



**MASTER OF MEDICINE  
(ORTHOPAEDIC)  
M. MED (ORTHO) USM  
UNIVERSITI SAINS MALAYSIA**

*Department of Orthopaedics  
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TRAINING CURRICULUM FOR TRAINEES AND SUPERVISORS  
UNIVERSITI SAINS MALAYSIA

-2022-

## **MASTER OF MEDICINE (ORTHOPAEDIC)**

### **1. Aim**

We aim to ensure effective teachings and learning process of the M. Med postgraduate and undergraduate students at the Department of Orthopaedics. A four-year post-graduate training program in Orthopaedic Surgery.

### **2. Background**

The School of Medical Sciences, Universiti Sains Malaysia (USM), was established in 1979 to train undergraduate medical doctors. This evolved into developing post-graduate training in Medicine, which begun in 1987. Presently there are more than fifteen specialty post graduate training programmes being conducted by the School of Medical Sciences, USM.

The orthopaedic unit of Pusat Pengajian Sains Perubatan, Universiti Sains Malaysia was established in Pulau Pinang Hospital in 1981 with the first teaching personnel, Dr Zulmi Wan, who was then sent to Singapore through SLAB program for training. In 1983, the Orthopaedic Department was moved to Kubang Kerian, Kelantan, with Dr. Michael Devas from England was appointed as the first Head of Department. The other lecturers were Dr. Richard Southwood from Australia, Dr. Sudir Kumar (India) and Dr. Abd Wahab Ghani (trainee lecturer). In 1985, Dr. Michael Devas moved to England followed by Dr. Abd Wahab Ghani for further learning and training. The position as the head of the department was taken over by Dr Zulmi Wan and then followed by Dr John Anandhan. This department continued to grow and improved when it started the Orthopaedic Masters Programme in 1991. With this, a new era in Orthopaedic Department with master student's trainee began. In 2003, the orthopaedic Department was managed according to units; Orthopaedic Oncology Unit, Paediatric Unit, Spine Unit and Hand Unit. We introduced the Arthoroplasty Unit in 2006, followed later by the Sport Unit and the Trauma Unit in 2007 and 2018 respectively.

In 2020, there were an estimated 1100 Orthopaedic surgeons in Malaysia, a little more than half of whom served in public hospitals and universities. This gives a ratio of 3.4 Orthopaedic surgeons per 100,000 population, achieving developed nation status. There is still a need, however, for more Orthopaedic surgeons to ensure an evenly distributed coverage of services for the entire country.

Every year approximately 80 trainees are recruited into the specialty. They are placed at 30 accredited training centres throughout the country. They are trained by approximately 200 qualified Orthopaedic trainers out of an eligible 440 Orthopaedic specialists and consultants. Training in Orthopaedics is overseen by the Orthopaedic Specialty Committee or OSC (previously known as Conjoint Board of Orthopaedics - CBO) whose members are representatives from the universities offering postgraduate Orthopaedic training, Ministry of Health (MOH) Malaysia, Academy of Medicine Malaysia (AMM) and the Malaysian Orthopaedic Association (MOA). The majority of trainees are sponsored by the MOH or the universities. A small percentage are self-funded, most of whom are from overseas.

The School of Medical Sciences USM, in collaboration of the Ministry of Health of Malaysia, is one of main training centre for Orthopaedic Surgery.

The Department of Orthopaedics has been a major department in the medical school which provides expert treatment for all aspects of musculoskeletal ailments. There are eight (8) service, teaching and research units. All of our surgeons have specific training and experience in their specialised fields, and each unit is headed by:

- a) Head of Orthopaedic Department: Prof. (Dr.) Amran Ahmed Shokri
- b) Orthopaedic Oncology and Reconstructive Unit : Prof. (Dr.) Wan Faisham Wan Ismail
- c) Paediatric Orthopaedic Unit : Assoc. Prof. (Dr.) Ismail Munajat
- d) Spine and Spinal Cord Rehabilitation Unit : Prof. (Dr.) Mohd Imran Yusof
- e) Upper Limb and Microsurgical Unit: Assoc. Prof. (Dr.) Abdul Nawfar Sadagatullah
- f) Arthroplasty and Adult Joint Reconstructive Unit : Prof. (Dr.) Amran Ahmad Shokri
- g) Sports Traumatology and Arthroscopy Unit: Assoc. Prof. (Dr.) Tg Muzaffar Tg Md Shihabudin
- h) Advanced Trauma, Foot & Ankle Unit : Dr. Mohd Hadizie Din
- i) Orthopaedic Rehabilitation Unit : Dr. Al-Hafiz Ibrahim

We have 3 dedicated orthopaedic wards (4 Selatan = 36 regular beds + 12 additional beds, 4 Utara = 32 regular beds, including 8 isolation beds, and 2 Zamrud = 25 acute beds). That is a total of 105 beds, excluding the common surgical paediatric wards.

### 3. Structure of course (Appendix I)

The training is divided into 2 phases.

- Early Phase (year 1): Basic surgical sciences and Trauma in Orthopaedic Surgery
- Advanced Phase (year 2,3 & 4): Orthopaedic Subspecialty Clinical Rotations (surgical trainee and elective orthopaedic practice).

#### 3.1 Curriculum structure phase I

The curriculum is divided into 2 parts. (Appendix II)

- a. Phase 1 (Early Phase)
- b. Phase 2 (Advance Phase)

Phase	Year	Curriculum and Training	Assessment
I	1	<ul style="list-style-type: none"> <li>- Management of trauma</li> <li>- Basic surgical sciences</li> <li>- Basic principles in orthopaedic surgery</li> <li>- Clinical responsibility at orthopaedic surgical services</li> <li>- Student portfolio</li> </ul>	<ul style="list-style-type: none"> <li>- Continuous supervisor assessment</li> <li>- Formative workplace assessments:               <ul style="list-style-type: none"> <li>▪ <i>Case Based Discussion</i></li> <li>▪ <i>Mini CEX</i></li> <li>▪ <i>Procedure Based Assessment</i></li> </ul> </li> </ul>

### 3.2 Curriculum structure Advance Phase (specialty trainee in orthopaedic surgery)

Phase	Year	Curriculum and Training	Assessment
II	2, 3, and 4	<ul style="list-style-type: none"> <li>- Develop competence in the areas of trauma and elective Orthopaedic practice</li> <li>- Clinical rotations in Orthopaedic Subspecialty</li> <li>- Clinical responsibilities in orthopaedic surgical services</li> <li>- Case reports</li> <li>- Dissertation</li> <li>- Student portfolio</li> </ul>	<ul style="list-style-type: none"> <li>- Continuous supervisor assessment</li> <li>- Formative workplace assessments:               <ul style="list-style-type: none"> <li>▪ <i>Case Based Discussion</i></li> <li>▪ <i>Mini CEX</i></li> <li>▪ <i>Procedure Based Assessment</i></li> </ul> </li> <li>- Annual End of Year Review</li> <li>- End of training examination (Year 4)</li> </ul>



#### **4. Mode of Teaching and Learning**

Various modes will be used to achieve effective learning objectives.

- Notes, articles, references, and audiovisual material will be prepared together with candidates.
- Lectures and seminar will be given in packages to cover the whole syllabus of orthopaedic surgery.
- Candidate will be actively involved in clinical activities including clinics, ward management, preparation, planning and executing operative procedures, post-operative care and on-call duties in orthopaedic surgery.
- Preparation of case reports, a total of 8 case reports.
- Actively participating in academic and research activities.
- Writing up of dissertation. The title must be specific. The length is about 15,000 words.

#### **5. Supervision and progress reports**

The medical school will appoint a qualified orthopaedic surgeon to be a supervisor for each candidate. The supervisor is responsible for the progress report of the candidate.

#### **6. Examination and Assessment**

Assessment during the course is divided into 2 parts

- Continuous assessment
  - Examination (end of training examinations)

##### **6.1 Year 1, 2 and 3 assessments:**

##### **6.1.1 Continuous assessment**

- a. Procedure Based Assessment (PBA)

- b. Mini Clinical Evaluation Exercise (Mini-CEX)
- c. Case-based Discussion (CbD)
- d. Clinical reports

#### 6.1.2 End of Year Review

- a. Trainee Portfolio Review

### 6.2 Year 4 assessment:

#### 6.2.1 Continuous assessment

- a. Procedure Based Assessment (PBA)
- b. Mini Clinical Evaluation Exercise (Mini-CEX)
- c. Case-based Discussion (CbD)
- d. Clinical reports
- e. Dissertation

#### 6.2.2 Exit Examination



Professional examination (End of training assessment) End of year 4

- a. Candidate must pass both components (Theory and Clinical)
- b. Theory: Guided essay/BAQ
- c. Clinical: OSCE / Clinical Viva/ Long Case / Short Case

#### 6.2.3 Repeat examination

Failing the professional examination, the candidate may appear in the examination after 6 months or 1 year upon approval of the University senate.

## 7 Entrance Criteria

- Candidate must hold a recognized medical degree.
- Candidate must have 6 months experience in Orthopaedic surgery after completing the housemanship training.
- Candidates are required to appear for National Selection for Postgraduate Orthopaedic Training (SPOT).

## 8 Exemption

Candidate can be exempted from 1 case report for every local paper presentation and 2 case reports for every international presentation. Candidate can also be exempted from 2 case reports for every publication in national journal and 3 case reports for each publication in an international journal.

## 9. Duration of Training

The minimum duration of training is four (4) years with a maximum of seven (7) years.

## 10. Curriculum and syllabus

Syllabus that will be used is attached (appendix II & III). However, the syllabus will be updated from time to time in view of the progress in this field of specialty.

## 11. Academic and Teaching Staffs

All academic staffs at the School of Medical Sciences will be involved in teaching activities for early and advanced phase

**12. Administrative committee**

The Orthopaedic Department together with Orthopaedic Specialty Committee (OSC) will be responsible in organizing and monitoring the program, preparing teaching schedule and organizing seminars pertaining to the program.

**13. Administration of Examination**

The Medical School will coordinate and execute all examination. The result will be discussed at the Examination Board before approval by the Medical School Board and the Post-graduate University Board

## Appendix I

### Programme Structure

Phase	Year	Curriculum
I	1	<ul style="list-style-type: none"><li>- Basic Surgical Sciences</li><li>- Orthopaedic Trauma Management</li><li>- End of Year review before proceeding to next phase</li></ul>
II	2,3 and 4	<ul style="list-style-type: none"><li>- Continuous supervisor assessment</li><li>- Formative workplace assessments:<ul style="list-style-type: none"><li>▪ <i>Case Based Discussion</i></li><li>▪ <i>Mini CEX</i></li><li>▪ <i>Procedure Based Assessment</i></li></ul></li><li>- Case reports</li><li>- Logbook</li><li>- Dissertation</li><li>- Annual End of Year Review</li><li>- End of training examination</li></ul>

## Appendix II

### **SYLLABUS**

List of topics for Orthopaedic postgraduate training. The competency level expectation is different depending on phase or level of a candidate during the training period.

### **Applied Clinical Sciences**

#### **ANATOMY**

Must know what is normal, its variance and the clinical relevance

Embryology and developmental anatomy of the musculoskeletal system
Structure and function of connective tissue: bone, cartilage, muscle and tendon, synovium, ligament, nerve, intervertebral disc
Applied anatomy of the limbs and axial skeleton: bone, muscle and tendon, ligament, vasculature and nerve
Surgical approaches to the limbs and axial skeleton
Applied anatomy of the thorax and abdomen

#### **PHYSIOLOGY**

Must know the normal body response, control and its clinical relevance particularly in disease conditions or trauma

Cardiovascular system: cardiac cycle, control of blood pressure, myocardial performance, shock, interpretation of ECG, central venous pressure, Valsalva manoeuvre, regulation of coronary blood flow, pulmonary circulation, cardiac muscle
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Respiratory system: mechanism of breathing, lung volumes and capacity, compliance, changes in gaseous composition, gaseous exchange, oxygen delivery and transport, central and peripheral control of respiration
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Nervous system: Resting membrane potential, action potential, synapse and reflexes, pain transmission, nerve repair, motor and sensory system, autonomic nervous system, spinal shock, hypothalamic thermoregulation

Musculoskeletal system: skeletal and smooth muscle, neuromuscular transmission, gait cycle

Endocrine system: Calcium and Vitamin D metabolism, adrenal gland, hypothalamic-pituitary-adrenal axis, regulation of blood glucose level

Blood and haematological system: composition of blood and its components, coagulation pathway, compatibility testing of blood, anaemia

Fluid, electrolyte & acid-base balance: distribution and control of body fluid, osmotic pressure, oncotic pressure, fluid and electrolyte management in the perioperative period, fluid resuscitation, sodium homeostasis, potassium homeostasis, calcium homeostasis

Renal system: physiology of urine formation - glomerular filtration rate, creatinine and renal clearance, endocrine function of the kidney

## **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: inflammation, healing and repair, fat embolism

Fluid and hemodynamic derangements and its management: haemorrhage, haemostasis, thromboembolism, oedema, hyperaemia, congestion, shock, infarction, pulmonary embolism, fluid management in the injured patient ( $\alpha$ ) and in the perioperative period, fluid resuscitation

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*

Wound healing and management

Muscle, tendon and ligament injury and healing
Nerve injury and regeneration
Musculoskeletal infections: infectious agents including tuberculosis, host barriers to infectious agents,
pathogenesis of infectious diseases, diagnosis of infectious diseases, periprosthetic infections
Benign tumours, tumour-like conditions and malignancies of the musculoskeletal system: carcinogenesis and molecular basis of cancer, characteristics of benign and malignant tumours, biology of tumour growth, clinical features and diagnosis of cancer, staging of cancer, principles of cancer treatment
Congenital and inherited musculoskeletal and neuromuscular disorders: mutations, Mendelian disorders, cytogenetic disorders, congenital anomalies, paediatric disorders, diagnosis of genetic disorders, haemophilia
Degenerative musculoskeletal diseases: bones, cartilage, muscles NB: These are general expected knowledge levels, but in some clinical regions, the levels may differ according to the condition/diagnosis
Endocrine and metabolic bone disorders affecting the musculoskeletal system, nutritional disorders
Haematological disorders involving the musculoskeletal system
Heterotopic ossification
Immune system: hypersensitivity reactions, transplant rejections, autoimmune diseases, immunodeficiency disorders, amyloidosis, immunization
Inflammatory musculoskeletal disorders
Osteochondritides
Osteonecrosis

Perioperative management of the orthopaedic patient – including high risk and immunocompromised patients
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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
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## PHARMACOLOGY

Must know the mechanism of action and pharmacokinetics of drugs commonly used in Orthopaedics

Antibiotics and antibiotic resistance: therapeutic and prophylaxis, therapeutic levels, minimal inhibitory concentration (MIC)
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Corticosteroids
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Chemotherapeutic agents
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Local anaesthetics: with and without adrenaline
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Neuroleptic agents
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Nonsteroidal Anti-Inflammatory Drugs (NSAIDs): nonselective NSAIDs, COX2 inhibitors
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Opiates and opioids
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Others: paracetamol, sedatives, anxiolytics
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## 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
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Orthotics and Prosthetics
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Physiotherapy
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### **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
Pain management
Palliative care
Radiotherapy
Regenerative therapy: stem cells, platelet rich plasma (PRP), regenerative agents, tissue engineering
Transfusion of blood products

### **Clinical rotations**

All Orthopaedic trainees undergo a series of rotations throughout their training. Except for Orthopaedic Oncology, the syllabus for the rotations is set out according to patient age and regions. The expected level of knowledge and skills are different, depending on at the start of the rotation, end of rotation, and at the end of training. In some instances, the level expected at the end of training may be higher than that at the end of the rotation

<b>SPINE</b>
C1/ C2 subluxation
Cauda equina syndrome
Conus medullaris syndrome
Hangman fracture
Jefferson fracture
Kyphotic deformities – Scheuermann disease, Ankylosing spondylitis



Metabolic disorders affecting the spine – Osteoporosis and others
Myelopathies – cervical and thoracic
Odontoid fracture
Other causes of low back pain – Sacroiliac (SI) joint, Diffuse Idiopathic Skeletal Hyperostosis (DISH), coccydynia and others
Prolapse Intervertebral Disc (PID)
Radiculopathies
Sacral fractures
Scoliosis (Idiopathic, Neuromuscular, Congenital and others)
Spinal cord injury syndromes
Spine infection – Tuberculosis (TB) and pyogenic
Subaxial fractures and dislocations
Thoracolumbar fractures
Tumour – benign and malignant/metastatic
<b>SHOULDER &amp; ELBOW</b>
Acromioclavicular joint injuries
Adhesive capsulitis (Frozen shoulder)
Calcific tendonitis
Shoulder dislocation and instability
Rotator cuff injuries

<b>WRIST &amp; HAND</b>
Brachial plexus injury
Congenital abnormalities of the upper limb
Dislocation and ligamentous injuries of the upper limb
Fingertip and nailbed injuries
Infections in the hand and upper limb
Inflammatory conditions affecting the hand
Peripheral nerve conditions in the upper limb (injuries, compression and tumours)

Tendinopathies and tendon injuries
Tumours of the hand
Vascular conditions and injuries
<b>PELVIS AND HIP</b>
Pelvic injuries
Acetabulum fracture
Fracture neck of femur
Inflammatory arthropathies
Osteoarthritis
Osteonecrosis of the femoral head
Peri-prosthetic fractures
Peri-prosthetic infections
Femoro-acetabular impingement
Snapping hip
Trochanteric bursitis
<b>KNEE</b>
Bursitis around the joints of the lower limb
Inflammatory arthropathies
Osteoarthritis
Peri-prosthetic fractures
Peri-prosthetic infections
Articular cartilage defects
Avulsion fractures
Ligamentous injuries with/without dislocation
Meniscal injuries
Osgood-Schlatter disease
Patello-femoral disorders

<b>FOOT &amp; ANKLE</b>
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Achilles tendinopathy
Angular deformities
Diabetic limb problems
Dislocations and joint instability
Forefoot deformities
Hallux valgus
Inflammatory arthropathies
In-growing toenail
Lesser toe deformities
Pes planus, pes cavus, congenital talipes equinovarus (CTEV), equinus deformity and other foot deformities
Plantar fasciitis
Syndactyly and polydactyly
<b>PAEDIATRIC</b>
Angular deformities
Arthrogryposis multiplex congenita
Blount's disease
Congenital talipes equinovarus (CTEV)
Constriction band
Development dysplasia of the hip (DDH)
Ehlers-Danlos syndrome
Hand & Foot syndactyly and polydactyly
Klippel-Feil
Lesser toe deformities
Limb length discrepancy
Marfan's syndrome
Neurofibromatosis
Neuromuscular disease
Orthopaedic problems related to cerebral palsy
Orthopaedic problems related to Trisomy 21

Osteogenesis imperfecta
Osteomyelitis
Perthes' disease
Pes planus, pes cavus, equinus deformity and other foot deformities
Proximal femoral focal deficiency (PFFD)
Radial club hand
Short stature
Slipped capital femoral epiphysis (SCFE)
Spina bifida
Tibia / fibula hemimelia

<b>ORTHOPAEDIC ONCOLOGY</b>
Benign soft tissue tumour
Chondrosarcoma
Ewing sarcoma
Giant cell tumour (GCT)
Haematological malignancies
Malignant soft tissue tumour
Metastatic bone tumour
Neural tumours
Osteoblastoma/ osteoid osteoma
Osteochondroma
Osteosarcoma
Other primary bone tumours
Pathological fractures
Tumour-like conditions of the bone

## **MULTIDISCIPLINARY TEAM MANAGEMENT**

Adjunct therapy

Chemotherapy

Palliative care

Radiotherapy

## **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.

Bone mineral densitometry

Computed Tomography (CT)

Magnetic Resonance Imaging (MRI)

Musculoskeletal ultrasound

Positron Emission Tomography (PET) scan

Radiographs

Nuclear Medicine Scans - bone scan, tagged scans

## **BIOMECHANICS & BIOMATERIALS**

Musculoskeletal biomechanics: kinetic and kinematic, biomechanics of musculoskeletal tissues (bone – properties, mechanism of fractures, strain theory on fracture healing; ligament and tendons), biomechanics of natural and artificial joints (spine, hip, knee, hand)

Biological materials: bone, tendon and nerve grafts, bone banking and tissue transplantation, autograft vs allograft vs synthetic

Materials in orthopaedic implants (e.g., metals, polyethylene, polymethylmethacrylate, fibre wire, biodegradable screws etc): characteristics (biocompatibility, bioinert), types of materials, material properties, mechanism of material failure

Biomechanics of fracture fixation: tissue response to implants, plates vs nail, screws, load sharing vs load sparing, Kirschner wires, cerclage wire, tension band principle, lag screw fixation, compression/ buttress/neutralising plate, factors of internal fixation failure, external fixation, biomechanics of Plaster-of-Paris (POP) application

Bearing materials (tribology) of artificial joints

### **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.

Principles of safe surgery and clinical practice: universal precautions, surgical precautions, surgical sitemarking, time out, hand hygiene, surgical site infection prevention, prophylactic antibiotics

Diathermy

Neuro-monitoring

Skin and skeletal traction

Sterilisation

Surgical instruments

Suture and needles

Tourniquet

Vascular Doppler

## **Procedures in Subspecialty Clinical Rotations**

All orthopaedic trainees undergo a series of rotations throughout their training (Upper limb, paediatrics, spine etc). The syllabus for these rotations is set out according to regions to accommodate the various combinations of subspecialty coverage in different hospitals (for example: LLRS may be covered by Trauma or Paediatric Orthopaedic units in different hospital settings). There are various procedures that are not listed here. Please refer to Orthopaedic Surgery Postgraduate Training in Malaysia booklet for full information.