations and injury mechanism understanding.

15. **Basic response:** Trauma history taking is adapted to the acute setting, using the AMPLE structure and collateral information where needed, with mechanism of injury guiding suspicion for occult injury.

Value-added response: A systematic review of systems ensures thorough clerking extends beyond the immediate musculoskeletal complaint to relevant systemic and comorbid factors.

Answers to Pilot Questions [Series 1]

Part 1.1

1. The diagnosis, treatment, and prevention of disorders affecting the musculoskeletal system.
2. Because road traffic collisions and occupational injury patterns are common in many resource-limited settings.
3. Traumatic, congenital, infective, degenerative, neoplastic, and metabolic.
4. It focuses attention on the expected history and examination findings typical of a given underlying cause.
5. It ranges from congenital conditions at birth through childhood growth disorders to degenerative and traumatic conditions in adults and the elderly.



Part 1.2

1. Using an open-ended initial question, recorded using the patient's own terminology.
2. Pain, deformity, swelling, stiffness, and instability or loss of function.
3. Site and radiation, onset, character, severity, and aggravating or relieving factors.
4. It frequently carries specific diagnostic implications relevant to inflammatory or neoplastic causes.
5. A clear timeline from onset to current presentation, the disease course, and associated symptoms.

Part 1.3

1. Because it carries direct relevance to wound healing and infection risk.
2. The specific procedure performed, approximate date, and any recognised complications.
3. Because they carry relevance to bleeding risk and bone/wound healing effects, respectively.
4. Because many perioperative medications, particularly antibiotics, carry allergy risk.
5. Because certain conditions, such as connective tissue disorders and haemoglobinopathies, carry a genetic or familial component.

Part 1.4

1. Living circumstances and support, home layout, and smoking and alcohol use.
2. Because it affects bone healing and surgical risk.
3. An assessment of baseline ability to perform activities of daily living, including walking, stairs, and personal care.
4. Because it allows realistic goal setting and measurement of the impact of the presenting condition.
5. It informs realistic recovery timeframes, workplace modification needs, and the patient's personal recovery goals.

Part 1.5

- By adopting a more rapid, focused approach and relying on collateral information where the patient cannot provide a history directly.
- Allergies, Medications, Past medical history, Last meal, and Events surrounding the injury.
- It supports prediction of the likely pattern and severity of underlying injury.
- Because they can produce injuries not immediately apparent on initial assessment.
- It identifies relevant systemic and comorbid symptoms that might otherwise be overlooked, extending beyond the immediate musculoskeletal complaint.



References and Attributions [Series 1]

- Solomon, L., Warwick, D., & Nayagam, S. (2018). Apley and Solomon's System of Orthopaedics and Trauma (10th ed.). CRC Press.
- Bickley, L. S. (2020). Bates' Guide to Physical Examination and History Taking (13th ed.). Wolters Kluwer.
- McRae, R., & Esser, M. (2008). Practical Fracture Treatment (5th ed.). Churchill Livingstone.
- American College of Surgeons Committee on Trauma (2018). Advanced Trauma Life Support (ATLS) Student Course Manual (10th ed.).

Figures, Plates, Tables, and Boxes

- Figure 1.1: A simple classification diagram grouping orthopaedic conditions by aetiology: traumatic, congenital, infective, degenerative, neoplastic, and metabolic. AI-generated using the prompt: "A single clean, accurate schematic classification diagram with six labelled boxes arranged around a central label reading orthopaedic conditions, each box named traumatic, congenital, infective, degenerative, neoplastic, and metabolic, textbook educational diagram style, neutral background, no photographic realism, no other panels."
- Figure 1.2: A clinician taking a structured pain history from a seated patient, using a body diagram to mark the site of pain. AI-generated using the prompt: "A single clean, realistic clinical illustration of a clinician sitting across from a seated patient, both looking at a simple body outline diagram on a clipboard while the clinician points to a marked area, calm consultation room setting, natural lighting, no legible text detail, no other panels, respectful depiction, no identifying facial features."
- Table 1.3: Key elements of past medical, surgical, drug, and family history in orthopaedic clerking. AI-generated using the prompt: "Create a clean clinical reference table titled Key Elements of Past Medical, Surgical, Drug, and Family History in Orthopaedic Clerking, listing history component, key focus, and clinical relevance. Clinical reference table style with outside border, no photographic elements."
- Figure 1.4: A clinician reviewing a patient's functional activities of daily living checklist during a consultation. AI-generated using the prompt: "A single clean, realistic clinical illustration of a clinician and seated patient reviewing a simple printed checklist together"



at a consultation desk, calm professional setting, natural lighting, no legible text detail, no other panels, respectful depiction, no identifying facial features."

- Table 1.5: The AMPLE history structure for trauma patients. AI-generated using the prompt: "Create a clean clinical reference table titled The AMPLE History Structure for Trauma Patients, listing letter, component, and purpose. Clinical reference table style with outside border, no photographic elements."



Course code: ORT 603

Course title: Clinics, Theatre and Bed Side Teaching in Orthopaedics

Course credit load: 3 Units

Series 2: Physical Examination in Orthopaedic Practice

- **Part 2.1: General Principles of Orthopaedic Examination**
 - Sub Part 2.1.1: Preparing the patient and setting for examination
 - Sub Part 2.1.2: The look, feel, move sequence revisited
 - Sub Part 2.1.3: Comparison with the contralateral side and use of measurement
- **Part 2.2: Examination of the Upper Limb**
 - Sub Part 2.2.1: Examination of the shoulder
 - Sub Part 2.2.2: Examination of the elbow and forearm
 - Sub Part 2.2.3: Examination of the wrist and hand
- **Part 2.3: Examination of the Lower Limb**
 - Sub Part 2.3.1: Examination of the hip
 - Sub Part 2.3.2: Examination of the knee
 - Sub Part 2.3.3: Examination of the ankle and foot
- **Part 2.4: Examination of the Spine**
 - Sub Part 2.4.1: Inspection and palpation of the spine
 - Sub Part 2.4.2: Range of motion assessment of the spine
 - Sub Part 2.4.3: Special tests for spinal pathology
- **Part 2.5: Neurovascular Examination in Orthopaedics**
 - Sub Part 2.5.1: Vascular examination of a limb
 - Sub Part 2.5.2: Motor and sensory examination of a limb
 - Sub Part 2.5.3: Special tests and provocative manoeuvres



Introduction

In the last Series, we established detailed history taking in orthopaedic practice. We now turn to **physical examination**, applying the general principles of orthopaedic examination to each major anatomical region in turn, the upper limb, lower limb, and spine, together with the essential **neurovascular examination** completing every thorough orthopaedic assessment.

The aim of this Series is to equip you with a thorough, practical understanding of the general principles of orthopaedic examination, region-specific examination of the upper limb, lower limb, and spine, and neurovascular examination in orthopaedic practice.

This Series begins with the **general principles of orthopaedic examination**, before turning to **examination of the upper limb**. We then examine the **lower limb**, followed by the **spine**, concluding with **neurovascular examination in orthopaedics**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 2.1:** prepare a patient appropriately for orthopaedic examination and apply the look, feel, move sequence
- **SLO 2.2:** compare findings with the contralateral side and apply appropriate measurement in orthopaedic examination
- **SLO 2.3:** examine the shoulder, elbow, forearm, wrist, and hand
- **SLO 2.4:** describe the key findings expected in normal and abnormal upper limb examination
- **SLO 2.5:** examine the hip, knee, ankle, and foot
- **SLO 2.6:** describe the key findings expected in normal and abnormal lower limb examination
- **SLO 2.7:** examine the spine, including inspection, palpation, and range of motion assessment
- **SLO 2.8:** perform special tests for spinal pathology
- **SLO 2.9:** perform vascular, motor, and sensory examination of a limb, and
- **SLO 2.10:** perform special tests and provocative manoeuvres in orthopaedic examination.



2.1 General Principles of Orthopaedic Examination

2.1.1 preparing the patient and setting for examination

Adequate exposure, privacy, and patient comfort

Effective orthopaedic examination requires **adequate exposure** of the region being examined, discussed in relation to look, feel, and move in an earlier related course, together with appropriate patient **privacy** and comfort, since inadequate exposure represents a common, avoidable source of missed clinical findings.

The examination setting should provide adequate lighting and sufficient space to allow comprehensive assessment, including gait observation, discussed further later in this Series, where relevant, with clear explanation of the planned examination given to the patient beforehand to secure informed **cooperation**.

Fill in the blank: Effective orthopaedic examination requires adequate exposure of the region being examined, together with appropriate patient privacy and _____.

2.1.2 the look, feel, move sequence revisited

The **look, feel, move** sequence, discussed in an earlier related course, applies consistently across every anatomical region examined throughout this Series, beginning with systematic visual inspection, progressing to careful palpation, and concluding with active and passive movement **assessment**.

For joint examination specifically, this sequence is generally supplemented by assessment of **joint stability**, testing the integrity of supporting ligamentous structures, and, where relevant, specific special tests, discussed further later in this Series, targeting particular suspected pathology at that **joint**.

Fill in the blank: For joint examination specifically, the look, feel, move sequence is generally supplemented by assessment of joint _____, testing the integrity of supporting ligamentous structures.

2.1.3 comparison with the contralateral side and use of measurement

Comparison with the **contralateral**, unaffected side, discussed in an earlier related course, represents an essential principle throughout orthopaedic examination, since normal anatomical variation between individuals means the patient's own unaffected side generally provides the most clinically meaningful **reference** point.



Objective **measurement**, including goniometric assessment of joint range of motion and tape measurement of limb length or circumference, discussed further later in this Series, supports consistent, reproducible documentation of examination findings, allowing reliable tracking of change over **time**.

Fill in the blank: Objective measurement, including goniometric assessment of joint range of motion, supports consistent, reproducible documentation of examination findings, allowing reliable tracking of change over _____.



Figure 2.1: A clinician using a goniometer to measure joint range of motion at the elbow, comparing with the contralateral arm.

Pilot questions 2.1

- Explain why adequate exposure is essential to effective orthopaedic examination. (Linked to SLO 2.1)
- Describe the look, feel, move sequence as it applies to joint examination. (Linked to SLO 2.1)
- Explain what joint stability assessment adds to the look, feel, move sequence. (Linked to SLO 2.1)
- Explain why comparison with the contralateral side is an essential examination principle. (Linked to SLO 2.2)



- Describe the value of objective measurement, such as goniometry, in orthopaedic examination. (Linked to SLO 2.2)

2.2 Examination of the Upper Limb

2.2.1 examination of the shoulder

Assessing the most mobile joint in the body

Shoulder examination begins with inspection for **muscle wasting**, particularly of the supraspinatus and infraspinatus fossae, discussed in relation to visual inspection principles earlier in this Series, and asymmetry, before palpation of the acromioclavicular joint, greater tuberosity, and bicipital groove.

Range of motion assessment includes **flexion**, **abduction**, and internal and external **rotation**, generally assessed both actively and passively, discussed earlier in this Series, with specific attention to a **painful arc** during abduction, suggestive of subacromial impingement.

Fill in the blank: Shoulder range of motion assessment includes flexion, abduction, and internal and external rotation, with specific attention to a painful arc during abduction, suggestive of subacromial _____.

2.2.2 examination of the elbow and forearm

Elbow examination assesses the **carrying angle**, the normal valgus angulation of the extended elbow, together with flexion, extension, and forearm **pronation** and **supination**, discussed in relation to forearm rotational anatomy in an earlier related course.

Palpation should specifically assess the **medial** and **lateral epicondyles**, common sites of tendinopathy, discussed in relation to overuse injury in an earlier related course, and the radial head, with specific provocative tests for epicondylitis discussed further later in this Series.

Fill in the blank: Elbow examination assesses the carrying angle, together with flexion, extension, and forearm pronation and _____.

2.2.3 examination of the wrist and hand

Wrist examination assesses flexion, extension, and radial and ulnar deviation, together with palpation of the **anatomical snuffbox**, a site of particular clinical relevance given its relationship



to the scaphoid bone and risk of missed fracture, discussed in relation to fracture classification in an earlier related course.

Hand examination, discussed in relation to hand anatomy in an earlier related course, includes systematic assessment of each digit's flexion and extension, grip strength, and specific tendon and nerve function testing, discussed further later in this Series, essential given the hand's central role in overall functional **capacity**.

Fill in the blank: Wrist examination includes palpation of the anatomical snuffbox, a site of particular clinical relevance given its relationship to the _____ bone and risk of missed fracture.

Table 2.2: Key examination findings across the upper limb.

Region	Key inspection/palpation finding	Key special consideration
Shoulder	Supraspinatus/infraspinatus wasting	Painful arc suggesting impingement
Elbow	Carrying angle and epicondyle tenderness	Epicondylitis provocative testing
Wrist/hand	Anatomical snuffbox tenderness	Risk of missed scaphoid fracture

Pilot questions 2.2

1. Describe the inspection and palpation findings assessed during shoulder examination. (Linked to SLO 2.3)
2. Define a painful arc and its clinical significance. (Linked to SLO 2.4)
3. Describe the carrying angle of the elbow. (Linked to SLO 2.3)
4. Explain the clinical significance of tenderness in the anatomical snuffbox. (Linked to SLO 2.4)
5. Describe the key components of hand examination. (Linked to SLO 2.3)

2.3 Examination of the Lower Limb

2.3.1 examination of the hip

Assessing a deep joint through indirect and direct signs

Hip examination begins with assessment of **gait**, discussed in relation to visual inspection principles in an earlier related course, and leg length, before assessing range of motion including



flexion, abduction, adduction, and internal and external rotation, generally performed with the patient supine.

The **Trendelenburg test**, assessing hip abductor function by observing pelvic tilt while the patient stands on one leg, provides valuable indirect information regarding hip abductor **strength** and stability, complementing the direct range of motion assessment discussed earlier in this Part.

Fill in the blank: The Trendelenburg test assesses hip abductor function by observing pelvic tilt while the patient stands on one _____.

2.3.2 examination of the knee

Knee examination assesses flexion and extension range of motion, together with specific tests for **ligamentous stability**, including the anterior and posterior drawer tests for cruciate ligament integrity, and varus and valgus stress testing for collateral ligament **integrity**.

Further important assessments include testing for a knee **effusion**, using the patellar tap or bulge test, and meniscal provocative tests, discussed further later in this Series, with careful attention to the specific mechanism of any reported injury guiding the most relevant specific tests to **perform**.

Fill in the blank: Knee examination includes testing for ligamentous stability, including the anterior and posterior drawer tests for cruciate ligament _____.

2.3.3 examination of the ankle and foot

Ankle examination assesses dorsiflexion and plantarflexion range of motion, together with palpation of the **lateral** and **medial malleoli** and the specific ligaments of the lateral ankle complex, discussed in relation to ankle sprain injury in an earlier related course.

Foot examination includes assessment of the longitudinal **arch**, discussed in relation to congenital foot deformity in an earlier related course, forefoot and hindfoot alignment, and specific palpation of the metatarsal heads and plantar fascia, relevant to common forefoot and heel pain **presentations**.

Fill in the blank: Foot examination includes assessment of the longitudinal arch, forefoot and hindfoot alignment, and specific palpation of the metatarsal heads and plantar _____.





Figure 2.3: Diagram illustrating the anterior drawer test for anterior cruciate ligament integrity at the knee.

Pilot questions 2.3

1. Describe the Trendelenburg test and what it assesses. (Linked to SLO 2.5)
2. Describe the drawer tests used to assess cruciate ligament integrity at the knee. (Linked to SLO 2.6)
3. Describe how a knee effusion is assessed on examination. (Linked to SLO 2.6)
4. Describe the key components of ankle examination. (Linked to SLO 2.5)
5. Describe the key components of foot examination. (Linked to SLO 2.6)

2.4 Examination of the Spine

2.4.1 inspection and palpation of the spine

Assessing alignment and identifying tender segments

Spinal inspection assesses overall spinal **alignment**, from behind and from the side, identifying any abnormal curvature such as scoliosis or exaggerated kyphosis, discussed in relation to Pott's



disease in an earlier related course, together with any visible skin abnormality overlying the spine.

Palpation systematically assesses each spinous **process** and the adjacent paraspinal musculature for tenderness, together with assessment of the sacroiliac joints, discussed in relation to pelvic anatomy in an earlier related course, with any focal tenderness carrying particular relevance to suspected localised spinal **pathology**.

Fill in the blank: Spinal palpation systematically assesses each spinous process and the adjacent paraspinal musculature for tenderness, with any focal tenderness carrying particular relevance to suspected localised spinal _____.

2.4.2 range of motion assessment of the spine

Cervical spine range of motion assessment includes **flexion, extension**, lateral flexion, and rotation, generally performed with the patient seated, while lumbar spine range of motion includes flexion, extension, and lateral flexion, generally assessed with the patient standing.

Schober's test provides an objective measure of lumbar flexion range of motion, using specific skin markings and measured distance change during forward flexion, discussed in relation to objective measurement principles earlier in this Series, providing a reproducible assessment of lumbar spine **mobility**.

Fill in the blank: Schober's test provides an objective measure of lumbar flexion range of motion, using specific skin markings and measured distance change during forward _____.

2.4.3 special tests for spinal pathology

The **straight leg raise test** assesses for lumbar nerve root irritation, discussed in relation to nerve compression in an earlier related course, with reproduction of radicular leg pain during passive hip flexion with the knee extended supporting a diagnosis of underlying **disc** pathology or nerve root compression.

Further relevant special tests include assessment of specific **myotomes** and **dermatomes** to localise a suspected nerve root level, discussed in relation to spinal cord injury classification in an earlier related course, and reflexes, discussed further later in this Series, each contributing to accurate localisation of suspected spinal **pathology**.

Fill in the blank: Further relevant special tests for spinal pathology include assessment of specific myotomes and dermatomes to localise a suspected nerve root _____.



Table 2.4: Key spinal examination assessments.

Assessment	Technique	Clinical relevance
Inspection	Assess alignment from behind and from the side	Detect scoliosis or exaggerated kyphosis
Schober's test	Skin marking and measured distance during flexion	Objective lumbar flexion measurement
Straight leg raise	Passive hip flexion with knee extended	Assess for lumbar nerve root irritation

Pilot questions 2.4

1. Describe what is assessed during spinal inspection. (Linked to SLO 2.7)
2. Describe cervical and lumbar spine range of motion assessment. (Linked to SLO 2.7)
3. Describe Schober's test. (Linked to SLO 2.7)
4. Describe the straight leg raise test and its clinical significance. (Linked to SLO 2.8)
5. Explain the role of myotome and dermatome assessment in spinal examination. (Linked to SLO 2.8)

2.5 Neurovascular Examination in Orthopaedics

2.5.1 vascular examination of a limb

Assessing perfusion and pulse integrity

Vascular examination of a limb assesses **skin colour**, temperature, and capillary refill time, together with palpation of the relevant distal **pulses**, discussed in relation to circulation assessment in an earlier related course, essential in any limb with suspected fracture, soft tissue injury, or compartment syndrome.

Absent or asymmetrically reduced pulses, discussed in relation to vascular injury earlier in this Series, warrant urgent further **investigation** and specialist vascular assessment, given the time-critical nature of limb-threatening vascular compromise, discussed in relation to compartment syndrome in an earlier related course.



Fill in the blank: Absent or asymmetrically reduced pulses warrant urgent further investigation and specialist vascular assessment, given the time-critical nature of limb-threatening vascular _____.

2.5.2 motor and sensory examination of a limb

Motor examination systematically assesses muscle power in each relevant muscle group, generally graded using the **Medical Research Council** scale from 0 to 5, discussed in relation to disability assessment in an earlier related course, allowing consistent, reproducible documentation of motor function.

Sensory examination systematically assesses light touch and, where relevant, pinprick sensation across each nerve's specific cutaneous distribution, discussed in relation to hand nerve supply in an earlier related course, with any identified sensory deficit carefully documented according to its precise anatomical **boundary**.

Fill in the blank: Motor examination systematically assesses muscle power, generally graded using the Medical Research Council scale from 0 to _____.

2.5.3 special tests and provocative manoeuvres

Specific **provocative manoeuvres**, such as **Tinel's sign**, tapping over a nerve to elicit distal tingling suggestive of nerve irritation or regeneration, and **Phalen's test**, sustained wrist flexion reproducing median nerve symptoms, assist in localising specific peripheral nerve **compression** syndromes.

These special tests complement, rather than replace, systematic motor and sensory examination discussed earlier in this Part, with a positive special test result generally interpreted alongside the full clinical picture rather than in **isolation**, supporting accurate overall diagnostic conclusion.

Fill in the blank: Special tests such as Tinel's sign and Phalen's test complement, rather than replace, systematic motor and sensory examination, generally interpreted alongside the full clinical picture rather than in _____.



CLINICAL EXAMINATION TESTS FOR CARPAL TUNNEL SYNDROME.

Fig. A - Tinel's Sign Test



Fig. A: Tapping over the median nerve at the wrist (Tinel's sign).

Fig. B - Phalen's Maneuver Test

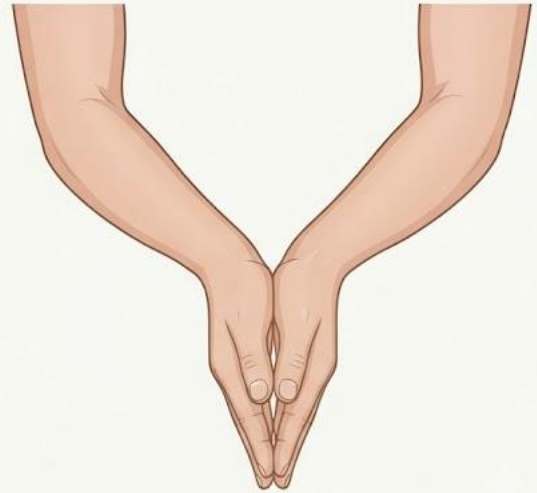


Fig. B: Forced wrist flexion (Phalen's maneuver).

Figure 2.5: Diagram illustrating Tinel's sign and Phalen's test as provocative manoeuvres for median nerve compression at the wrist.

Pilot questions 2.5

1. Describe the components of vascular examination of a limb. (Linked to SLO 2.9)
2. Explain why absent or asymmetrically reduced pulses warrant urgent further investigation. (Linked to SLO 2.9)
3. Describe the Medical Research Council scale used in motor examination. (Linked to SLO 2.9)
4. Describe Tinel's sign and Phalen's test. (Linked to SLO 2.10)
5. Explain how special tests should be interpreted in relation to the overall clinical picture. (Linked to SLO 2.10)



Series Summary

This Series examined **physical examination in orthopaedic practice**, beginning with the **general principles of orthopaedic examination**, patient preparation, the look, feel, move sequence, and contralateral comparison and measurement, before turning to **examination of the upper limb**, the shoulder, elbow, wrist, and hand.

We then examined **examination of the lower limb**, the hip, knee, ankle, and foot, followed by **examination of the spine**, inspection, range of motion, and special tests, concluding with **neurovascular examination in orthopaedics**, vascular, motor, sensory examination, and provocative manoeuvres. Having worked through this Series, you should now be equipped to understand investigations and diagnosis in orthopaedic practice examined in the next Series of this course.

Glossary of Terms

6. **Painful arc:** pain occurring during a specific portion of shoulder abduction, suggesting impingement.
7. **Carrying angle:** the normal valgus angulation of the fully extended elbow.
8. **Anatomical snuffbox:** the depression at the wrist relevant to suspected scaphoid fracture.
9. **Trendelenburg test:** a test of hip abductor function performed by observing pelvic tilt during single-leg standing.
10. **Drawer test:** a knee examination technique assessing cruciate ligament integrity by displacing the tibia relative to the femur.
11. **Schober's test:** an objective measure of lumbar flexion range of motion using skin markings.
12. **Straight leg raise test:** a test assessing for lumbar nerve root irritation via passive hip flexion with the knee extended.
13. **Medical Research Council (MRC) scale:** a standardised 0 to 5 scale grading muscle power.
14. **Tinel's sign:** tapping over a nerve to elicit distal tingling, suggesting nerve irritation or regeneration.
15. **Phalen's test:** sustained wrist flexion used to reproduce median nerve compression symptoms.
16. **Myotome:** a group of muscles supplied by a single spinal nerve root.
17. **Dermatome:** an area of skin supplied by a single spinal nerve root.



Concept Check Questions [Series 2]

Objective questions

- For joint examination specifically, the look, feel, move sequence is generally supplemented by assessment of joint _____.
- Shoulder range of motion assessment includes specific attention to a painful arc during abduction, suggestive of subacromial _____.
- The Trendelenburg test assesses hip abductor function by observing pelvic tilt while the patient stands on one _____.
- Schober's test provides an objective measure of lumbar flexion range of motion during forward _____.
- Motor examination is generally graded using the Medical Research Council scale from 0 to _____.

Short-answer questions

1. Explain why comparison with the contralateral side is an essential examination principle.
2. Explain the clinical significance of tenderness in the anatomical snuffbox.
3. Describe the drawer tests used to assess cruciate ligament integrity at the knee.
4. Describe the straight leg raise test and its clinical significance.
5. Describe Tinel's sign and Phalen's test.

Long-answer questions

6. Discuss the general principles of orthopaedic examination, including preparation, the look, feel, move sequence, contralateral comparison, and measurement. (Linked to SLO 2.1, SLO 2.2)
7. Discuss the examination of the shoulder, elbow, forearm, wrist, and hand. (Linked to SLO 2.3, SLO 2.4)
8. Discuss the examination of the hip, knee, ankle, and foot. (Linked to SLO 2.5, SLO 2.6)
9. Discuss the examination of the spine, including inspection, palpation, range of motion, and special tests. (Linked to SLO 2.7, SLO 2.8)
10. Discuss vascular, motor, and sensory examination of a limb, and special tests and provocative manoeuvres. (Linked to SLO 2.9, SLO 2.10)



Answers to Concept Check Questions [Series 2]

Objective questions

11. Stability.
12. Impingement.
13. Leg.
14. Flexion.
15. 5.

Short-answer questions

16. Because normal anatomical variation between individuals means the patient's own unaffected side provides the most meaningful reference.
17. It suggests possible underlying scaphoid fracture, a commonly missed injury.
18. Anterior and posterior drawer tests, assessing forward and backward tibial displacement relative to the femur.
19. Passive hip flexion with the knee extended reproducing radicular leg pain, supporting a diagnosis of disc pathology or nerve root compression.
20. Tinel's sign involves tapping over a nerve to elicit tingling; Phalen's test involves sustained wrist flexion reproducing median nerve symptoms.

Long-answer questions

21. **Basic response:** Orthopaedic examination requires adequate exposure and preparation, followed by the systematic look, feel, move sequence supplemented by stability assessment.

Value-added response: Comparison with the contralateral side and objective measurement, such as goniometry, support reproducible, clinically meaningful documentation.

22. **Basic response:** Shoulder examination assesses wasting, range of motion, and impingement signs, while elbow examination assesses carrying angle and epicondyle tenderness.

Value-added response: Wrist and hand examination includes snuffbox palpation for scaphoid injury and systematic digit, grip, tendon, and nerve function assessment.

23. **Basic response:** Hip examination includes gait, range of motion, and the Trendelenburg test, while knee examination includes ligamentous stability and effusion assessment.



Value-added response: Ankle and foot examination assesses range of motion, ligament integrity, and specific structures relevant to common forefoot and heel presentations.

24. **Basic response:** Spinal examination begins with inspection and palpation for alignment and tenderness, followed by range of motion assessment including Schober's test.

Value-added response: Special tests such as the straight leg raise, together with myotome, dermatome, and reflex assessment, support localisation of suspected spinal pathology.

25. **Basic response:** Vascular examination assesses perfusion and pulses, while motor and sensory examination systematically assess muscle power and cutaneous sensation.

Value-added response: Special tests such as Tinel's sign and Phalen's test complement this systematic assessment in localising specific nerve compression syndromes.

Answers to Pilot Questions [Series 2]

Part 2.1

1. Because inadequate exposure represents a common, avoidable source of missed clinical findings.
2. Beginning with visual inspection, progressing to palpation, and concluding with active and passive movement assessment.
3. It tests the integrity of supporting ligamentous structures at the joint.
4. Because the patient's own unaffected side provides the most meaningful reference given normal anatomical variation between individuals.
5. It supports consistent, reproducible documentation allowing reliable tracking of change over time.

Part 2.2

6. Inspection for muscle wasting and asymmetry, and palpation of the acromioclavicular joint, greater tuberosity, and bicipital groove.
7. Pain during a specific portion of abduction; it suggests subacromial impingement.
8. The normal valgus angulation of the fully extended elbow.
9. It suggests possible underlying scaphoid fracture, a commonly missed injury.
10. Systematic digit flexion/extension assessment, grip strength, and tendon and nerve function testing.



Part 2.3

11. A test assessing hip abductor function by observing pelvic tilt while standing on one leg.
12. Anterior and posterior drawer tests, assessing forward and backward tibial displacement relative to the femur.
13. Using the patellar tap or bulge test.
14. Dorsiflexion and plantarflexion range of motion, and palpation of the malleoli and lateral ligament complex.
15. Assessment of the longitudinal arch, forefoot and hindfoot alignment, and palpation of the metatarsal heads and plantar fascia.

Part 2.4

1. Overall spinal alignment from behind and from the side, identifying abnormal curvature or skin abnormality.
2. Cervical assessment includes flexion, extension, lateral flexion, and rotation seated; lumbar assessment includes flexion, extension, and lateral flexion standing.
3. An objective measure of lumbar flexion using skin markings and measured distance change during forward flexion.
4. Passive hip flexion with the knee extended, reproducing radicular leg pain, suggesting disc pathology or nerve root compression.
5. They help localise a suspected nerve root level based on the specific pattern of motor or sensory deficit identified.

Part 2.5

1. Skin colour, temperature, capillary refill time, and palpation of relevant distal pulses.
2. Because they may indicate time-critical, limb-threatening vascular compromise requiring urgent specialist assessment.
3. A standardised 0 to 5 scale grading muscle power.
4. Tinel's sign involves tapping over a nerve to elicit tingling; Phalen's test involves sustained wrist flexion reproducing median nerve symptoms.
5. They should be interpreted alongside the full clinical picture rather than in isolation.

References and Attributions [Series 2]

6. Solomon, L., Warwick, D., & Nayagam, S. (2018). Apley and Solomon's System of Orthopaedics and Trauma (10th ed.). CRC Press.
7. McRae, R. (2010). Clinical Orthopaedic Examination (6th ed.). Churchill Livingstone.



8. Bickley, L. S. (2020). Bates' Guide to Physical Examination and History Taking (13th ed.). Wolters Kluwer.
9. Magee, D. J. (2014). Orthopedic Physical Assessment (6th ed.). Elsevier.

Figures, Plates, Tables, and Boxes

1. Figure 2.1: A clinician using a goniometer to measure joint range of motion at the elbow, comparing with the contralateral arm. AI-generated using the prompt: "A single clean, clinically accurate illustration of a clinician holding a goniometer against a patient's bent elbow to measure joint angle, with the patient's other arm visible for comparison, calm clinical setting, natural lighting, no text overlays, no other panels, respectful depiction, no identifying facial features."
2. Table 2.2: Key examination findings across the upper limb. AI-generated using the prompt: "Create a clean clinical reference table titled Key Examination Findings Across the Upper Limb, listing region, key inspection/palpation finding, and key special consideration. Clinical reference table style with outside border, no photographic elements."
3. Figure 2.3: Diagram illustrating the anterior drawer test for anterior cruciate ligament integrity at the knee. AI-generated using the prompt: "A single clean, clinically accurate illustration of a clinician's hands grasping the proximal tibia of a flexed knee and applying a forward-directed pulling motion relative to the thigh, close-up procedural viewpoint, medical textbook clinical skills style, neutral background, no photographic realism, no other panels."
4. Table 2.4: Key spinal examination assessments. AI-generated using the prompt: "Create a clean clinical reference table titled Key Spinal Examination Assessments, listing assessment, technique, and clinical relevance. Clinical reference table style with outside border, no photographic elements."
5. Figure 2.5: Diagram illustrating Tinel's sign and Phalen's test as provocative manoeuvres for median nerve compression at the wrist. AI-generated using the prompt: "A single clean, clinically accurate two-panel illustration, one panel showing a clinician's finger tapping the volar wrist of a patient, the other showing the patient holding both wrists in flexed position pressed together, medical textbook clinical skills style, neutral background, no photographic realism, no other panels."



Course code: ORT 603

Course title: Clinics, Theatre and Bed Side Teaching in Orthopaedics

Course credit load: 3 Units

Series 3: Investigations and Diagnosis in Orthopaedic Practice

- **Part 3.1: Plain Radiography in Orthopaedic Diagnosis**
 - Sub Part 3.1.1: Principles and standard views in orthopaedic radiography
 - Sub Part 3.1.2: Interpreting fractures on plain radiographs
 - Sub Part 3.1.3: Interpreting joint and soft tissue changes on plain radiographs
- **Part 3.2: Advanced Imaging in Orthopaedic Diagnosis**
 - Sub Part 3.2.1: CT in orthopaedic diagnosis
 - Sub Part 3.2.2: MRI in orthopaedic diagnosis
 - Sub Part 3.2.3: Ultrasound and bone scintigraphy in orthopaedic diagnosis
- **Part 3.3: Laboratory Investigations in Orthopaedic Practice**
 - Sub Part 3.3.1: Haematological investigations
 - Sub Part 3.3.2: Inflammatory markers and their orthopaedic relevance
 - Sub Part 3.3.3: Biochemical and microbiological investigations
- **Part 3.4: Special Investigations and Procedures**
 - Sub Part 3.4.1: Joint aspiration
 - Sub Part 3.4.2: Nerve conduction studies and electromyography
 - Sub Part 3.4.3: Bone biopsy
- **Part 3.5: Formulating a Diagnosis in Orthopaedic Practice**
 - Sub Part 3.5.1: Clinical reasoning and differential diagnosis
 - Sub Part 3.5.2: Correlating history, examination, and investigation findings
 - Sub Part 3.5.3: Arriving at a working diagnosis and management plan



Introduction

In the last Series, we established physical examination in orthopaedic practice. We now turn to **investigations**, plain radiography, advanced imaging, laboratory studies, and special investigations and procedures, and, ultimately, the process of synthesising history, examination, and investigation findings to arrive at a **working diagnosis**, the essential culmination of every thorough orthopaedic clinical assessment.

The aim of this Series is to equip you with a thorough, practical understanding of plain radiography and advanced imaging, laboratory investigations, special investigations and procedures, and the process of formulating a diagnosis in orthopaedic practice.

This Series begins with **plain radiography in orthopaedic diagnosis**, before turning to **advanced imaging in orthopaedic diagnosis**. We then examine **laboratory investigations**, followed by **special investigations and procedures**, concluding with **formulating a diagnosis in orthopaedic practice**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 3.1:** describe the principles and standard views used in orthopaedic radiography
- **SLO 3.2:** interpret fractures and joint and soft tissue changes on plain radiographs
- **SLO 3.3:** describe the role of CT and MRI in orthopaedic diagnosis
- **SLO 3.4:** describe the role of ultrasound and bone scintigraphy in orthopaedic diagnosis
- **SLO 3.5:** describe relevant haematological investigations in orthopaedic practice
- **SLO 3.6:** describe inflammatory markers and their orthopaedic relevance
- **SLO 3.7:** describe relevant biochemical and microbiological investigations
- **SLO 3.8:** describe joint aspiration, nerve conduction studies, and bone biopsy
- **SLO 3.9:** apply clinical reasoning to formulate a differential diagnosis, and
- **SLO 3.10:** correlate history, examination, and investigation findings to arrive at a working diagnosis and management plan.

3.1 Plain Radiography in Orthopaedic Diagnosis

3.1.1 principles and standard views in orthopaedic radiography



Two orthogonal views forming the standard baseline

Plain radiography, discussed in relation to X-ray generation and image quality in an earlier related course, remains the **first-line** imaging investigation for most orthopaedic presentations, generally requiring a minimum of two **orthogonal views**, typically anteroposterior and lateral, to accurately localise and characterise a suspected abnormality.

Further specific views, including **oblique** projections and joint-specific views, discussed in relation to standard radiographic technique in an earlier related course, are frequently required for particular anatomical regions or suspected pathology, with the specific request generally guided by the clinical question the requesting clinician wishes to **answer**.

Fill in the blank: Plain radiography generally requires a minimum of two orthogonal views, typically anteroposterior and lateral, to accurately localise and characterise a suspected _____.

3.1.2 interpreting fractures on plain radiographs

Systematic fracture interpretation, discussed in relation to fracture classification in an earlier related course, should describe the specific **pattern**, transverse, oblique, spiral, or comminuted, the degree of displacement and angulation, and involvement of any adjacent **joint** surface.

Careful attention should additionally be paid to identifying subtle, easily missed fractures, such as scaphoid or stress fractures, discussed in relation to fracture causes in an earlier related course, with a low threshold for further imaging, discussed further later in this Series, where clinical suspicion remains high despite an apparently normal initial **radiograph**.

Fill in the blank: Careful attention should be paid to identifying subtle, easily missed fractures, with a low threshold for further imaging where clinical suspicion remains high despite an apparently normal initial _____.

3.1.3 interpreting joint and soft tissue changes on plain radiographs

Plain radiographic assessment of joints, discussed in relation to joint examination in the previous Series of this course, includes evaluation of joint **space width**, subchondral bone quality, and presence of osteophytes, discussed in relation to degenerative joint disease aetiology in an earlier related course, together with any periarticular soft tissue swelling.

Soft tissue changes visible on plain radiography, though generally less well characterised than on cross-sectional imaging, discussed further later in this Series, include joint effusion, discussed in



relation to knee examination in the previous Series of this course, and **calcification** within tendons or soft tissue, each carrying specific diagnostic **relevance**.

Fill in the blank: Soft tissue changes visible on plain radiography include joint effusion and calcification within tendons or soft tissue, each carrying specific diagnostic _____.

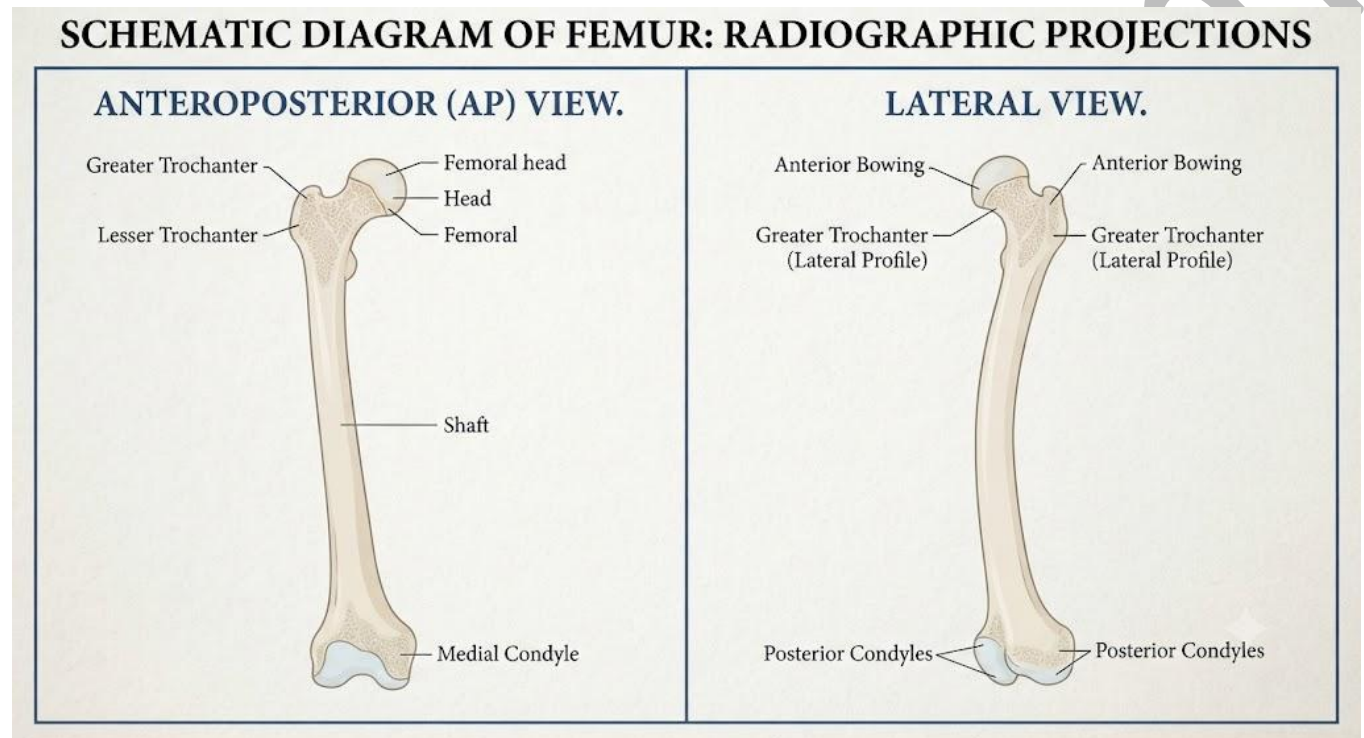


Figure 3.1: Diagram illustrating the standard anteroposterior and lateral orthogonal radiographic views of a long bone.

Pilot questions 3.1

- Explain why plain radiography generally requires a minimum of two orthogonal views. (Linked to SLO 3.1)
- List the specific features that should be described when interpreting a fracture on plain radiograph. (Linked to SLO 3.2)
- Explain why a low threshold for further imaging is appropriate despite a normal initial radiograph in certain cases. (Linked to SLO 3.2)
- List the joint features assessed on plain radiography. (Linked to SLO 3.2)
- Describe two soft tissue changes visible on plain radiography. (Linked to SLO 3.2)



3.2 Advanced Imaging in Orthopaedic Diagnosis

3.2.1 ct in orthopaedic diagnosis

Superior bony detail for complex assessment

Computed tomography, discussed in an earlier related course, provides detailed cross-sectional bony assessment, particularly valuable for characterising complex or occult fractures, discussed earlier in this Series, not fully appreciated on plain radiography, and for detailed preoperative surgical **planning**.

CT additionally plays an important role in assessing suspected bone tumours, discussed in an earlier related course, and in evaluating complex spinal pathology, discussed in relation to spinal examination in the previous Series of this course, given its superior spatial resolution for bony **detail**.

Fill in the blank: CT provides detailed cross-sectional bony assessment, particularly valuable for characterising complex or occult fractures and detailed preoperative surgical _____.

3.2.2 mri in orthopaedic diagnosis

Magnetic resonance imaging, discussed in an earlier related course, provides superior soft tissue contrast, discussed in relation to MRI principles in an earlier related course, making it the investigation of choice for assessing ligaments, tendons, cartilage, and suspected bone marrow **pathology**.

MRI is additionally particularly valuable for evaluating suspected soft tissue tumours, discussed in relation to bone tumour imaging in an earlier related course, spinal cord and nerve root compression, and early avascular necrosis, given its superior sensitivity for detecting these conditions before changes become apparent on plain radiography or **CT**.

Fill in the blank: MRI is particularly valuable for evaluating early avascular necrosis, given its superior sensitivity for detecting this condition before changes become apparent on plain radiography or _____.

3.2.3 ultrasound and bone scintigraphy in orthopaedic diagnosis

Ultrasound, discussed in an earlier related course, provides real-time, dynamic assessment of tendons and superficial soft tissue structures, discussed in relation to musculoskeletal ultrasound in an earlier related course, and additionally guides image-directed joint or soft tissue injection **procedures**.



Bone scintigraphy, using a radioactive tracer that concentrates in areas of increased bone turnover, provides a sensitive, though relatively non-specific, means of identifying occult fractures, infection, or metastatic bone disease, discussed in relation to bone tumour spread in an earlier related course, across the entire skeleton in a single examination.

Fill in the blank: Bone scintigraphy uses a radioactive tracer that concentrates in areas of increased bone turnover, providing a sensitive, though relatively non-specific, means of identifying occult fractures, infection, or metastatic bone _____.

Table 3.2: Comparing advanced imaging modalities in orthopaedic diagnosis.

Modality	Primary strength	Typical orthopaedic indication
CT	Detailed bony assessment	Complex fractures, tumour and spinal assessment
MRI	Superior soft tissue contrast	Ligament, tendon, cartilage, and marrow pathology
Bone scintigraphy	Whole-skeleton sensitivity	Occult fracture, infection, or metastatic disease

Pilot questions 3.2

1. Describe the role of CT in orthopaedic diagnosis. (Linked to SLO 3.3)
2. Describe the role of MRI in orthopaedic diagnosis. (Linked to SLO 3.3)
3. Explain why MRI is particularly valuable for detecting early avascular necrosis. (Linked to SLO 3.3)
4. Describe the role of ultrasound in orthopaedic diagnosis. (Linked to SLO 3.4)
5. Describe the principle and typical use of bone scintigraphy. (Linked to SLO 3.4)

3.3 Laboratory Investigations in Orthopaedic Practice

3.3.1 haematological investigations

Baseline blood parameters relevant to diagnosis and surgical fitness

The **full blood count**, discussed in relation to preoperative assessment in an earlier related course, provides baseline haemoglobin, white cell, and platelet information, with an elevated white cell count supporting suspicion of infection, discussed in relation to osteomyelitis in an



earlier related course, and haemoglobin assessment relevant to both surgical fitness and blood loss quantification.

Coagulation studies, discussed in relation to bleeding risk assessment in an earlier related course, become particularly relevant before surgical intervention or in patients taking anticoagulant medication, discussed in relation to drug history in the previous Series of this course, requiring careful perioperative **management**.

Fill in the blank: The full blood count provides baseline haemoglobin, white cell, and platelet information, with an elevated white cell count supporting suspicion of _____.

3.3.2 inflammatory markers and their orthopaedic relevance

Erythrocyte sedimentation rate and **C-reactive protein**, discussed in relation to inflammatory markers in an earlier related course, are frequently elevated in orthopaedic infection, discussed in relation to osteomyelitis and septic arthritis in an earlier related course, and inflammatory arthritis, providing useful, though non-specific, supportive diagnostic **information**.

Serial measurement of inflammatory markers additionally supports monitoring of treatment **response**, discussed in relation to osteomyelitis management in an earlier related course, with a failure of these markers to appropriately decline following treatment warranting reconsideration of the underlying diagnosis or treatment adequacy.

Fill in the blank: Serial measurement of inflammatory markers supports monitoring of treatment response, with a failure of these markers to appropriately decline following treatment warranting reconsideration of the underlying diagnosis or treatment _____.

3.3.3 biochemical and microbiological investigations

Relevant **biochemical investigations** include serum calcium, phosphate, and alkaline phosphatase, discussed in relation to bone metabolism in an earlier related course, providing important information regarding suspected metabolic bone disease, and renal function tests, discussed in relation to preoperative assessment in an earlier related course.

Microbiological investigations, including blood culture and, where indicated, tissue or joint fluid culture, discussed further later in this Series, are essential in suspected orthopaedic infection, discussed throughout this course, providing definitive organism identification and antibiotic sensitivity information guiding targeted **treatment**.



Fill in the blank: Microbiological investigations, including blood culture and tissue or joint fluid culture, are essential in suspected orthopaedic infection, providing definitive organism identification and antibiotic sensitivity information guiding targeted _____.

Table 3.3: Comparing key laboratory investigations in orthopaedic practice.

Investigation	Main relevance	Key interpretive note
Full blood count	Infection screening and surgical fitness	Elevated white cells suggest infection
ESR/CRP	Monitoring inflammation and infection	Non-specific but useful for treatment response
Blood/tissue culture	Definitive organism identification	Guides targeted antibiotic therapy

Pilot questions 3.3

1. Describe the relevance of the full blood count in orthopaedic practice. (Linked to SLO 3.5)
2. Describe the relevance of ESR and CRP in orthopaedic practice. (Linked to SLO 3.6)
3. Explain how serial inflammatory marker measurement supports treatment monitoring. (Linked to SLO 3.6)
4. Describe the relevance of biochemical investigations to suspected metabolic bone disease. (Linked to SLO 3.7)
5. Explain the role of microbiological investigations in suspected orthopaedic infection. (Linked to SLO 3.7)

3.4 Special Investigations and Procedures

3.4.1 joint aspiration

Sampling synovial fluid for diagnosis and symptom relief

Joint aspiration, or arthrocentesis, involves sterile needle sampling of synovial fluid, discussed in relation to joint examination in the previous Series of this course, generally indicated in suspected septic arthritis, discussed in relation to joint infection in an earlier related course, or to relieve a tense, symptomatic joint **effusion**.



Aspirated fluid is generally sent for **microscopy**, culture, and sensitivity, together with assessment of fluid appearance and cell count, with a markedly elevated white cell count and positive Gram stain strongly supporting a diagnosis of septic **arthritis** requiring urgent treatment.

Fill in the blank: Joint aspiration involves sterile needle sampling of synovial fluid, generally indicated in suspected septic arthritis or to relieve a tense, symptomatic joint _____.

3.4.2 nerve conduction studies and electromyography

Nerve conduction studies assess the speed and amplitude of electrical signal transmission along a peripheral nerve, discussed in relation to nerve injury in an earlier related course, providing objective evidence supporting a suspected diagnosis of nerve **compression** or injury.

Electromyography, generally performed alongside nerve conduction studies, directly assesses electrical activity within muscle tissue, discussed in relation to motor examination in the previous Series of this course, helping distinguish nerve-related from primary muscle **pathology** and localising the specific level of any suspected nerve **lesion**.

Fill in the blank: Electromyography directly assesses electrical activity within muscle tissue, helping distinguish nerve-related from primary muscle _____.

3.4.3 bone biopsy

Bone biopsy provides definitive tissue diagnosis for a suspected bone tumour, discussed in an earlier related course, or, occasionally, chronic osteomyelitis, discussed in an earlier related course, generally obtained through either a **needle** biopsy technique or an **open surgical** biopsy where more tissue is required.

Careful biopsy **planning**, including the specific approach and tract used, is essential, particularly for suspected malignant bone tumours, since an inappropriately planned biopsy tract can compromise subsequent definitive surgical treatment, meaning bone biopsy should generally be performed by, or in close consultation with, the surgeon planning any eventual definitive **procedure**.

Fill in the blank: Careful bone biopsy planning is essential, since an inappropriately planned biopsy tract can compromise subsequent definitive surgical _____.



Table 3.4: Comparing key special investigations in orthopaedic practice.

Investigation	Purpose	Key consideration
Joint aspiration	Diagnose or relieve joint effusion	Urgent if septic arthritis suspected
Nerve conduction studies/EMG	Assess nerve and muscle function	Distinguishes nerve from muscle pathology
Bone biopsy	Definitive tissue diagnosis of bone lesion	Careful tract planning to avoid compromising surgery

Pilot questions 3.4

1. Describe the indications for joint aspiration. (Linked to SLO 3.8)
2. Describe what aspirated joint fluid is generally sent for and its diagnostic significance. (Linked to SLO 3.8)
3. Describe the purpose of nerve conduction studies and electromyography. (Linked to SLO 3.8)
4. Describe the indications for bone biopsy. (Linked to SLO 3.8)
5. Explain why careful biopsy tract planning is essential for suspected malignant bone tumours. (Linked to SLO 3.8)

3.5 Formulating a Diagnosis in Orthopaedic Practice

3.5.1 clinical reasoning and differential diagnosis

Systematically generating and narrowing a list of possibilities

Clinical reasoning in orthopaedic practice generates an initial **differential diagnosis**, a prioritised list of plausible explanations for the patient's presentation, informed by the history, discussed in an earlier Series of this course, examination, discussed in the previous Series of this course, and the patient's specific demographic and risk factor **profile**.

This differential diagnosis is then progressively **narrowed** through targeted further history, examination, and investigation, discussed throughout this Series, with each additional piece of clinical information either supporting or making less likely each specific diagnosis under active **consideration**.



Fill in the blank: Clinical reasoning generates an initial differential diagnosis, a prioritised list of plausible explanations, which is then progressively narrowed through targeted further history, examination, and _____.

3.5.2 correlating history, examination, and investigation findings

Effective diagnostic synthesis requires genuine **correlation** between history, examination, and investigation findings, discussed throughout this Series, rather than treating each source of information in isolation, since apparent discrepancies between these sources frequently provide the most valuable diagnostic **clue**.

Where investigation findings do not adequately explain the clinical presentation, discussed throughout this course, further clinical reassessment or additional targeted investigation is generally warranted, since premature acceptance of an incompletely correlated diagnosis risks missing the true underlying **condition**.

Fill in the blank: Where investigation findings do not adequately explain the clinical presentation, further clinical reassessment or additional targeted investigation is generally _____.

3.5.3 arriving at a working diagnosis and management plan

A **working diagnosis** represents the most probable explanation for the patient's presentation based on currently available information, discussed throughout this Series, providing a practical basis for initiating **management** while remaining genuinely open to revision should further information emerge.

The resulting **management plan** should directly address the working diagnosis while appropriately accounting for remaining diagnostic uncertainty, discussed earlier in this Part, with clear planned follow-up and reassessment ensuring the diagnosis and management plan genuinely remain open to appropriate **revision** as further information becomes available.

Fill in the blank: The management plan should directly address the working diagnosis while appropriately accounting for remaining diagnostic uncertainty, with clear planned follow-up ensuring genuine openness to appropriate _____.



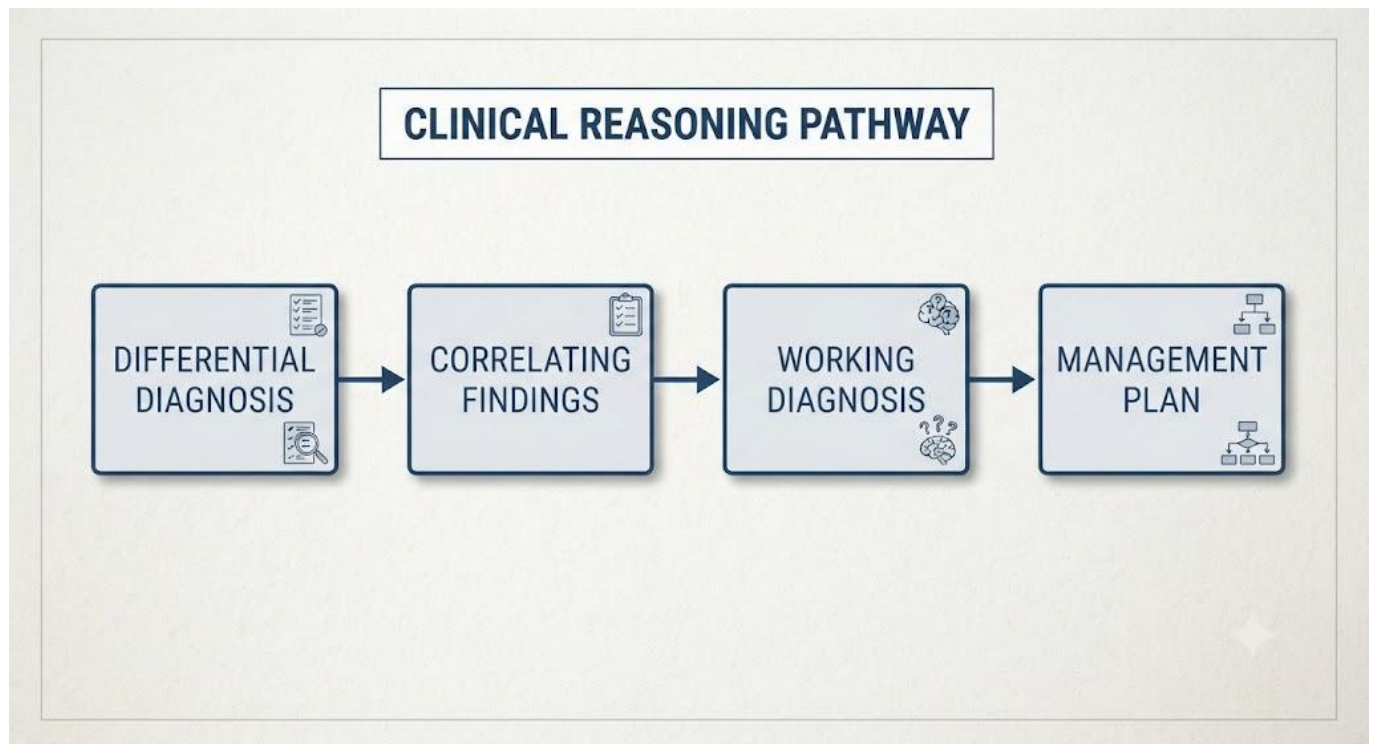


Figure 3.5: A flow diagram illustrating the progression from differential diagnosis through correlation of findings to a working diagnosis and management plan.

Pilot questions 3.5

1. Define differential diagnosis. (Linked to SLO 3.9)
2. Describe how a differential diagnosis is progressively narrowed. (Linked to SLO 3.9)
3. Explain why apparent discrepancies between history, examination, and investigation findings are valuable. (Linked to SLO 3.10)
4. Define a working diagnosis. (Linked to SLO 3.10)
5. Explain why a management plan should remain open to revision. (Linked to SLO 3.10)

Series Summary

This Series examined **investigations and diagnosis in orthopaedic practice**, beginning with **plain radiography in orthopaedic diagnosis**, before turning to **advanced imaging in orthopaedic diagnosis**, CT, MRI, ultrasound, and bone scintigraphy.



We then examined **laboratory investigations**, followed by **special investigations and procedures**, joint aspiration, nerve conduction studies, and bone biopsy, concluding with **formulating a diagnosis in orthopaedic practice**, clinical reasoning, correlation of findings, and arriving at a working diagnosis and management plan. Having worked through this Series, you should now be equipped to understand clinic and theatre-based evaluation and treatment examined in the next Series of this course.

Glossary of Terms

6. **Orthogonal views:** two radiographic projections taken at right angles to one another, such as AP and lateral.
7. **Bone scintigraphy:** a nuclear medicine investigation using a radioactive tracer to detect areas of increased bone turnover.
8. **Erythrocyte sedimentation rate (ESR):** a non-specific marker of inflammation, elevated in infection and inflammatory arthritis.
9. **C-reactive protein (CRP):** an acute-phase marker of inflammation used to monitor infection and treatment response.
10. **Joint aspiration (arthrocentesis):** sterile needle sampling of synovial fluid for diagnosis or symptom relief.
11. **Nerve conduction study:** a test measuring the speed and amplitude of electrical signal transmission along a nerve.
12. **Electromyography:** a test assessing electrical activity within muscle tissue.
13. **Bone biopsy:** sampling of bone tissue to obtain a definitive diagnosis, generally by needle or open technique.
14. **Differential diagnosis:** a prioritised list of plausible explanations for a patient's clinical presentation.
15. **Clinical reasoning:** the process of generating and narrowing a differential diagnosis using available clinical information.
16. **Working diagnosis:** the most probable explanation for a presentation based on currently available information.
17. **Management plan:** the planned course of action addressing a patient's working diagnosis.



Concept Check Questions [Series 3]

Objective questions

- Plain radiography generally requires a minimum of two orthogonal views to accurately localise and characterise a suspected _____.
- MRI is particularly valuable for evaluating early avascular necrosis, given its superior sensitivity for detecting this condition before changes become apparent on plain radiography or _____.
- Serial measurement of inflammatory markers supports monitoring of treatment response, with a failure of these markers to appropriately decline warranting reconsideration of the underlying diagnosis or treatment _____.
- Careful bone biopsy planning is essential, since an inappropriately planned biopsy tract can compromise subsequent definitive surgical _____.
- Clinical reasoning generates an initial differential diagnosis, which is then progressively narrowed through targeted further history, examination, and _____.

Short-answer questions

1. List the specific features that should be described when interpreting a fracture on plain radiograph.
2. Describe the role of CT versus MRI in orthopaedic diagnosis.
3. Describe the relevance of ESR and CRP in orthopaedic practice.
4. Describe what aspirated joint fluid is generally sent for and its diagnostic significance.
5. Explain why apparent discrepancies between history, examination, and investigation findings are valuable.

Long-answer questions

6. Discuss the principles and standard views of plain radiography, and interpreting fractures and joint/soft tissue changes. (Linked to SLO 3.1, SLO 3.2)
7. Discuss the role of CT, MRI, ultrasound, and bone scintigraphy in orthopaedic diagnosis. (Linked to SLO 3.3, SLO 3.4)
8. Discuss haematological, inflammatory marker, biochemical, and microbiological investigations in orthopaedic practice. (Linked to SLO 3.5, SLO 3.6, SLO 3.7)
9. Discuss joint aspiration, nerve conduction studies, electromyography, and bone biopsy. (Linked to SLO 3.8)
10. Discuss clinical reasoning, correlating findings, and arriving at a working diagnosis and management plan. (Linked to SLO 3.9, SLO 3.10)



Answers to Concept Check Questions [Series 3]

Objective questions

11. Abnormality.
12. CT.
13. Adequacy.
14. Treatment.
15. Investigation.

Short-answer questions

16. Fracture pattern, degree of displacement and angulation, and any joint surface involvement.
17. CT provides superior detailed bony assessment; MRI provides superior soft tissue contrast for ligaments, tendons, and marrow.
18. Both are frequently elevated in infection and inflammatory arthritis, providing useful, non-specific supportive diagnostic information.
19. Microscopy, culture, and sensitivity, with cell count and appearance; a markedly elevated white cell count and positive Gram stain support septic arthritis.
20. Because they frequently provide the most valuable diagnostic clue, prompting further reassessment or investigation.

Long-answer questions

21. **Basic response:** Plain radiography uses standard orthogonal views to localise abnormality, with fracture interpretation describing pattern, displacement, and joint involvement.

Value-added response: Joint and soft tissue changes, including joint space width and effusion, provide further important diagnostic information despite plain radiography's relative limitations for soft tissue detail.

22. **Basic response:** CT provides superior bony detail for complex fractures, tumours, and spinal pathology, while MRI provides superior soft tissue contrast for ligaments, cartilage, and marrow.

Value-added response: Ultrasound offers dynamic, real-time assessment and procedural guidance, while bone scintigraphy provides sensitive whole-skeleton screening for occult pathology.



23. **Basic response:** Haematological investigations provide baseline surgical fitness and infection screening information, while inflammatory markers support diagnosis and treatment monitoring.

Value-added response: Biochemical investigations assess metabolic bone disease, and microbiological investigations provide definitive organism identification guiding targeted antibiotic therapy.

24. **Basic response:** Joint aspiration diagnoses or relieves effusion, particularly urgent in suspected septic arthritis, while nerve conduction studies and EMG assess nerve and muscle function.

Value-added response: Bone biopsy provides definitive tissue diagnosis, requiring careful tract planning to avoid compromising subsequent definitive surgical treatment.

25. **Basic response:** Clinical reasoning generates and progressively narrows a differential diagnosis through correlation of history, examination, and investigation findings.

Value-added response: The resulting working diagnosis and management plan should remain genuinely open to revision as further information becomes available.

Answers to Pilot Questions [Series 3]

Part 3.1

1. Because a single view cannot reliably localise a finding in three-dimensional space or reveal displacement in all planes.
2. Fracture pattern, degree of displacement and angulation, and joint surface involvement.
3. Because certain fractures, such as scaphoid fractures, may not be visible on initial radiographs despite genuine injury.
4. Joint space width, subchondral bone quality, and presence of osteophytes.
5. Joint effusion and calcification within tendons or soft tissue.

Part 3.2

6. Detailed bony assessment for complex or occult fractures, tumours, and preoperative planning.
7. Superior soft tissue contrast for ligaments, tendons, cartilage, and marrow pathology.



8. Because MRI can detect early changes before they become apparent on plain radiography or CT.
9. Dynamic, real-time assessment of tendons and soft tissue, and guidance for injections.
10. A radioactive tracer concentrates in areas of increased bone turnover, used for detecting occult fracture, infection, or metastatic disease across the whole skeleton.

Part 3.3

11. It provides baseline haemoglobin, white cell, and platelet information relevant to infection and surgical fitness.
12. Both are frequently elevated in infection and inflammatory arthritis, providing supportive diagnostic information.
13. A failure of markers to decline appropriately after treatment warrants reconsideration of the diagnosis or treatment adequacy.
14. Serum calcium, phosphate, and alkaline phosphatase provide information regarding suspected metabolic bone disease.
15. They provide definitive organism identification and antibiotic sensitivity, guiding targeted treatment.

Part 3.4

1. Suspected septic arthritis, or to relieve a tense, symptomatic joint effusion.
2. Microscopy, culture, and sensitivity, with cell count; markedly elevated white cells and positive Gram stain support septic arthritis.
3. To assess nerve conduction speed and amplitude, and muscle electrical activity, distinguishing nerve from muscle pathology.
4. Suspected bone tumour or, occasionally, chronic osteomyelitis.
5. Because an inappropriately planned tract can compromise subsequent definitive surgical treatment.

Part 3.5

1. A prioritised list of plausible explanations for a patient's clinical presentation.
2. Through targeted further history, examination, and investigation, refining the list based on new information.
3. Because they frequently provide the most valuable diagnostic clue, prompting further reassessment.
4. The most probable explanation for a presentation based on currently available information.
5. Because further information may emerge that requires reconsideration of the diagnosis and adjustment of management.



References and Attributions [Series 3]

6. Solomon, L., Warwick, D., & Nayagam, S. (2018). Apley and Solomon's System of Orthopaedics and Trauma (10th ed.). CRC Press.
7. Chapman, S., & Nakielnny, R. (2014). Aids to Radiological Differential Diagnosis (6th ed.). Elsevier.
8. Skinner, H. B., & McMahon, P. J. (Eds.). (2013). Current Diagnosis and Treatment in Orthopedics (5th ed.). McGraw-Hill.
9. Longmore, M., et al. (2020). Oxford Handbook of Clinical Medicine (10th ed.). Oxford University Press.

Figures, Plates, Tables, and Boxes

1. Figure 3.1: Diagram illustrating the standard anteroposterior and lateral orthogonal radiographic views of a long bone. AI-generated using the prompt: "A single clean, accurate two-panel schematic diagram of a long bone, one panel labelled anteroposterior view showing the bone from the front, the other panel labelled lateral view showing the bone from the side, textbook radiographic technique diagram style, neutral background, no photographic realism, no other panels."
2. Table 3.2: Comparing advanced imaging modalities in orthopaedic diagnosis. AI-generated using the prompt: "Create a clean clinical reference table titled Comparing Advanced Imaging Modalities in Orthopaedic Diagnosis, listing modality, primary strength, and typical orthopaedic indication. Clinical reference table style with outside border, no photographic elements."
3. Table 3.3: Comparing key laboratory investigations in orthopaedic practice. AI-generated using the prompt: "Create a clean clinical reference table titled Comparing Key Laboratory Investigations in Orthopaedic Practice, listing investigation, main relevance, and key interpretive note. Clinical reference table style with outside border, no photographic elements."
4. Table 3.4: Comparing key special investigations in orthopaedic practice. AI-generated using the prompt: "Create a clean clinical reference table titled Comparing Key Special Investigations in Orthopaedic Practice, listing investigation, purpose, and key consideration. Clinical reference table style with outside border, no photographic elements."
5. Figure 3.5: A flow diagram illustrating the progression from differential diagnosis through correlation of findings to a working diagnosis and management plan. AI-generated using the prompt: "A single clean, accurate schematic flow diagram with four



labelled sequential boxes, Differential Diagnosis, Correlating Findings, Working Diagnosis, and Management Plan, connected by directional arrows, textbook clinical reasoning diagram style, neutral background, no photographic realism, no other panels."



Course code: ORT 603

Course title: Clinics, Theatre and Bed Side Teaching in Orthopaedics

Course credit load: 3 Units

Series 4: Clinic and Theatre-Based Evaluation and Treatment

- **Part 4.1: Outpatient Clinic Evaluation**
 - Sub Part 4.1.1: Structure and flow of an orthopaedic outpatient clinic
 - Sub Part 4.1.2: Evaluating a new patient in clinic
 - Sub Part 4.1.3: Evaluating a follow-up patient in clinic
- **Part 4.2: Medical (Non-Surgical) Therapy**
 - Sub Part 4.2.1: Principles of non-surgical orthopaedic management
 - Sub Part 4.2.2: Analgesia and anti-inflammatory therapy
 - Sub Part 4.2.3: Physiotherapy and orthotic management
- **Part 4.3: Indications for Surgery**
 - Sub Part 4.3.1: General indications for surgical intervention
 - Sub Part 4.3.2: Elective versus emergency surgical indications
 - Sub Part 4.3.3: Weighing risks and benefits of surgery
- **Part 4.4: The Patient Being Operated Upon: Perioperative Care**
 - Sub Part 4.4.1: Preoperative preparation in theatre practice
 - Sub Part 4.4.2: Intraoperative considerations and the surgical team
 - Sub Part 4.4.3: Postoperative care and monitoring
- **Part 4.5: Theatre Etiquette and Patient Safety**
 - Sub Part 4.5.1: Principles of theatre asepsis
 - Sub Part 4.5.2: The surgical safety checklist
 - Sub Part 4.5.3: Patient positioning and safety in theatre



Introduction

In the last Series, we established investigations and diagnosis in orthopaedic practice. We now turn to the practical setting of **clinic and theatre-based evaluation and treatment**, the structure and conduct of the outpatient clinic, the distinction between medical and surgical management, the indications guiding surgical decision making, and the essential **perioperative care and theatre safety practices** surrounding the patient being operated upon.

The aim of this Series is to equip you with a thorough, practical understanding of outpatient clinic evaluation, medical and surgical therapy for indicated cases, the perioperative care of the patient being operated upon, and theatre etiquette and patient safety.

This Series begins with **outpatient clinic evaluation**, before turning to **medical (non-surgical) therapy**. We then examine the **indications for surgery**, followed by **the patient being operated upon: perioperative care**, concluding with **theatre etiquette and patient safety**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 4.1:** describe the structure and flow of an orthopaedic outpatient clinic
- **SLO 4.2:** evaluate a new patient and a follow-up patient in clinic
- **SLO 4.3:** describe the principles of non-surgical orthopaedic management
- **SLO 4.4:** describe analgesia, anti-inflammatory therapy, physiotherapy, and orthotic management
- **SLO 4.5:** describe the general indications for surgical intervention
- **SLO 4.6:** distinguish elective from emergency surgical indications and describe how risks and benefits of surgery are weighed
- **SLO 4.7:** describe preoperative preparation in theatre practice
- **SLO 4.8:** describe intraoperative considerations, the surgical team, and postoperative care and monitoring
- **SLO 4.9:** describe the principles of theatre asepsis and the surgical safety checklist, and
- **SLO 4.10:** describe patient positioning and safety considerations in theatre.

4.1 Outpatient Clinic Evaluation

4.1.1 structure and flow of an orthopaedic outpatient clinic



An organised sequence supporting efficient patient throughput

An orthopaedic **outpatient clinic** generally accommodates a mixture of **new patients**, attending for initial assessment of a previously unevaluated condition, and **follow-up patients**, discussed further later in this Part, returning for review of a condition already under active management, with clinic scheduling generally reflecting the differing time requirements of each.

Efficient clinic **flow** requires appropriate patient triage and prioritisation, adequate support staff for clerking and vital sign measurement, discussed in relation to systematic history taking in an earlier Series of this course, and timely availability of relevant investigation results, discussed in an earlier Series of this course, supporting productive clinical **decision making** during the consultation itself.

Fill in the blank: An orthopaedic outpatient clinic generally accommodates a mixture of new patients and follow-up patients, with clinic scheduling generally reflecting the differing time requirements of _____.

4.1.2 evaluating a new patient in clinic

Evaluation of a new patient in clinic generally follows the systematic history and examination sequence discussed throughout this course, culminating in formulation of a working diagnosis and **management plan**, discussed in the previous Series of this course, together with clear communication of this plan to the patient in accessible, understandable terms.

New patient evaluation additionally requires appropriate arrangement of any further **investigation** needed, discussed in the previous Series of this course, and clear documentation supporting continuity of care at subsequent follow-up visits, discussed further in the next sub-Part, or referral to colleagues where appropriate.

Fill in the blank: New patient evaluation requires appropriate arrangement of any further investigation needed and clear documentation supporting continuity of care at subsequent follow-up _____.

4.1.3 evaluating a follow-up patient in clinic

Evaluation of a **follow-up patient** should specifically assess progress since the previous consultation, discussed earlier in this Part, including symptom trajectory, treatment **adherence**, and any new symptoms or concerns, generally requiring more focused, problem-specific examination rather than a complete systematic reassessment.



Follow-up evaluation additionally requires review of any interval **investigation** results, discussed in the previous Series of this course, and reassessment of the original working diagnosis and management plan in light of the patient's actual clinical **course**, adjusting treatment as genuinely warranted by this ongoing reassessment.

Fill in the blank: Evaluation of a follow-up patient generally requires more focused, problem-specific examination rather than a complete systematic _____.

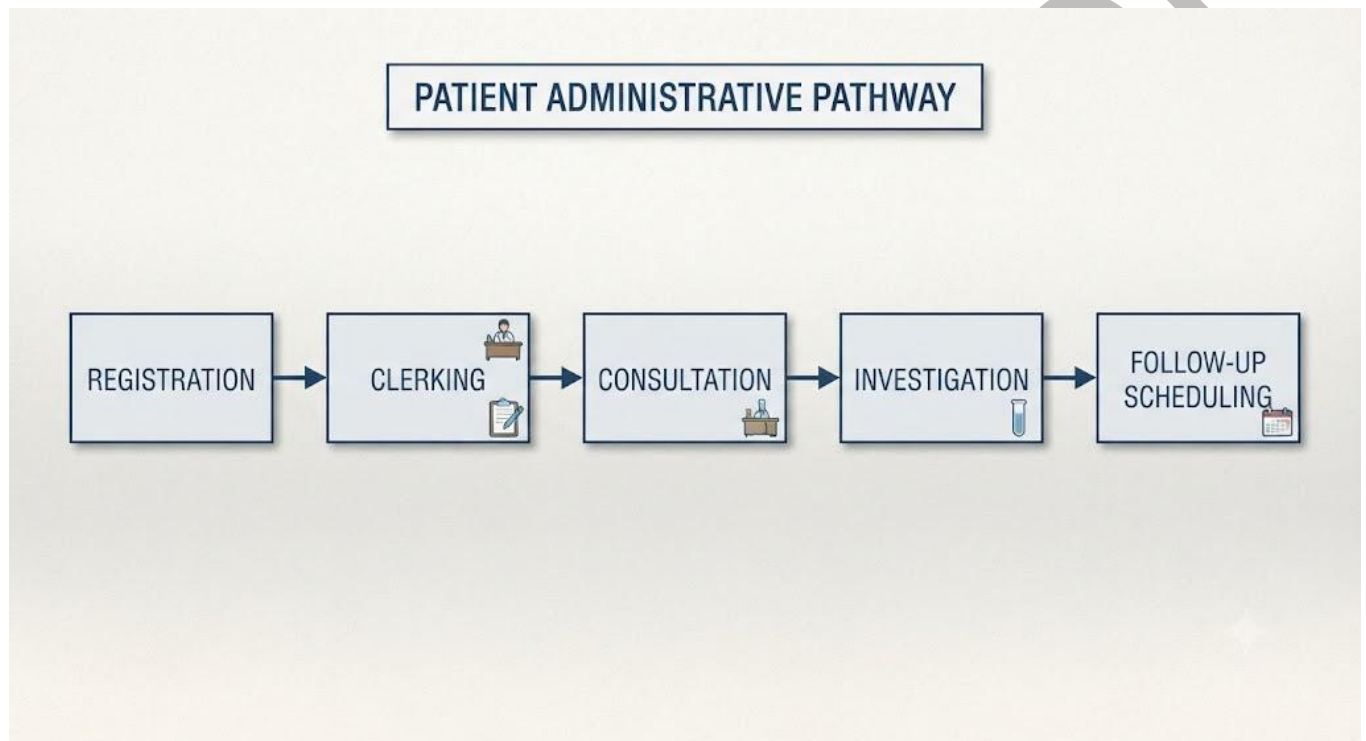


Figure 4.1: A schematic diagram showing patient flow through an outpatient clinic: registration, clerking, consultation, investigation, and follow-up scheduling.

Pilot questions 4.1

- Distinguish new patients from follow-up patients in an orthopaedic outpatient clinic. (Linked to SLO 4.1)
- List the requirements for efficient clinic flow. (Linked to SLO 4.1)
- Describe the essential components of evaluating a new patient in clinic. (Linked to SLO 4.2)
- Describe what should be specifically assessed when evaluating a follow-up patient. (Linked to SLO 4.2)



- Explain why follow-up evaluation generally requires more focused examination than initial evaluation. (Linked to SLO 4.2)

4.2 Medical (Non-Surgical) Therapy

4.2.1 principles of non-surgical orthopaedic management

A generally preferred first step for many conditions

Non-surgical management represents the appropriate initial approach for the substantial majority of orthopaedic conditions, discussed throughout this course, reserving surgical intervention, discussed further later in this Series, for cases where non-surgical measures prove genuinely **insufficient** or where the specific condition demands surgical treatment from the outset.

Effective non-surgical management generally combines several complementary approaches, including **analgesia**, discussed further in the next sub-Part, activity modification, and structured rehabilitation, discussed further later in this Part, rather than relying on any single intervention alone.

Fill in the blank: Non-surgical management represents the appropriate initial approach for the substantial majority of orthopaedic conditions, reserving surgical intervention for cases where non-surgical measures prove genuinely _____.

4.2.2 analgesia and anti-inflammatory therapy

Analgesia for orthopaedic pain generally follows a stepwise approach, beginning with simple analgesics such as paracetamol, progressing to **non-steroidal anti-inflammatory drugs**, discussed in relation to peptic ulcer risk in an earlier related course, and, where necessary, stronger opioid analgesia for more severe pain.

Local or intra-articular **corticosteroid injection**, discussed in relation to joint aspiration technique in the previous Series of this course, provides a further recognised anti-inflammatory treatment option for specific localised conditions, generally reserved for cases where systemic analgesic and anti-inflammatory therapy proves genuinely **insufficient**.

Fill in the blank: Analgesia for orthopaedic pain generally follows a stepwise approach, beginning with simple analgesics, progressing to non-steroidal anti-inflammatory drugs, and, where necessary, stronger opioid _____.



4.2.3 physiotherapy and orthotic management

Physiotherapy, discussed in relation to rehabilitation principles in an earlier related course, provides structured exercise and manual therapy addressing joint range of motion, muscle strength, and functional mobility, generally forming an essential component of non-surgical management for the majority of orthopaedic **conditions**.

Orthotic management, including braces, splints, and specialised footwear, provides external support or correction addressing biomechanical abnormality, discussed in relation to congenital foot deformity in an earlier related course, or supporting healing following injury, complementing physiotherapy within a comprehensive non-surgical treatment **plan**.

Fill in the blank: Orthotic management, including braces, splints, and specialised footwear, provides external support or correction addressing biomechanical _____.

Table 4.2: Components of non-surgical orthopaedic management.

Component	Purpose	Example
Analgesia	Reduce pain to support function and rehabilitation	Paracetamol, NSAIDs, opioids
Physiotherapy	Restore range of motion, strength, and mobility	Structured exercise and manual therapy
Orthotic management	Provide external support or correction	Braces, splints, specialised footwear

Pilot questions 4.2

1. Explain why non-surgical management generally represents the appropriate initial approach for most orthopaedic conditions. (Linked to SLO 4.3)
2. Describe the stepwise approach to orthopaedic analgesia. (Linked to SLO 4.4)
3. Describe the role of local or intra-articular corticosteroid injection. (Linked to SLO 4.4)
4. Describe the role of physiotherapy in non-surgical management. (Linked to SLO 4.4)
5. Describe the role of orthotic management. (Linked to SLO 4.4)

4.3 Indications for Surgery

4.3.1 general indications for surgical intervention



Surgery reserved for specific, well justified circumstances

General indications for orthopaedic surgical intervention include failure of adequate **non-surgical management**, discussed earlier in this Series, progressive deformity or functional decline, and specific conditions inherently requiring surgical treatment, such as displaced fractures, discussed in an earlier related course, requiring reduction and fixation.

Further recognised indications include suspected malignancy requiring surgical biopsy or resection, discussed in relation to bone tumour biopsy in the previous Series of this course, and specific emergencies, discussed further in the next sub-Part, where delay would risk irreversible harm or genuinely worse patient **outcome**.

Fill in the blank: General indications for orthopaedic surgical intervention include failure of adequate non-surgical management, progressive deformity or functional decline, and specific conditions inherently requiring surgical _____.

4.3.2 elective versus emergency surgical indications

Elective surgery is planned in advance for a non-urgent condition, generally allowing adequate time for optimisation of the patient's medical fitness, discussed in relation to preoperative assessment later in this Series, and thorough discussion of the planned procedure with the patient.

Emergency surgery, by contrast, is required urgently given a genuinely time-critical clinical situation, such as compartment syndrome, discussed in an earlier related course, or open fracture requiring urgent debridement, discussed in an earlier related course, generally allowing considerably less time for extensive preoperative **optimisation**.

Fill in the blank: Emergency surgery is required urgently given a genuinely time-critical clinical situation, generally allowing considerably less time for extensive preoperative _____.

4.3.3 weighing risks and benefits of surgery

Surgical decision making requires careful, individualised weighing of the anticipated **benefits** of surgery, discussed throughout this Series, against the specific risks involved, including anaesthetic risk, discussed in relation to medical fitness earlier in this Part, surgical complication risk, and the patient's own personal preferences and priorities.

This risk-benefit assessment should be explicitly and honestly discussed with the patient as part of **informed consent**, discussed in relation to amputation consent in an earlier related course,



ensuring the patient genuinely understands both the potential benefits and the specific risks of the proposed procedure before proceeding to **surgery**.

Fill in the blank: Surgical risk-benefit assessment should be explicitly and honestly discussed with the patient as part of informed _____.

Table 4.3: Comparing elective and emergency surgical indications.

Feature	Elective surgery	Emergency surgery
Timing	Planned in advance	Required urgently
Preoperative optimisation	Generally adequate time available	Considerably limited time available
Example	Planned joint replacement	Open fracture debridement or compartment syndrome fasciotomy

Pilot questions 4.3

1. List three general indications for orthopaedic surgical intervention. (Linked to SLO 4.5)
2. Distinguish elective from emergency surgery in terms of timing and preoperative optimisation. (Linked to SLO 4.6)
3. Give an example of an emergency orthopaedic surgical indication. (Linked to SLO 4.6)
4. Describe the factors weighed in assessing the risks and benefits of surgery. (Linked to SLO 4.6)
5. Explain the role of informed consent in surgical decision making. (Linked to SLO 4.6)

4.4 The Patient Being Operated Upon: Perioperative Care

4.4.1 preoperative preparation in theatre practice

Optimising the patient and confirming procedural details

Preoperative preparation includes confirmation of patient identity, the specific procedure planned, and the correct surgical **site**, discussed in relation to consent discussion in an earlier related course, together with appropriate fasting instructions and confirmation of relevant investigation results, discussed in the previous Series of this course.



Further preoperative preparation includes appropriate **antibiotic prophylaxis** administration, discussed in relation to infection prevention in an earlier related course, and **thromboprophylaxis** measures, discussed in relation to venous thromboembolism risk in an earlier related course, reducing the risk of significant perioperative **complications**.

Fill in the blank: Preoperative preparation includes confirmation of patient identity, the specific procedure planned, and the correct surgical _____.

4.4.2 intraoperative considerations and the surgical team

The **surgical team** generally comprises the operating surgeon and assistants, the anaesthetist, discussed in relation to airway management in an earlier related course, and scrub and circulating nursing staff, each with specific, clearly defined roles supporting safe, efficient procedure **conduct**.

Intraoperative considerations include maintaining strict **asepsis**, discussed further later in this Series, careful patient positioning, discussed further later in this Series, and ongoing communication between team members regarding procedural progress and any unexpected findings or complications encountered **during** the procedure.

Fill in the blank: The surgical team generally comprises the operating surgeon and assistants, the anaesthetist, and scrub and circulating nursing staff, each with specific, clearly defined _____ supporting safe, efficient procedure conduct.

4.4.3 postoperative care and monitoring

Postoperative care requires close monitoring of vital signs, discussed in relation to systematic assessment earlier in this course, wound status, and adequate pain control, discussed earlier in this Series, together with prompt recognition of any early postoperative **complication**.

Postoperative monitoring additionally includes neurovascular assessment of the operated limb where relevant, discussed in relation to neurovascular examination in the previous Series of this course, and early mobilisation and rehabilitation planning, discussed earlier in this Series, supporting optimal functional **recovery**.

Fill in the blank: Postoperative monitoring additionally includes neurovascular assessment of the operated limb where relevant, and early mobilisation and rehabilitation planning, supporting optimal functional _____.



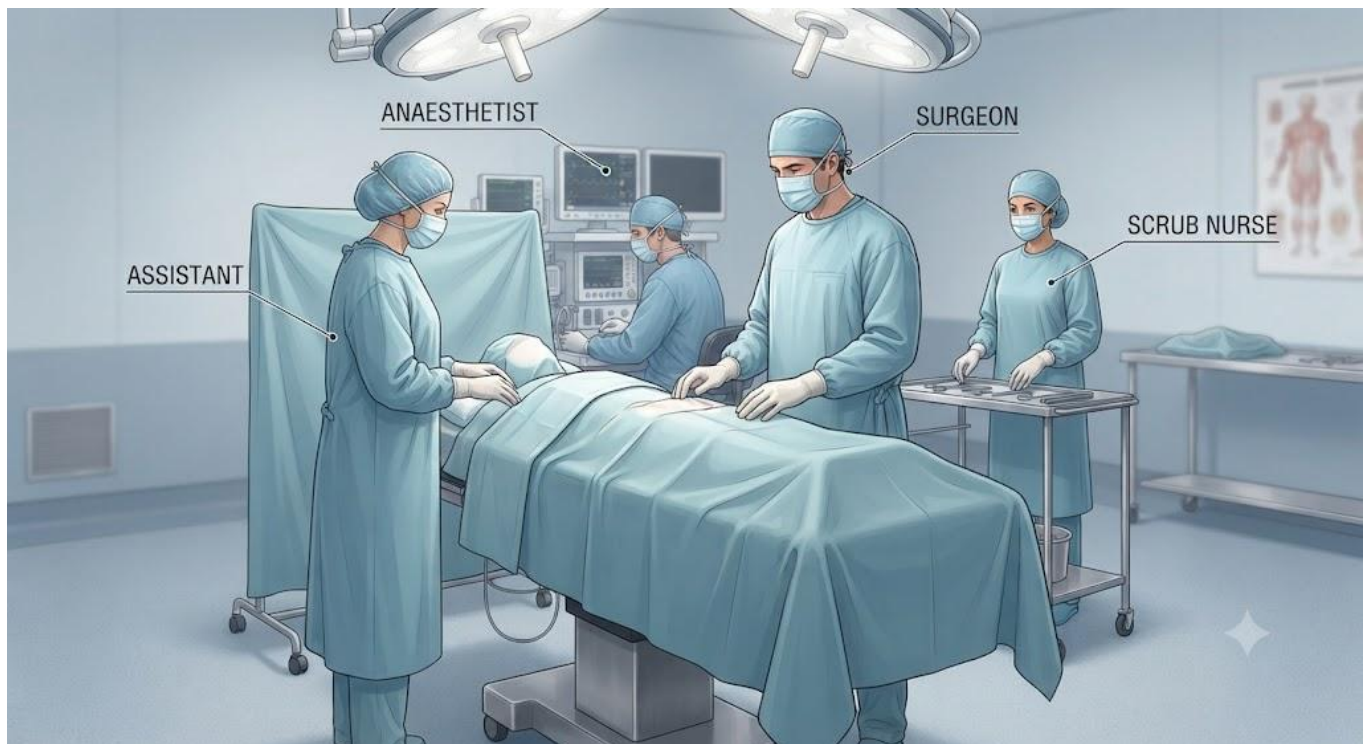


Figure 4.4: A surgical team, including surgeon, assistant, anaesthetist, and scrub nurse, positioned around an operating table.

Pilot questions 4.4

1. List the essential components of preoperative preparation. (Linked to SLO 4.7)
2. Describe the roles within a typical surgical team. (Linked to SLO 4.8)
3. List two important intraoperative considerations. (Linked to SLO 4.8)
4. Describe the essential components of postoperative care and monitoring. (Linked to SLO 4.8)
5. Explain why neurovascular assessment of the operated limb is an important part of postoperative monitoring. (Linked to SLO 4.8)

4.5 Theatre Etiquette and Patient Safety

4.5.1 principles of theatre asepsis

Minimising the risk of surgical site contamination

Theatre asepsis requires careful surgical hand **scrubbing**, discussed in relation to infection prevention principles in an earlier related course, appropriate sterile gowning and gloving, and



maintenance of a clearly defined **sterile field** throughout the procedure, minimising the risk of surgical site contamination.

Further important asepsis principles include appropriate **traffic** discipline within the operating theatre, minimising unnecessary movement and door opening during the procedure, and careful management of surgical instruments, discussed in relation to interventional instrument handling in an earlier related course, to maintain sterility throughout the operative **period**.

Fill in the blank: Theatre asepsis requires appropriate traffic discipline within the operating theatre, minimising unnecessary movement and door opening during the _____.

4.5.2 the surgical safety checklist

The **surgical safety checklist**, generally applied at three defined time points, before induction of anaesthesia, before skin incision, and before the patient leaves the operating room, provides a structured, standardised means of confirming essential safety information at each critical **stage**.

This checklist specifically confirms patient identity, the planned procedure and surgical site, discussed earlier in this Series, relevant allergy status, discussed in relation to drug history earlier in this Series, and completion of instrument and swab counts, providing a genuinely reliable safeguard against recognised categories of preventable surgical **error**.

Fill in the blank: The surgical safety checklist is generally applied at three defined time points, providing a structured, standardised means of confirming essential safety information at each critical _____.

4.5.3 patient positioning and safety in theatre

Correct **patient positioning** on the operating table, discussed in relation to specific surgical approaches throughout this course, requires careful attention to pressure point protection and appropriate padding, preventing positioning-related nerve injury or pressure sores during what may be a prolonged surgical **procedure**.

Further important safety considerations include appropriate **diathermy** pad placement and electrical safety precautions, discussed in relation to surgical equipment use in an earlier related course, and careful attention to maintaining core body **temperature**, discussed in relation to hypothermia prevention in an earlier related course, throughout the operative period.

Fill in the blank: Further important safety considerations include appropriate diathermy pad placement and electrical safety precautions, and careful attention to maintaining core body _____ throughout the operative period.



Table 4.5: The three time points of the surgical safety checklist.

Time point	Focus	Example confirmation
Before induction of anaesthesia	Patient and procedure identification	Confirm patient identity and consent
Before skin incision	Team briefing and final checks	Confirm surgical site and allergy status
Before patient leaves the operating room	Procedure completion checks	Confirm instrument and swab counts

Pilot questions 4.5

1. Describe the principles of theatre asepsis. (Linked to SLO 4.9)
2. Describe traffic discipline in the operating theatre and its purpose. (Linked to SLO 4.9)
3. State the three time points of the surgical safety checklist. (Linked to SLO 4.9)
4. Describe what the surgical safety checklist confirms. (Linked to SLO 4.9)
5. Describe the safety considerations relevant to patient positioning in theatre. (Linked to SLO 4.10)

Series Summary

This Series examined **clinic and theatre-based evaluation and treatment**, beginning with **outpatient clinic evaluation**, its structure and the evaluation of new and follow-up patients, before turning to **medical (non-surgical) therapy**, analgesia, physiotherapy, and orthotic management.

We then examined the **indications for surgery**, elective versus emergency, and weighing risks and benefits, followed by **the patient being operated upon: perioperative care**, preoperative, intraoperative, and postoperative considerations, concluding with **theatre etiquette and patient safety**, asepsis, the surgical safety checklist, and patient positioning. Having worked through this Series, you should now be equipped to understand case presentation and primary survey resuscitation examined in the final Series of this course.



Glossary of Terms

6. **New patient (clinic):** a patient attending for initial assessment of a previously unevaluated condition.
7. **Follow-up patient (clinic):** a patient returning for review of a condition already under active management.
8. **Non-surgical management:** treatment approaches, such as analgesia and physiotherapy, not requiring surgical intervention.
9. **Orthotic management:** the use of braces, splints, or specialised footwear to provide external support or correction.
10. **Elective surgery:** surgery planned in advance for a non-urgent condition.
11. **Emergency surgery:** surgery required urgently given a time-critical clinical situation.
12. **Informed consent:** a patient's voluntary agreement to treatment based on adequate understanding of relevant information.
13. **Thromboprophylaxis:** measures taken to reduce the risk of venous thromboembolism.
14. **Theatre asepsis:** practices minimising the risk of surgical site contamination.
15. **Surgical safety checklist:** a structured checklist applied at three time points to confirm essential surgical safety information.
16. **Sterile field:** the area maintained free of contamination during a surgical procedure.
17. **Diathermy:** an electrical surgical device used for cutting or coagulation, requiring specific safety precautions.

Concept Check Questions [Series 4]

Objective questions

- An orthopaedic outpatient clinic generally accommodates new patients and follow-up patients, with clinic scheduling reflecting the differing time requirements of _____.
- Non-surgical management represents the appropriate initial approach for most orthopaedic conditions, reserving surgery for cases where non-surgical measures prove genuinely _____.
- Emergency surgery is required urgently given a genuinely time-critical clinical situation, generally allowing considerably less time for extensive preoperative _____.
- The surgical safety checklist is generally applied at three defined time points to confirm essential safety information at each critical _____.
- Further important safety considerations include appropriate diathermy pad placement and careful attention to maintaining core body _____.



Short-answer questions

1. Distinguish new patients from follow-up patients in an orthopaedic outpatient clinic.
2. Describe the stepwise approach to orthopaedic analgesia.
3. Distinguish elective from emergency surgery in terms of timing and preoperative optimisation.
4. Describe the roles within a typical surgical team.
5. State the three time points of the surgical safety checklist.

Long-answer questions

6. Discuss the structure of an outpatient clinic and the evaluation of new and follow-up patients. (Linked to SLO 4.1, SLO 4.2)
7. Discuss the principles of non-surgical orthopaedic management, including analgesia, physiotherapy, and orthotic management. (Linked to SLO 4.3, SLO 4.4)
8. Discuss the indications for surgery, elective versus emergency surgery, and weighing risks and benefits. (Linked to SLO 4.5, SLO 4.6)
9. Discuss preoperative, intraoperative, and postoperative care of the patient being operated upon. (Linked to SLO 4.7, SLO 4.8)
10. Discuss theatre asepsis, the surgical safety checklist, and patient positioning and safety in theatre. (Linked to SLO 4.9, SLO 4.10)

Answers to Concept Check Questions [Series 4]

Objective questions

11. Each.
12. Insufficient.
13. Optimisation.
14. Stage.
15. Temperature.

Short-answer questions

16. New patients attend for initial assessment of a previously unevaluated condition; follow-up patients return for review of an already managed condition.
17. Beginning with simple analgesics such as paracetamol, progressing to NSAIDs, and, where necessary, opioid analgesia.



18. Elective surgery is planned in advance with adequate optimisation time; emergency surgery is required urgently with considerably limited optimisation time.
19. The operating surgeon and assistants, the anaesthetist, and scrub and circulating nursing staff.
20. Before induction of anaesthesia, before skin incision, and before the patient leaves the operating room.

Long-answer questions

21. **Basic response:** Outpatient clinics accommodate new and follow-up patients, requiring efficient flow and appropriate triage.

Value-added response: New patient evaluation follows systematic history and examination culminating in a management plan; follow-up evaluation focuses on progress, adherence, and interval investigation results.

22. **Basic response:** Non-surgical management combines analgesia, physiotherapy, and orthotic management as a generally preferred first step for most orthopaedic conditions.

Value-added response: Analgesia follows a stepwise approach, with corticosteroid injection reserved for specific localised conditions, while physiotherapy and orthotics restore or support function.

23. **Basic response:** Surgical indications include failure of non-surgical management, progressive deformity, and specific conditions requiring surgery outright, distinguished as elective or emergency based on urgency.

Value-added response: Decision making requires careful weighing of risks and benefits, discussed openly with the patient as part of informed consent.

24. **Basic response:** Perioperative care spans preoperative confirmation of identity and procedure, intraoperative team roles and considerations, and postoperative monitoring for complications and recovery.

Value-added response: Each phase requires specific attention to safety and communication to support optimal patient outcome.

25. **Basic response:** Theatre asepsis, through scrubbing, sterile technique, and traffic discipline, minimises contamination risk, while the surgical safety checklist provides structured confirmation at three critical time points.



Value-added response: Careful patient positioning and attention to electrical safety and temperature further protect patient safety throughout the operative period.

Answers to Pilot Questions [Series 4]

Part 4.1

1. New patients attend for initial assessment of a previously unevaluated condition; follow-up patients return for review of an ongoing condition.
2. Appropriate triage, adequate support staff, and timely availability of investigation results.
3. Systematic history and examination, formulation of a working diagnosis and management plan, and clear patient communication.
4. Progress since the previous consultation, treatment adherence, and any new symptoms or concerns.
5. Because the diagnosis and baseline have already been established, allowing more targeted assessment of progress.

Part 4.2

6. Because the majority of conditions respond adequately to non-surgical measures, reserving surgery for genuinely insufficient response.
7. Beginning with simple analgesics, progressing to NSAIDs, and then opioids where necessary.
8. A recognised anti-inflammatory option for specific localised conditions, reserved for cases where systemic therapy is insufficient.
9. It addresses joint range of motion, muscle strength, and functional mobility.
10. It provides external support or correction addressing biomechanical abnormality or supporting healing.

Part 4.3

11. Failure of non-surgical management, progressive deformity or functional decline, and conditions inherently requiring surgery such as displaced fracture.
12. Elective surgery is planned with adequate optimisation time; emergency surgery is urgent with limited optimisation time.
13. Compartment syndrome fasciotomy or open fracture debridement.
14. Anticipated benefits, anaesthetic and surgical complication risk, and the patient's personal preferences.



15. It ensures the patient understands both potential benefits and specific risks before proceeding.

Part 4.4

1. Confirming patient identity, procedure, and surgical site, fasting instructions, and antibiotic/thromboprophylaxis.
2. Operating surgeon and assistants, anaesthetist, and scrub and circulating nursing staff.
3. Maintaining asepsis and careful patient positioning, among others such as team communication.
4. Monitoring vital signs, wound status, pain control, and prompt recognition of complications.
5. Because it can detect early vascular or nerve compromise requiring urgent intervention.

Part 4.5

1. Surgical hand scrubbing, sterile gowning and gloving, and maintenance of a sterile field.
2. Minimising unnecessary movement and door opening; it helps maintain sterility during the procedure.
3. Before induction of anaesthesia, before skin incision, and before the patient leaves the operating room.
4. Patient identity, planned procedure and site, allergy status, and instrument and swab counts.
5. Pressure point protection and padding, diathermy and electrical safety, and temperature maintenance.

References and Attributions [Series 4]

6. Solomon, L., Warwick, D., & Nayagam, S. (2018). Apley and Solomon's System of Orthopaedics and Trauma (10th ed.). CRC Press.
7. World Health Organization (2009). WHO Guidelines for Safe Surgery: Safe Surgery Saves Lives.
8. Skinner, H. B., & McMahon, P. J. (Eds.). (2013). Current Diagnosis and Treatment in Orthopedics (5th ed.). McGraw-Hill.
9. Longmore, M., et al. (2020). Oxford Handbook of Clinical Medicine (10th ed.). Oxford University Press.



Figures, Plates, Tables, and Boxes

1. Figure 4.1: A schematic diagram showing patient flow through an outpatient clinic: registration, clerking, consultation, investigation, and follow-up scheduling. AI-generated using the prompt: "A single clean, accurate schematic flow diagram with five labelled sequential boxes, Registration, Clerking, Consultation, Investigation, and Follow-up Scheduling, connected by directional arrows, textbook administrative process diagram style, neutral background, no photographic realism, no other panels."
2. Table 4.2: Components of non-surgical orthopaedic management. AI-generated using the prompt: "Create a clean clinical reference table titled Components of Non-Surgical Orthopaedic Management, listing component, purpose, and example. Clinical reference table style with outside border, no photographic elements."
3. Table 4.3: Comparing elective and emergency surgical indications. AI-generated using the prompt: "Create a clean clinical reference table titled Comparing Elective and Emergency Surgical Indications, listing feature, elective surgery, and emergency surgery. Clinical reference table style with outside border, no photographic elements."
4. Figure 4.4: A surgical team, including surgeon, assistant, anaesthetist, and scrub nurse, positioned around an operating table. AI-generated using the prompt: "A single clean, realistic clinical illustration of a surgical team in theatre gowns and masks positioned around an operating table, each figure labelled with their role, surgeon, assistant, anaesthetist, and scrub nurse, calm operating theatre setting, no identifying facial features, no graphic surgical detail, respectful depiction, no other panels."
5. Table 4.5: The three time points of the surgical safety checklist. AI-generated using the prompt: "Create a clean clinical reference table titled The Three Time Points of the Surgical Safety Checklist, listing time point, focus, and example confirmation. Clinical reference table style with outside border, no photographic elements."



Course code: ORT 603

Course title: Clinics, Theatre and Bed Side Teaching in Orthopaedics

Course credit load: 3 Units

Series 5: Case Presentation and Primary Survey Resuscitation

- **Part 5.1: Principles of Case Presentation**
 - Sub Part 5.1.1: Purpose and audience of case presentation
 - Sub Part 5.1.2: Structuring a case presentation
 - Sub Part 5.1.3: Common pitfalls in case presentation
- **Part 5.2: The Long Case Presentation**
 - Sub Part 5.2.1: Components of a long case presentation
 - Sub Part 5.2.2: Presenting history and examination findings in a long case
 - Sub Part 5.2.3: Presenting investigations, diagnosis, and management plan in a long case
- **Part 5.3: The Short Case Presentation**
 - Sub Part 5.3.1: Components of a short case presentation
 - Sub Part 5.3.2: Focused examination technique in a short case
 - Sub Part 5.3.3: Concise, structured verbal presentation in a short case
- **Part 5.4: The Art of Resuscitation**
 - Sub Part 5.4.1: General principles of resuscitation
 - Sub Part 5.4.2: Team dynamics in resuscitation
 - Sub Part 5.4.3: Communication during resuscitation
- **Part 5.5: The Primary Survey Revisited**
 - Sub Part 5.5.1: The primary survey sequence in orthopaedic trauma
 - Sub Part 5.5.2: Integrating orthopaedic assessment within the primary survey
 - Sub Part 5.5.3: Transition from primary survey to definitive orthopaedic care



Introduction

In the last Series, we established clinic and theatre-based evaluation and treatment. We now conclude this course with **case presentation**, both the comprehensive long case and the focused short case format, and the genuine **art of resuscitation**, revisiting the primary survey specifically within the context of orthopaedic trauma, integrating the practical clinical skills established throughout this course into confident, effective bedside and emergency practice.

The aim of this Series is to equip you with a thorough, practical understanding of the principles of case presentation, the long and short case presentation formats, the art of resuscitation, and the primary survey as applied to orthopaedic trauma.

This Series begins with the **principles of case presentation**, before turning to **the long case presentation**. We then examine **the short case presentation**, followed by **the art of resuscitation**, concluding with **the primary survey revisited**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 5.1:** describe the purpose and audience of case presentation and structure a case presentation
- **SLO 5.2:** recognise and avoid common pitfalls in case presentation
- **SLO 5.3:** describe the components of a long case presentation
- **SLO 5.4:** present history and examination findings in a long case
- **SLO 5.5:** present investigations, diagnosis, and a management plan in a long case
- **SLO 5.6:** describe the components of a short case presentation and perform focused examination technique
- **SLO 5.7:** deliver a concise, structured verbal presentation in a short case
- **SLO 5.8:** describe the general principles of resuscitation and team dynamics during resuscitation
- **SLO 5.9:** describe effective communication during resuscitation, and
- **SLO 5.10:** describe the primary survey sequence in orthopaedic trauma and the transition to definitive orthopaedic care.



5.1 Principles of Case Presentation

5.1.1 purpose and audience of case presentation

Communicating clinical findings clearly to a specific listener

Case presentation serves to communicate a patient's clinical findings, discussed throughout this course, clearly and efficiently to a specific **audience**, whether a senior clinician supervising a bedside teaching session, discussed in relation to clinic evaluation in the previous Series of this course, or colleagues within a multidisciplinary team meeting.

The specific level of detail and technical language appropriate to a given presentation should be tailored to the **audience**, discussed earlier in this Part, and the specific purpose of the presentation, whether formal teaching assessment, clinical handover, or routine team **discussion**.

Fill in the blank: The specific level of detail and technical language appropriate to a given case presentation should be tailored to the audience and the specific purpose of the _____.

5.1.2 structuring a case presentation

A well structured case presentation generally follows a consistent, logical **sequence**, beginning with patient demographics and the presenting complaint, discussed in relation to history taking in an earlier Series of this course, before proceeding through relevant history, examination findings, investigations, and, finally, diagnosis and management plan.

Maintaining this consistent **structure** across every presentation supports both the presenter's own clarity of thought and the listener's ability to follow and critically evaluate the clinical **reasoning** being presented, discussed in relation to clinical reasoning principles in an earlier Series of this course.

Fill in the blank: A well structured case presentation generally follows a consistent, logical sequence, beginning with patient demographics and the presenting complaint, before proceeding through relevant history, examination findings, investigations, and, finally, diagnosis and management _____.

5.1.3 common pitfalls in case presentation

Common pitfalls in case presentation include excessive, unstructured **detail**, obscuring the genuinely essential clinical information within extraneous or repetitive material, and premature presentation of a diagnostic conclusion before adequately establishing the supporting history and examination **evidence**.



Further recognised pitfalls include inadequate **preparation**, discussed in relation to structured presentation earlier in this Part, resulting in a disorganised, hesitant delivery, and failure to acknowledge genuine diagnostic uncertainty, discussed in relation to working diagnosis principles in an earlier Series of this course, where it genuinely **exists**.

Fill in the blank: Common pitfalls in case presentation include failure to acknowledge genuine diagnostic uncertainty where it genuinely _____.



Figure 5.1: A student presenting a structured case summary to a supervising clinician at the bedside.

Pilot questions 5.1

- Describe the purpose of case presentation. (Linked to SLO 5.1)
- Explain why the level of detail in a case presentation should be tailored to the audience. (Linked to SLO 5.1)
- Describe the general structure of a well organised case presentation. (Linked to SLO 5.1)
- List two common pitfalls in case presentation. (Linked to SLO 5.2)
- Explain why acknowledging genuine diagnostic uncertainty is important in case presentation. (Linked to SLO 5.2)



5.2 The Long Case Presentation

5.2.1 components of a long case presentation

A comprehensive account supporting detailed clinical assessment

A **long case presentation** provides a comprehensive account of a patient's presentation, generally following extended, unobserved history taking and examination, discussed in earlier Series of this course, allowing thorough exploration of the patient's condition and its broader context in genuine **depth**.

Components of a long case generally include the full history, discussed in an earlier Series of this course, complete examination findings, discussed in an earlier Series of this course, relevant investigations, discussed in an earlier Series of this course, and a differential diagnosis with proposed management **plan**, discussed further in the next sub-Part.

Fill in the blank: A long case presentation provides a comprehensive account of a patient's presentation, allowing thorough exploration of the patient's condition and its broader context in genuine _____.

5.2.2 presenting history and examination findings in a long case

History should be presented in a clear, chronological **narrative**, discussed in relation to history of present illness structure in an earlier Series of this course, avoiding simply reciting the raw clerking notes verbatim, and instead synthesising the information into a coherent clinical **story**.

Examination findings should be presented **systematically**, discussed in relation to the look, feel, move sequence in an earlier Series of this course, reporting both positive and genuinely relevant negative findings, since the deliberate absence of an expected finding frequently carries meaningful diagnostic **significance**.

Fill in the blank: Examination findings should be presented systematically, reporting both positive and genuinely relevant negative findings, since the deliberate absence of an expected finding frequently carries meaningful diagnostic _____.

5.2.3 presenting investigations, diagnosis, and management plan in a long case

Investigation findings should be presented with clear indication of their specific relevance to the presenting problem, discussed in relation to correlating findings in an earlier Series of this



course, rather than simply listing every result obtained regardless of its actual clinical **significance**.

The presentation should conclude with a clearly stated **differential diagnosis** and **working diagnosis**, discussed in an earlier Series of this course, together with a proposed management plan directly addressing this diagnosis, demonstrating the presenter's overall clinical reasoning and synthesis of the case as a coherent **whole**.

Fill in the blank: The long case presentation should conclude with a clearly stated differential diagnosis and working diagnosis, together with a proposed management plan demonstrating the presenter's overall clinical reasoning and synthesis of the case as a coherent _____.

Table 5.2: Structure of a long case presentation.

Section	Content	Purpose
History and examination	Full chronological history and systematic examination findings	Establish comprehensive clinical picture
Investigations	Relevant results with clear indication of significance	Support or refine the differential diagnosis
Diagnosis and management	Working diagnosis and proposed management plan	Demonstrate overall clinical reasoning

Pilot questions 5.2

1. Describe the essential components of a long case presentation. (Linked to SLO 5.3)
2. Explain how history should be presented in a long case. (Linked to SLO 5.4)
3. Explain why relevant negative examination findings should be reported. (Linked to SLO 5.4)
4. Describe how investigation findings should be presented in a long case. (Linked to SLO 5.5)
5. Describe how a long case presentation should conclude. (Linked to SLO 5.5)

5.3 The Short Case Presentation

5.3.1 components of a short case presentation



A rapid, targeted assessment of a specific clinical sign

A **short case presentation**, by contrast with the long case discussed earlier in this Series, involves rapid, focused **examination** of a specific clinical sign or region, generally performed under direct observation, without the extended history taking characteristic of the long case format.

The short case format specifically assesses a candidate's practical **examination technique** and ability to rapidly identify and interpret specific clinical signs, discussed throughout an earlier Series of this course, under the time pressure and direct observation characteristic of this assessment **format**.

Fill in the blank: The short case format specifically assesses a candidate's practical examination technique and ability to rapidly identify and interpret specific clinical _____.

5.3.2 focused examination technique in a short case

Focused examination in a short case requires efficient, confident application of the look, feel, move sequence, discussed in an earlier Series of this course, directed specifically at the presenting abnormality, without unnecessary digression into unrelated or overly detailed examination **components**.

Efficient short case technique additionally requires appropriate use of relevant special tests, discussed in an earlier Series of this course, selected specifically based on the initial inspection findings, demonstrating targeted, clinically reasoned examination rather than an unfocused, exhaustive **checklist** approach.

Fill in the blank: Efficient short case technique requires appropriate use of relevant special tests, selected specifically based on initial inspection findings, demonstrating targeted, clinically reasoned examination rather than an unfocused, exhaustive _____ approach.

5.3.3 concise, structured verbal presentation in a short case

The verbal presentation accompanying a short case should be genuinely **concise**, discussed in relation to structured presentation principles earlier in this Series, generally summarising the key positive findings and their most likely clinical interpretation within a brief, focused **summary** rather than a lengthy, comprehensive account.

Effective short case presentation additionally demonstrates the candidate's ability to prioritise the most clinically **significant** findings, discussed in relation to relevant negative findings earlier in



this Series, over less relevant observations, reflecting genuine clinical judgement rather than simple rote description of every observed **finding**.

Fill in the blank: Effective short case presentation demonstrates the candidate's ability to prioritise the most clinically significant findings over less relevant observations, reflecting genuine clinical _____.

Table 5.3: Comparing long case and short case presentation formats.

Feature	Long case	Short case
History taking	Extended, unobserved history taking	Minimal or no history taking
Examination	Complete systematic examination	Rapid, focused examination of a specific sign
Presentation length	Comprehensive, detailed account	Brief, concise summary

Pilot questions 5.3

1. Distinguish a short case presentation from a long case presentation. (Linked to SLO 5.6)
2. Describe what a short case format specifically assesses. (Linked to SLO 5.6)
3. Describe efficient focused examination technique in a short case. (Linked to SLO 5.6)
4. Describe how the verbal presentation of a short case should differ from a long case. (Linked to SLO 5.7)
5. Explain why prioritising the most clinically significant findings reflects genuine clinical judgement in a short case. (Linked to SLO 5.7)

5.4 The Art of Resuscitation

5.4.1 general principles of resuscitation

Systematic, prioritised intervention under time pressure

Resuscitation, discussed in relation to ATLS principles in an earlier Series of this course, requires systematic, prioritised **intervention**, addressing the greatest immediate threat to life



first, and consistent application of a structured **approach** even under the genuine time pressure and stress characteristic of a genuine resuscitation situation.

The **art** of resuscitation lies in the confident, fluid application of these underlying systematic **principles**, discussed throughout this course, adapting to the specific evolving clinical situation, rather than rigidly following a checklist without genuine clinical **judgement** informing its application.

Fill in the blank: The art of resuscitation lies in the confident, fluid application of underlying systematic principles, adapting to the specific evolving clinical situation, rather than rigidly following a checklist without genuine clinical _____.

5.4.2 team dynamics in resuscitation

Effective resuscitation requires clear **team leadership**, discussed in relation to multidisciplinary trauma care in an earlier Series of this course, with a designated team leader coordinating overall assessment and intervention while other team members perform specific assigned **tasks**.

Effective team dynamics additionally require each team member to work confidently within their own defined **role**, discussed earlier in this Part, while maintaining genuine situational awareness of the overall resuscitation progress, supporting a coordinated, rather than chaotic, team **response**.

Fill in the blank: Effective team dynamics require each team member to work confidently within their own defined role while maintaining genuine situational awareness of the overall resuscitation _____.

5.4.3 communication during resuscitation

Closed-loop communication, discussed in relation to team communication principles earlier in this Part, in which an instruction is explicitly acknowledged and its completion confirmed back to the instructing team member, represents an essential communication technique reducing the risk of missed or misunderstood **instructions**.

Effective communication additionally requires clear, calm verbalisation of ongoing findings and actions taken, discussed throughout this Series, supporting genuine shared situational **awareness** across the entire resuscitation team, particularly important given the genuinely high-stress nature of this clinical **setting**.



Fill in the blank: Effective communication during resuscitation requires clear, calm verbalisation of ongoing findings and actions taken, supporting genuine shared situational _____ across the entire team.



Figure 5.4: A resuscitation team with a designated team leader coordinating assessment while other members perform specific assigned tasks.

Pilot questions 5.4

1. Describe the general principles guiding resuscitation. (Linked to SLO 5.8)
2. Explain what is meant by the art of resuscitation. (Linked to SLO 5.8)
3. Describe the role of team leadership in effective resuscitation. (Linked to SLO 5.8)
4. Define closed-loop communication and explain its value. (Linked to SLO 5.9)
5. Explain why clear, calm verbalisation of findings and actions is important during resuscitation. (Linked to SLO 5.9)

5.5 The Primary Survey Revisited

5.5.1 the primary survey sequence in orthopaedic trauma



Applying the familiar ATLS sequence to musculoskeletal trauma

The **primary survey** sequence, discussed in an earlier Series of this course, airway, breathing, circulation, disability, and exposure, applies equally to the orthopaedic trauma patient as to any other injured patient, with musculoskeletal injury assessment specifically integrated at the appropriate point within this sequence.

Significant limb haemorrhage, discussed in relation to circulation assessment in an earlier Series of this course, and suspected pelvic or long bone fracture requiring immediate **stabilisation**, discussed further in the next sub-Part, are specifically addressed during the circulation component of the primary survey, reflecting their potential contribution to haemodynamic **instability**.

Fill in the blank: Significant limb haemorrhage and suspected pelvic or long bone fracture requiring immediate stabilisation are specifically addressed during the circulation component of the primary survey, reflecting their potential contribution to haemodynamic _____.

5.5.2 integrating orthopaedic assessment within the primary survey

Orthopaedic assessment within the primary survey specifically includes rapid assessment for **pelvic instability**, discussed in relation to pelvic fracture in an earlier related course, and gross limb deformity, discussed in relation to fracture assessment in an earlier Series of this course, with provisional splinting or pelvic binding applied where appropriate during this initial assessment **phase**.

This integration reflects the genuine principle that orthopaedic injury, discussed throughout this course, though frequently dramatic in appearance, must be assessed and managed within the broader context of overall patient physiology, discussed in relation to ATLS resuscitation principles in an earlier Series of this course, rather than in clinical **isolation**.

Fill in the blank: This integration reflects the genuine principle that orthopaedic injury must be assessed and managed within the broader context of overall patient physiology, rather than in clinical _____.

5.5.3 transition from primary survey to definitive orthopaedic care

Following completion of the primary survey and initial resuscitation, discussed throughout this Series, and the secondary survey, discussed in an earlier Series of this course, transition to **definitive orthopaedic care** requires clear communication of all identified musculoskeletal injuries and their relative priority, discussed in relation to injury outlining in an earlier Series of this course.



This transition represents the practical culmination of the entire clinical process established throughout this course, from history and examination, discussed in earlier Series of this course, through investigation and diagnosis, discussed in an earlier Series of this course, to coordinated, prioritised definitive **management**, reflecting the genuinely integrated nature of comprehensive orthopaedic trauma care.

Fill in the blank: The transition from primary survey to definitive orthopaedic care represents the practical culmination of the entire clinical process, reflecting the genuinely integrated nature of comprehensive orthopaedic trauma _____.

Table 5.5: Integrating orthopaedic assessment within the primary survey.

Primary survey component	Orthopaedic integration	Example action
Circulation	Assess limb haemorrhage and pelvic/long bone fracture	Direct pressure, pelvic binder, provisional splinting
Exposure	Full examination for occult limb or spinal injury	Log-roll and complete limb examination
Secondary survey	Detailed musculoskeletal examination and injury outlining	Prioritise injuries for definitive management planning

Pilot questions 5.5

1. State the primary survey sequence and its relevance to orthopaedic trauma. (Linked to SLO 5.10)
2. Describe why significant limb haemorrhage and suspected pelvic fracture are addressed during the circulation component. (Linked to SLO 5.10)
3. Describe how orthopaedic assessment is integrated within the primary survey. (Linked to SLO 5.10)
4. Explain why orthopaedic injury should not be assessed in clinical isolation. (Linked to SLO 5.10)
5. Describe what is required for effective transition from primary survey to definitive orthopaedic care. (Linked to SLO 5.10)



Series Summary

This final Series examined **case presentation and primary survey resuscitation**, beginning with the **principles of case presentation**, purpose, structure, and common pitfalls, before turning to **the long case presentation**, its comprehensive components, and **the short case presentation**, its focused, rapid format.

We then examined **the art of resuscitation**, general principles, team dynamics, and communication, concluding with **the primary survey revisited**, applying the familiar ATLS sequence specifically within orthopaedic trauma and the transition to definitive care. Having worked through this Series, and indeed this entire course, you should now possess a comprehensive, practically grounded foundation in clinics, theatre, and bedside teaching in orthopaedics, from detailed history taking and physical examination through investigations and diagnosis, clinic and theatre-based evaluation and treatment, to confident case presentation and resuscitation practice addressed throughout ORT 603.

Glossary of Terms

6. **Case presentation:** the structured communication of a patient's clinical findings to a specific audience.
7. **Long case presentation:** a comprehensive case presentation following extended, unobserved history and examination.
8. **Short case presentation:** a rapid, focused case presentation following observed, targeted examination of a specific sign.
9. **Relevant negative finding:** the deliberate absence of an expected clinical finding, carrying diagnostic significance.
10. **Working diagnosis:** the most probable explanation for a presentation based on currently available information.
11. **Resuscitation:** systematic, prioritised intervention addressing immediately life-threatening problems.
12. **Team leadership (resuscitation):** the coordinating role directing overall assessment and intervention during resuscitation.
13. **Closed-loop communication:** a communication technique in which an instruction is explicitly acknowledged and its completion confirmed.
14. **Primary survey:** the rapid ATLS assessment sequence: airway, breathing, circulation, disability, exposure.
15. **Pelvic binder:** a device applying circumferential compression to stabilise a suspected unstable pelvic fracture.



16. **Secondary survey:** a comprehensive head-to-toe evaluation performed once immediate threats to life are controlled.
17. **Definitive care:** the ongoing, prioritised management addressing all identified injuries following initial resuscitation.

Concept Check Questions [Series 5]

Objective questions

- The level of detail in a case presentation should be tailored to the audience and the specific purpose of the _____.
- A well structured case presentation follows a consistent sequence concluding with diagnosis and management _____.
- The short case format specifically assesses a candidate's practical examination technique and ability to rapidly identify and interpret specific clinical _____.
- The art of resuscitation lies in the confident, fluid application of underlying systematic principles, adapting to the specific evolving clinical situation, rather than rigidly following a checklist without genuine clinical _____.
- Significant limb haemorrhage and suspected pelvic fracture are addressed during the circulation component of the primary survey, reflecting their potential contribution to haemodynamic _____.

Short-answer questions

1. List two common pitfalls in case presentation.
2. Describe the essential components of a long case presentation.
3. Distinguish a short case presentation from a long case presentation.
4. Define closed-loop communication and explain its value.
5. Describe how orthopaedic assessment is integrated within the primary survey.

Long-answer questions

6. Discuss the purpose, structure, and common pitfalls of case presentation. (Linked to SLO 5.1, SLO 5.2)
7. Discuss the components and delivery of a long case presentation. (Linked to SLO 5.3, SLO 5.4, SLO 5.5)
8. Discuss the components and delivery of a short case presentation. (Linked to SLO 5.6, SLO 5.7)
9. Discuss the general principles, team dynamics, and communication involved in resuscitation. (Linked to SLO 5.8, SLO 5.9)



10. Discuss the primary survey sequence in orthopaedic trauma and the transition to definitive orthopaedic care. (Linked to SLO 5.10)

Answers to Concept Check Questions [Series 5]

Objective questions

11. Presentation.
12. Plan.
13. Signs.
14. Judgement.
15. Instability.

Short-answer questions

16. Excessive, unstructured detail, and premature presentation of a diagnostic conclusion before establishing supporting evidence.
17. Full history, complete examination findings, relevant investigations, and a differential diagnosis with proposed management plan.
18. A short case involves rapid, focused examination of a specific sign with minimal history taking; a long case involves extended history and complete examination.
19. An instruction is explicitly acknowledged and its completion confirmed back to the instructing team member, reducing the risk of missed instructions.
20. It is specifically addressed during the circulation component (haemorrhage and fracture stabilisation) and exposure component (full examination for occult injury) of the primary survey.

Long-answer questions

21. **Basic response:** Case presentation communicates clinical findings clearly to a specific audience, following a consistent structure from demographics through to management plan.

Value-added response: Common pitfalls include excessive unstructured detail, premature conclusions, and failure to acknowledge genuine diagnostic uncertainty.

22. **Basic response:** A long case presentation comprehensively covers history, examination, investigations, and diagnosis and management, presented as a coherent chronological narrative.



Value-added response: Relevant negative findings and clear indication of investigation significance support a well synthesised, clinically reasoned presentation.

23. **Basic response:** A short case presentation involves rapid, focused examination of a specific clinical sign, assessing practical examination technique under observation.

Value-added response: The accompanying verbal presentation should be concise, prioritising the most clinically significant findings over exhaustive detail.

24. **Basic response:** Resuscitation requires systematic, prioritised intervention and clear team leadership, with each member working confidently within a defined role.

Value-added response: Closed-loop communication and calm, clear verbalisation of findings support coordinated, effective team performance under pressure.

25. **Basic response:** The primary survey sequence applies equally to orthopaedic trauma, with limb haemorrhage and fracture stabilisation integrated at the circulation stage.

Value-added response: Following the primary and secondary survey, clear communication of injury priorities supports effective transition to coordinated definitive orthopaedic care.

Answers to Pilot Questions [Series 5]

Part 5.1

1. To communicate clinical findings clearly and efficiently to a specific audience.
2. Because different audiences and purposes require different levels of technical detail and language.
3. Demographics and presenting complaint, then history, examination, investigations, diagnosis, and management.
4. Excessive unstructured detail, and premature presentation of a diagnostic conclusion.
5. Because it reflects honest, accurate clinical reasoning rather than false certainty.



Part 5.2

6. Full history, complete examination findings, relevant investigations, and differential diagnosis with management plan.
7. As a clear, chronological narrative synthesising the information rather than reciting raw notes.
8. Because their deliberate absence frequently carries meaningful diagnostic significance.
9. With clear indication of their specific relevance to the presenting problem, not simply listed exhaustively.
10. With a clearly stated differential and working diagnosis and a proposed management plan.

Part 5.3

11. A short case involves rapid, focused examination with minimal history taking; a long case involves extended history and complete examination.
12. Practical examination technique and the ability to rapidly identify and interpret specific clinical signs.
13. Efficient, confident application of the look, feel, move sequence directed at the presenting abnormality, with relevant special tests.
14. It should be genuinely concise, summarising key findings and interpretation rather than a comprehensive account.
15. Because it demonstrates the ability to distinguish important from unimportant findings, reflecting genuine clinical reasoning.

Part 5.4

1. Systematic, prioritised intervention addressing the greatest immediate threat to life first, applied consistently under time pressure.
2. The confident, fluid application of systematic principles adapted to the evolving situation, rather than rigid, unthinking checklist following.
3. A designated team leader coordinates overall assessment and intervention while others perform assigned tasks.
4. An instruction is explicitly acknowledged and its completion confirmed back; it reduces the risk of missed or misunderstood instructions.
5. Because it supports genuine shared situational awareness across the team in a high-stress setting.



Part 5.5

1. Airway, breathing, circulation, disability, and exposure; it applies equally to orthopaedic trauma patients.
2. Because they can contribute significantly to haemodynamic instability requiring urgent control.
3. Rapid assessment for pelvic instability and gross limb deformity, with provisional splinting or pelvic binding applied where appropriate.
4. Because it must be assessed and managed within the broader context of overall patient physiology.
5. Clear communication of all identified musculoskeletal injuries and their relative priority for coordinated management planning.

References and Attributions [Series 5]

6. Solomon, L., Warwick, D., & Nayagam, S. (2018). Apley and Solomon's System of Orthopaedics and Trauma (10th ed.). CRC Press.
7. American College of Surgeons Committee on Trauma (2018). Advanced Trauma Life Support (ATLS) Student Course Manual (10th ed.).
8. Bickley, L. S. (2020). Bates' Guide to Physical Examination and History Taking (13th ed.). Wolters Kluwer.
9. Cooper, N., & Forrest, K. (2020). Essential Clinical Skills: Clinical Reasoning, Decision-Making and Teamworking (2nd ed.). Wiley-Blackwell.

Figures, Plates, Tables, and Boxes

1. Figure 5.1: A student presenting a structured case summary to a supervising clinician at the bedside. AI-generated using the prompt: "A single clean, realistic clinical illustration of a student speaking to a supervising clinician standing beside a hospital bed, both attentive, calm ward teaching setting, natural lighting, no legible text detail, no other panels, respectful depiction, no identifying facial features."
2. Table 5.2: Structure of a long case presentation. AI-generated using the prompt: "Create a clean reference table titled Structure of a Long Case Presentation, listing section, content,



and purpose. Clinical reference table style with outside border, no photographic elements."

3. Table 5.3: Comparing long case and short case presentation formats. AI-generated using the prompt: "Create a clean reference table titled Comparing Long Case and Short Case Presentation Formats, listing feature, long case, and short case. Clinical reference table style with outside border, no photographic elements."
4. Figure 5.4: A resuscitation team with a designated team leader coordinating assessment while other members perform specific assigned tasks. AI-generated using the prompt: "A single clean, realistic clinical illustration of a resuscitation team positioned around a patient trolley in an emergency setting, one figure positioned at the foot of the bed in a coordinating stance while others attend to different tasks, calm but purposeful atmosphere, no identifying facial features, no graphic medical detail, respectful depiction, no other panels."
5. Table 5.5: Integrating orthopaedic assessment within the primary survey. AI-generated using the prompt: "Create a clean clinical reference table titled Integrating Orthopaedic Assessment Within the Primary Survey, listing primary survey component, orthopaedic integration, and example action. Clinical reference table style with outside border, no photographic elements."

