Scope of Knowledge for Orthopaedic Surgery MedEx

The Orthopaedic MedEx consists of 100 Best Answer Questions (BAQs). The duration for this examination is 3 hours. There is no negative marking and the minimum score for each question is ZERO (0). The questions will be based on the SPOT 2022 syllabus/SOK. The distribution of the questions will be as follows:

a. Anatomy: 30 questions

b. Physiology: 20 questions

c. Pathology: 20 questions

d. Principles of Surgery: 20 questions

e. Biomechanics: 10 questions

Overview

This syllabus defines what should be learned prior to entry into a Postgraduate Orthopaedic programme. It contains a list of topics and the competency levels at which they must be understood by the trainee. The syllabus describes three key aspects of what must be learned:

1. Expectations for the level of knowledge and skills that should be attained ***prior*** to entering specialty level training for the conditions, procedures and principles underpinning the practice of orthopaedic surgery in Malaysia.
2. Competencies that must be demonstrated by a trainee applying for entry to the programme in specific procedures identified as essential.
3. Attitudes and values that must be demonstrated by a general orthopaedic surgeon practising in Malaysia.

To guide trainees as they progress through the programme, the syllabus is presented with expected levels of knowledge and skills. The levels of knowledge and skills listed is the minimal that trainees are expected to reach at entry into the programme.

The levels are presented in a table and range from a "Basic" Level 1 to an "Advanced" Level 6. Each level has specific descriptions and definitions on what needs to be learnt or skill to be acquired. The tables are divided based on core topics as listed below:

A. Applied Clinical Sciences (anatomy, physiology, pathology, pharmacology, rehabilitation, other therapeutic modalities)
B. Imaging
C. Biomechanics and Biomaterials
D. Surgical Principles and Equipment
E. Essential Orthopaedic Procedures
F. Additional reading

Throughout training, trainees must acquire a thorough familiarity with each condition or skill in the specialty. This should cover:

- normal anatomy and its variations
- physiology
- pathology/pathophysiology
- biomechanics of the area in question
- epidemiology
- clinical presentation
- investigations
- assessment
- non-operative treatment (medication physical therapy, others)
- operative treatment (common procedures and other relevant procedures)
- appropriate counselling
- recent advances

A: Expected Levels of Clinical Knowledge

LEVEL	Descriptor for Clinical Knowledge	Example: Wound healing
1	**Basic** • Normal anatomy, physiology, pathology • Able to identify signs and symptoms of common conditions as listed in syllabus by taking history and perform physical examination relevant to the condition/affected area • Aware of need for referral	Normal anatomy of the skin Function of the skin Wound healing processes History of wound and associated conditions, examination of wounds Triaging, and prioritisation of management
2	In addition to the above, • Knows of normal biomechanics • Able to interpret history, physical examination findings in pathological conditions • Able to describe the types of conditions and how to investigate them	Factors affecting healing of different types of wounds – patient/general factors (neurovascular, comorbidities nutrition etc), wound/local factors (infection, wound edges) Wound assessment and classification according to pathology ABSI and other investigations to confirm/rule out diagnosis or cause of wound – includes knowing when and how to correctly obtain specimens for culture & sensitivity
3	In addition to the above, • Able to interpret investigations to reliably diagnose and treat specific condition • Able to apply clinical anatomical knowledge to conditions/injuries	Able to interpret ABSI and investigations results then implement a general treatment plan for wound management Able to manage acute wounds
4	In addition to the above, • Able to describe the different types of conditions and comment in general terms about the treatment including relevant rehabilitation modalities • Able to discuss the evidence-based treatment options • Able to recognise complications of the condition or the treatment	Knows the different dressing methods, options and materials which can aid in improved wound healing – types of dressing materials, solutions and techniques (negative pressure wound therapy, silver dressing, saline vs antiseptic solutions, regenerative options)
5	In addition to the above, • Knows of the specifics of diagnosis/condition, sub-types and treatment options • Able to discuss the treatment options and derive an algorithm that is appropriate to follow • Able to treat complications	Detail a holistic treatment plan for the patient which includes rehabilitation, nutrition etc Able to manage chronic non-healing or atypical wounds (e.g.: TB marinum wounds) Able to monitor treatment progress and take appropriate action in event of complication or worsening of the patient's condition
6	**Advanced** In addition to the above, • Keeps up to date with the recent advances • Able to diagnose and treat complex cases	Knows in great detail all surgical and nonsurgical options of treatment of complex wounds (such as large sacral pressure ulcers) Knows the principles of flaps to aid in wound coverage

Applied Clinical Sciences	Expected Knowledge Level
ANATOMY Must know what is normal, its variance and the clinical relevance	
Embryology and developmental anatomy of the musculoskeletal system	1
Structure and function of connective tissue: bone, cartilage, muscle and tendon, synovium, ligament, nerve, intervertebral disc	2
Applied anatomy of the limbs and axial skeleton: bone, muscle and tendon, ligament, vasculature and nerve	2
Surgical approaches to the limbs and axial skeleton	2
Applied anatomy of the thorax and abdomen	2
PHYSIOLOGY Must know the normal body response, control and its clinical relevance particularly in disease conditions or trauma	
Cardiovascular system	2
Respiratory system	2
Nervous system	2
Musculoskeletal system	2
Endocrine system	2
Blood and haematological system	2
Renal system	2
Fluid, Electrolyte & Acid-Base Balance	2
PATHOLOGY Must know mechanisms of damage or injury, body's response, and the clinical relevance/application particularly in disease conditions or trauma	
Cellular injury and tissue response	2
Fluid and hemodynamic derangements and its management	3
Fractures: including healing and its complications *NB: These are general expected knowledge levels, but in some clinical regions, the levels may differ according to the condition/diagnosis*	3
Wound healing and management	2
Muscle, tendon and ligament injury and healing	2
Nerve injury and regeneration	2
Musculoskeletal infections	2
Benign & malignant tumours, (or Neoplasia &) tumour-like conditions of the musculoskeletal system	2
Congenital and inherited musculoskeletal and neuromuscular disorders	1
Degenerative musculoskeletal diseases *NB: These are general expected knowledge levels, but in some clinical regions, the levels may differ according to the condition/diagnosis*	2
Endocrine and metabolic bone disorders affecting the musculoskeletal system, nutritional disorders	1
Haematological disorders involving the musculoskeletal system	1
Heterotopic ossification	1
Immune System	2
Inflammatory musculoskeletal disorders	2
Osteochondritides	1

Applied Clinical Sciences	Expected Knowledge Level
Osteonecrosis	2
Perioperative management of the Orthopaedic patient – including high risk and immunocompromised patients	2
Systemic disorders: respiratory failure, renal failure, Acute Respiratory Distress Syndrome (ARDS), Systemic Inflammatory Response Syndrome (SIRS), Multiple Organ Dysfunction Syndrome (MODS), metabolic response to trauma and injury	2
PHARMACOLOGY Must know the mechanism of action and pharmacokinetics of drugs commonly used in orthopaedics	
Antibiotics and antibiotic resistance	2
Corticosteroids	2
Chemotherapeutic agents	1
Local anaesthetics: with and without adrenaline	2
Neuroleptic agents	1
Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)	3
Opiates and opioids	3
Others: paracetamol, sedatives, anxiolytics	2
REHABILITATION Must know common terms and modalities used in rehabilitation of orthopaedic patients. Must know indications and contraindications as well as the strengths and weaknesses of each modality.	
Occupational therapy	2
Orthotics and Prosthetics	1
Physiotherapy	2
OTHER THERAPEUTIC MODALITIES Must be aware of the principle of use, indication, contraindications, strength & weakness of the modality in question. Not expected to know the inner workings of the equipment.	
Hyperbaric therapy	1
Pain management	2
Palliative care	1
Radiotherapy	1
Regenerative therapy: stem cells, platelet rich plasma (PRP), regenerative agents, tissue engineering	1
Transfusion of blood products	3

B: Expected Levels of Knowledge for Imaging

LEVEL	Descriptor for Knowledge for Imaging	Example: Radiograph
1	**Basic** • Principles of the imaging modality and how it helps with diagnosis • Normal anatomy and its correlation to Imaging	Knows the anatomy of the body part to be radiographed Knows in general how a radiograph is obtained Knows that radiographs are good for visualisation of bone, calcified tissue, and implants, but have some limitations with respect to visualisation of soft tissue (skin, ligaments, nerves etc)
2	In addition to the above, • Knows the indications and contraindications/precautions of use of the imaging modality • Knows how to select the appropriate and basic imaging views or modalities based on patient's history and physical examination findings	Indication for the use of radiograph including identifying fractures, dislocations Contraindication/precaution in women of childbearing age, healthcare workers (repeated exposure), precautions in children Knows that to identify a fracture will need at least 2 views (AP and Lateral) of the affected part and 2 joints (proximal and distal joints)
3	In addition to the above, • Able to interpret imaging findings to reliably diagnose a specific condition	Able to read and identify radiographic features to diagnose fracture, dislocation, degenerative joint disease, deformities, osteomyelitis, benign bone lesions, tumours, thoracic injury etc
4	In addition to the above, • Knows of different/specialised views or imaging techniques to aid in diagnosis	Indication for specialised views and how to obtain them e.g valgus and varus stress views of the knee, Judet views of the pelvis, use of contrast etc Knows of fluoroscopy, computed tomography
5	In addition to the above, • Able to discuss the imaging options in detail • Able to recognise complications of use of the imaging modality and its alternative options	Complications: 1. Radiation exposure injury to healthcare professional and patients – fluoroscopy and CT have more radiation exposure than radiographs. 2. Leakage of dye in angiography – reactions, signs Knows signs and symptoms of radiation exposure
6	**Advanced** In addition to the above, • Able to diagnose and manage complications related to the imaging modality • Keeps up to date with advances in use of imaging	Knows monitoring techniques for radiation exposure Diagnose radiation exposure and knows who to refer to for further action

IMAGING Must be aware of the principle of use, indication, contraindications, strength & weakness of the modality in question. Not expected to know the inner workings of the equipment.	**Expected Knowledge Level**
Bone mineral densitometry	2
Computed Tomography (CT)	1
Magnetic Resonance Imaging (MRI)	1
Musculoskeletal ultrasound	1
Positron Emission Tomography (PET) scan	1
Radiographs	2
Nuclear Medicine Scans - bone scan, tagged scans	1

C: Expected Levels of Knowledge for Biomechanics and Biomaterials

LEVEL	Descriptor for Knowledge of Biomechanics and Biomaterials	Example: Biomechanics of patella fracture fixation
1	**Basic** • Normal anatomy, physiology of normal tissue • Knows of common materials used in orthopaedics • Knows the biomechanical properties of normal tissue	Normal anatomy of patellofemoral joint – including muscles and tendons Materials that make K- and cerclage wires and its properties (bioinert, biocompatibility) Biomechanical properties of bone, tendon and muscle
2	In addition to the above, • Knows the biomechanical properties of implants and other biomaterials • Knows the biomechanics of joints, fractures	Knows the biomechanical principles and techniques of TBW Know the kinematics of the knee joint – in particular, of the patellofemoral joint, extensor mechanism Knows the mechanisms of patella fractures
3	In addition to the above, • Able to apply knowledge of biomechanics and biomaterials to treat simple fractures and injuries • Knows the consequences of deviation from normal	Able to recognise types of patella fractures suitable for TBW Recognises a poorly applied TBW
4	In addition to the above, • Able to apply knowledge of biomechanics and biomaterials to treat complex fractures and injuries	Able to recognise that comminuted patella fractures require alternative fixation methods – example cerclage wiring
5	In addition to the above, • Able to identify causes of biomechanical and biomaterial failure post treatment	Able to identify causes of failure of patella fracture fixation – e.g. inappropriate indication, noncompliance to rehabilitation protocols
6	**Advanced** In addition to the above, • Able to use knowledge of biomechanics and biomaterials to address post-treatment failure	Uses knowledge of failure mechanisms and normal biomechanics to manage fixation failure – e.g. reconstruction of knee extensor mechanism

BIOMECHANICS & BIOMATERIALS	Expected Knowledge Level
Musculoskeletal biomechanics	2
Biological materials	2
Materials in orthopaedic implants (e.g. metals, polyethylene, polymethylmethacrylate, fibre wire, biodegradable screws etc)	2
Biomechanics of fracture fixation	2
Bearing materials (tribology) of artificial joints	1

D: Expected Levels of Knowledge for Surgical Principles and Equipment

LEVEL	Descriptor for Knowledge of Surgical Principles and Equipment	Example: Diathermy
1	**Basic** • Knows normal anatomy, physiology and pathology • Knows basic surgical principles and functions of different surgical instruments and equipment	Knows vascular anatomy Knows coagulation pathways, clotting mechanisms Knows diathermy modules – bipolar vs monopolar, coagulation vs cutting – and how to apply to blood vessels only
2	In addition to the above, • Able to describe the indications, contraindications and precautions of use of surgical instruments/equipment • Able to apply surgical principles and/or use surgical equipment safely under supervision	Indications to use bipolar (e.g. hand surgery) vs monopolar (e.g. hip surgery) Caution in patients with cardiac pacemaker
3	In addition to the above, • Able to apply surgical principles and/or use surgical equipment safely independently • Knows how to avoid complications of use	Positioning of patient – avoid touching grounded metal objects Placement of return pad on muscular areas of the body close to operative site Avoid using in vicinity of flammable substances e.g. alcohol skin preparations Not to apply on skin to avoid burn wounds
4	In addition to the above, • Able to recognise common complications related to misuse or errors in use of equipment and instruments and managing with assistance	Recognises diathermy burn wounds to skin edges, needs assistance and guidance to excise lesion and treat the wound appropriately
5	In addition to the above, • Able to supervise and guide juniors on the correct/appropriate use of surgical principles, equipment and instruments. • Knows of and able to use alternatives to conventional devices • Able to independently recognise and treat common complications related to misuse or errors in use of equipment and instruments.	Use of Gelfoam® to aid in coagulation Recognises diathermy burn wounds to skin edges, able to excise lesion and treat the wound appropriately independently
6	**Advanced** In addition to the above, • Able to recognise and treat serious complications related to misuse or errors in use of equipment and instruments.	Effect of diathermy on patients with cardiac pacemakers, and treating dysrhythmias or cardiovascular collapse in these patients as a result of diathermy use Recognising and managing major burn wounds due to use of diathermy in wet conditions

SURGICAL PRINCIPLES AND EQUIPMENT Must be aware of the principle of use, indication, contraindications, safety/precautions to be taken when using, advantages/disadvantages and how to manage complications of accidents/misuse of the modality in question. Not expected to know the inner workings of the equipment.	**Expected Knowledge Level**
Principles of safe surgery and clinical practice	3
Diathermy	2
Neuro-monitoring	1
Skin and skeletal traction	2
Sterilisation	1
Surgical instruments	2
Suture and needles	3
Tourniquet	3
Vascular Doppler	1

E: Expected Levels of Surgical Knowledge and Skills

Surgical knowledge in this section refers to the knowledge needed to perform a particular procedure. The pre-requisite knowledge of the condition/diagnosis is covered in the previous section (Clinical Knowledge). In certain cases, the condition itself poses surgical challenges. For example, in correction of congenital deformity, it will require some detailed knowledge of that deformity so that the surgeon will know how to plan for and address it during surgery. In the second example of neglected DDH for THR, knowing that the femoral neck is more anteverted than normal and the acetabulum is more shallow than normal, will alert the surgeon to account for these during THR. In both instances, the trainee would come to know of these abnormalities when going through the Applied Clinical Sciences and Clinical Knowledge sections of this Syllabus.

LEVEL	Descriptor for Knowledge of Procedure	Example: Carpal Tunnel Release
1	**Basic** • Normal surgical anatomy, physiology, pathology	Anatomy of the carpal tunnel and its contents
2	In addition to the above, knows of • Principles of the surgery/procedure • The most widely used surgical approach	Identifying anatomical landmarks and placement of incision Purpose of transverse carpal ligament release
3	In addition to the above, knows of • The detailed surgical technique • Important structures to avoid • Knows to apply principles to management of patients • Complications of the procedure/management	Application of tourniquet and anaesthesia (local and regional) Knows the steps from incision to closure Structures to avoid: median nerve, recurrent branch of median nerve, superficial and deep palmar arches
4	In addition to the above, knows of • Alternative surgical approaches/techniques • Variation in local anatomy which may lead to potential difficulties – needs to know when to call for assistance • Ways to avoid and manage complications of the procedure	Mini-open, Endoscopic techniques Complications: nerve and tendon injury, infection, poor wound healing, haematoma
5	In addition to the above, knows of • Recent advances related to surgical procedure • The principles for complex and/or revision procedures	Knows causes of recurrent CTS Identify the reasons leading to difficult CTR (e.g scarring around incision site, ESRF with distal AV fistula on the same limb)
6	**Advanced** In addition to the above, knows of • Surgical planning and techniques for complex and/or revision procedures • The evidence for the surgical options and able to decide for or against a procedure tailored to the patient	Knows of the techniques and able to plan how to overcome scarring and fibrosis when performing CTR (e.g. hypothenar fatpad flap, nerve wrapping technique)

In the table for Descriptor for Skills to Perform A Procedure, the levels range from no prior experience expected (Level 1) to able to manage without assistance or supervision (Level 6). Selected procedures are required as part of the entry and/or exit Essential Learning Activities (ELA) and is depicted with the following symbol: α

LEVEL	Descriptor for Skills to Perform Procedure	Example: Carpal Tunnel Release
1	No experience expected	Has observed a CTR
2	Has assisted	Has assisted in CTR
3	Can manage under supervision	Able to carry out parts of the procedure with assistance – skin incision, identifying vital structures Able to come up with a workable postoperative care plan with assistance/supervision
4	Can manage unsupervised but knows when to call for assistance Able to detect common complications.	Able to perform the open CTR independently and unsupervised but knows when to seek help if in difficulty. Able to come up with a workable postoperative care plan without assistance including identifying common complications
5	Able to manage independently including use of alternative surgical approaches and/or techniques. Able to treat common complications.	Able to perform CTR via a mini-incision or endoscopically. Able to manage common complications of CTR – wound breakdown, haematoma
6	Able to manage without assistance including complex/reconstructive surgeries, revisions and its complications	Able to perform revision CTR

Essential Orthopaedic Procedures

Essential Orthopaedic Procedures are those which are considered crucial for surgeons to become skilled in to practice in Malaysia. Trainees must continually improve upon them throughout the entire training programme.

ESSENTIAL ORTHOPAEDIC PROCEDURES	Expected level of	
	K	S
Arthrotomy	2	2
Bone grafting	2	2
Buttress plating	2	2
Closed manipulative reduction and application of full-length cast under sedation – upper and lower limbs	3	3
Early complications following trauma – Review and management of painful swollen extremities post trauma – compartment syndrome, fractures, vascular injury, crush syndrome, fat embolism	3	2
Fixation of peri- and intra-articular fractures	2	2
Fluid management in the injured patient	3	3
Incision & drainage / Toilet & suturing / debridement	3	3
Initial assessment of patient with a possible acute musculoskeletal infection	2	2
Intramedullary nailing of the tibia and femur	2	2
K-wiring techniques	2	2
Lag screw fixation	2	2
Large joint aspiration and injection	2	2
Local anaesthetic use – local blocks – upper and lower limbs	2	2
Local anaesthetic use –regional blocks – upper and lower limbs	2	1
Lower limb amputations – transtibial and transfemoral	2	2
Major traumatic amputations and crush injuries	2	1
Management of acute dislocations with and without fractures	2	2
Management of late fracture complications (general/local)	2	2
Management of implant associated infection	2	2
Management of neurovascular injuries	2	2
Management of open fractures	3	2
Management of pelvic injuries – acute	2	2
Management of pelvic injuries – definitive	2	2
Management of physeal injuries	1	1
Management of septic arthritis	2	2
Management of the polytrauma patient – ETC, DCO	3	2
Plating of long bone fractures	3	2
Sequestrectomy/bone resection in osteomyelitis	1	1
Spinal trauma – Urgent assessment of patient with possible cervical spine injury	2	2
Split skin grafting	3	2
Tension band wiring – patella, olecranon	2	2
Uniaxial external fixation of extremities	3	2
Wide Awake Local Anaesthesia No Tourniquet (WALANT)	1	1

F: Additional reading

The following topics are common conditions encountered in clinical practice and candidates are encouraged to read them for further understanding of pathological disorders.

Respiratory System

Obstructive and restrictive lung diseases

Pulmonary infections

Tumours

Disorders of the upper respiratory tract

Cardiovascular System

Ischaemic heart disease

Heart failure

Valvular heart diseases

Congenital heart diseases

Vascular Disorders

Normal vessels and response to injury

Atherosclerosis

Hypertension

Aneurysms and dissections

Vasculitis

Venous diseases

Gastrointestinal Disorders

Gastritis, ulcers and tumours

Liver and Biliary Tract

Jaundice and hepatitis

Cirrhosis and liver failure

Gallbladder diseases

Pancreas

Endocrine pancreas

Renal System

Manifestations of renal diseases

Glomerular disorders

Diseases of the tubules and the interstitium

Acute and chronic renal failure

Hypertensive renal disease

Diseases of Ageing

Haematopoietic System

Red cell disorders

White cell disorders

Bleeding disorders

Endocrine System

Pituitary

Thyroid

Parathyroid

Pancreas

Adrenal

The Breast

Tumours of the breast

The Male Genitalia

Prostatic disorders

Sexually transmitted diseases