Orthopaedic Curriculum For Residency Training 2019

ASEAN Orthopaedic Association Education Committee

Table of Contents

Message from President (2018-2019)
ASEAN Orthopaedic Association

Dear all Education Committee members

It is indeed our privilege and honour to launch ASEAN Orthopaedic Resident Training Curriculum after five years of successive journey stepped together by members from Singapore, Malaysia, Phillipine, Indonesia, Thailand, Myanmar, Brunei, Vietnam. We must congratulate to all of your untired and enthusiastic efforts and excellency in medical education.

Our fundamental objectives for orthopaedic resident training in the region is determined by acquired standard of clinical competency in patient care, higher standard of ethics and professionalism, meet the expectation by community of respective country, in line with changing concept of current medical education and design based surgical training system, internationalization of our education system. We have tried to focus on basic and advance science, traumatology, spine surgery, hand and micro reconstructive surgery, adult reconstructive surgery, paediatrics, oncology, sport and arthroscopy, shoulder, foot and ankle specialities. This curriculum will be referencing to all member countries' existing program as standardized model as minimal requirement and can be modified or improved based on individual capacity and needs.

We sincerely hope that it will add on credibility and accountability of our training system with which our trained orthopaedic surgeons will have safe and reliable quality as well as can give reputable service in their own clinical setting. We still need to move forward with more engagement on collaborative education and research program, exchange of trainers and trainees, mentorship program and humanitarian aids in national disasters and trauma projects. We all are working hard today for tomorrow generation and shaping the future of our profession.

Our credits should go to Prof Ellewellyn Pasion, honourable general secretary of AOA and Prof LEE Eng Hin as a chair of education committee for their dedicated leadership in the whole journey of this process. I would also like to congratulate and show our appreciation to all members of education committee and contributors for this curriculum.

Finally I would like to say that ASEAN orthopaedic resident common curriculum greatly impact on our strength, unity, solidarity, dignity and capability of our society as well as mile stone of our journey.

Yours' faithfully,

Professor Myint Thaung
President (2018 - 2019)
ASEAN Orthopaedic Association

Message from Secretary General
ASEAN Orthopaedic Association

The idea of coming out with a common curriculum for Orthopaedic training in the ASEAN region was proposed during the first AOA Council Meeting in May 2013, during the presidency of Dr. Dohar Tobing. To prepare for the big task, the AOA Education Committee was formed and the AOA Council unanimously chose Professor Lee Eng Hin to chair the special committee. The AOA National Associations appointed their respective members to the Education Committee, the majority of whom are officers of their respective National Board of Orthopaedics Training programs. The first meeting of the AOA Education Committee was held in 2014. It was decided that they will come out with a curriculum based on the minimum standards that is required of an ASEAN trainee to become a competent orthopaedic surgeon. This will include levels in competency for both knowledge and skills by a resident trainee until the end of his residency. For the next 5 years that followed, 2 meetings per year, countless hours of exchanges through emails, telephone calls of many constructive and collective ideas, and numerous revisions, the final draft was finally approved by everyone in the Education Committee.

I would like to congratulate Professor Lee Eng Hin, for his unselfish, and untiring efforts in leading, challenging and motivating everyone in the Education Committee to this milestone in AOA history. Everyone who participated in this project are duly acknowledged in this booklet. I would also like to thank the Myanmar Orthopaedic Society through the leadership of the current AOA President, Prof Myint Thaung, for the printing of this Orthopaedic Curriculum Booklet.

I am sure this will not be the end but just the beginning of more successful milestones in the AOA, emphasizing what Cooperation and Collaboration among members can do.

This is the real ASEAN SPIRIT!!.

Mabuhay!

Prof Ellewellyn G. Pasion
MD, FACS, FPOA, FPCS
Secretary General, AOA

Message from Chairman
AOA Education Committee

It has been a privilege and honour to be given the opportunity to lead this project to develop a common curriculum for orthopaedic training in the ASEAN region. From the germination of the idea in 2013 by Dr Dohar Tobing, who was then the President of the ASEAN OrthopaedicAssociation and the first meeting of the Education Committee in 2014, it has been a very interesting and educational journey for all of us from the ASEAN member countries who were involved in this very useful and meaningful project.

The many meetings that we had over the years have brought us closer together as we learned about each other's training programs. Acknowledging that there are differences amongst the various ASEAN countries, the Committee made a decision to develop a curriculum based on minimum standards required to be a competent practising orthopaedic surgeon. All the representatives from the ASEAN countries gave freely of their time and participated actively in the drafting of the curriculum. Through constructive dialogue and discussions we were always able to arrive at a consensus on the content as well as the levels of competency for both knowledge and skills required of the graduate at the end of residency training. I hope that this curriculum will form a useful basic template for each ASEAN country to build upon. It is also important to note that the curriculum is a living document which will evolve as orthopaedic practice progresses in each country.

I would like to thank everyone who has contributed to the development of this curriculum. Your selfless dedication and commitment to this important cause is very much appreciated. It would not be possible for me to name everyone here but I would like to specially thank Prof Ellewellyn Pasion, the AOA Secretary General, for his unstinting support and Prof Myint Thaung for taking on the responsibility to publish this document.

Prof Lee Eng Hin
MD, FRCS(C). FRCS(Ed), FRCS(Glas), FAMS
Chairman, AOA Education Committee

ASEAN ORTHOPAEDIC ASSOCIATION

ORTHOPAEDIC CURRICULUM FOR RESIDENCY TRAINING

INTRODUCTION

In November 2013, Dr Dohar Tobing, who was the President of the ASEAN Orthopaedic Association at that time, organized a Seminar on Orthopaedic Education in Yogyakarta to discuss residency training in ASEAN. At this initial meeting the training program in each country was presented by representatives from each ASEAN country. Subsequently the ASEAN Orthopaedic Association established the Education Committee under the chairmanship of Professor Lee Eng Hin to develop a common syllabus/curriculum for all ASEAN countries based on minimum standards required to practice competently as a general orthopaedic surgeon. The main objective of having a common curriculum is to facilitate exchanges of residents and fellows amongst the ASEAN countries to increase their exposure to orthopaedic conditions in the region and improve their breadth and depth of knowledge and skills.

The first meeting of the Education Committee was held in Cebu in November 2014 and the Committee has since met twice a year in May and November. Training programs in the ASEAN countries were discussed and a consensus was reached on the structure and length of the training program for the AOA curriculum. In May 2016, three workgroups were formed under the leadership of Professor David Choon, Dr Dohar Tobing and Professor Lee Eng Hin to develop the detailed curriculum in the following areas:

a) General Orthopaedics/Trauma/Infection/Sports/Pathophysiology/Basic Science
   Lead: David Choon
   Members: Arturo C. Canete, Jean Pierre F. Leung, Apipop Kritsaneephaiboon, Maung Mg Htwe, Sabarul A. Mokhtar

b) Adult Orthopaedics/Spine/Upper Limb/Foot & Ankle/Biomaterials/Biomechanics
   Lead: Dohar Tobing
   Members: Myint Thaung, Peter Lee, Yeo Sing Jin, Kamarul Ariffin Khalid, Khin Mg Myint, Azlina Abbas

c) Pediatrics/Oncology
   Lead: Lee Eng Hin
   Members: Edward HM Wang, Kanyika Chamniprasas, Pornchai Mulpruek, Istan Irmansyah Irsan, Abdul Razak Sulaiman, Wan Faisham Nu'man Wan Ismail

In addition to their contributions as workgroup members, the following individuals made substantial contributions in the following areas:

- Pathophysiology/Basic Science: Vivek Ajit Singh and David Choon
- General Ortho: Wan Faisham Nu'man Wan Ismail and Kamarul Ariffin Khalid
- Trauma: Arturo Cañete and Jean Pierre Leung
- Sports Medicine: Aung Myo Win
- Adult-Hip & Knee: Maung Mg Htwe and Myint Thaung
- Spine: Dohar Tobing
- Upper limb/Hand: Khin Mg Myint
- Foot & Ankle: Inderjeet Singh
- Paediatrics: Lee Eng Hin and Abdul Razak Sulaiman
- Oncology: Edward Wang and Istan Irmansyah Irsan

Special thanks to the Secretary General of AOA, Professor Ellewellyn G. Pasion who attended all the meetings and provided valuable input. Special thanks also go to Mr. Mike Villanueva who provided excellent administrative support for all the meetings and the drafting of the Syllabus.

The Education Committee unanimously agreed that the minimum duration for orthopaedic residency training should be 4 years. It is expected that candidates entering the orthopaedic residency training program would already have undergone basic surgical training. The core curriculum was defined as:

- 12 months of general orthopaedics and trauma
- 6 months of adult reconstructive surgery (including arthroplasty, sports, arthroscopy & foot and ankle)
- 3 months of hand and reconstructive microsurgery
- 3 months of paediatric orthopaedics
- 3 months of musculoskeletal oncology
- 3 months of spinal surgery

In addition to the above, the training program should ensure that the candidate develops good communication skills, professionalism and ethics. The candidate should also be exposed to critical analysis of publications and training on how to undertake research and to present their findings at conferences.

The Curriculum, based on learning objectives and outcomes, provides guidelines for the requisite core knowledge and skills for Orthopaedic Residency Training Programs in ASEAN countries.

After studying the Orthopaedic Training Syllabus from various countries, the Education Committee unanimously agreed to adopt the Philippine Board of Orthopaedics format as a template for the detailed Syllabus. The Committee is grateful to the Philippine Board of Orthopaedics and appreciates the valuable contributions made by our colleagues from the Philippine Board of Orthopaedics, especially Dr J P Leung.

This Syllabus is presented in two parts, capture the clinical knowledge and procedural and surgical skills expected of orthopaedic residents at the end of their training. These two parts consists of:

- Applied Clinical Knowledge, including clinical examination, diagnosis and management, with specific application in the context of general orthopaedics and trauma
- Applied Clinical Skills including core competencies for specific procedures commonly performed in general orthopaedics and trauma

For Applied Clinical Knowledge and Skills, a modified Miller Pyramid was adopted to define the desired levels of competence for each area at the end of training. The modified Miller Pyramid is as follows:

Levels of Knowledge:

A: Demonstrate awareness of
B: Demonstrate adequate knowledge of
C: Demonstrate thorough knowledge of

Levels of Skills:

A: Demonstrate knowledge of
B: Demonstrate ability to assist and/or perform with assistance
C: Demonstrate ability to independently perform

The Education Committee decided that Assessment of the resident's progress in training will be left to individual training programs in the ASEAN countries. Likewise, the Assessment for completion of training and competency to practice orthopaedic

surgery will be based on the individual country's Board of Examination. However, the Education Committee encourages exchanges of examiners amongst the ASEAN countries to expose examiners to the examination processes in different countries and to enable examiners to learn from each other.

CONTENTS:

Applied Clinical Knowledge

The Applied Clinical Knowledge portion contains fundamentals essential both to put in proper perspective the skills and attitudes acquired in training and to set the foundation for future practice as an independent general orthopaedic surgeon. The modified Miller's pyramid for knowledge is presented below and it has three levels of competence with a description for each level. At the final or exit assessment, residents are expected to demonstrate knowledge of the different clinical orthopaedic and trauma conditions at the level of competence indicated for each topic.

LEVELS	CLINICAL KNOWLEDGE Required Learning Outcome	Description
A	Demonstration of awareness	Awareness or knowledge of the facts and relevant clinical information
B	Demonstration of adequate knowledge	Includes above competencies plus **competent** interpretation & analysis of basic & general concepts and principles.
C	Demonstration of thorough knowledge	**Competent application** of the knowledge on the evaluation and management of clinical cases, the complications, preventive measures, and in research activities.

Applied Clinical Skills

The section on Applied Clinical Skills itemizes requisite clinical skills that must be acquired during residency training. Residents must make every effort with the support of their department to experience the scope of each procedure in the list, as practicably possible. The training committee of each department must aspire for their trainees to gain mastery and not just core competence of the essential procedures.

Just like knowledge, Applied Clinical Skills are assessed at three levels of competence, which is a combination of perioperative knowledge and psychomotor skills of the required procedures. A description of the levels of competence is presented below. Not all procedures will require a level C competency as a minimum requirement. The levels in this syllabus are based on minimum requirements but training programs in each ASEAN country can set their own level at or above the recommended level.

SCALE	REQUIRED SKILL / COMPETENCE	DESCRIPTION
A	Demonstrate Knowledge of the Procedure	Demonstrate required perioperative knowledge: relevant surgical information, principles of treatment, indications, techniques, complications
B	Demonstrate ability to assist and/or perform with assistance	Demonstrate ability to do key major parts of the procedure under supervision.
C	Demonstrate ability to independently perform the particular procedure	Demonstrate actual use of the procedure in several cases to develop competency in varied situations.

I. BASIC SCIENCE

1. Musculoskeletal Tissues	
a. Bone	
i. Types	C
ii. Cellular biology	C
iii. Matrix	C
iv. Bone healing	C
v. Bone remodeling	C
vi. Bone Circulation	C
vii. Tissue surrounding bone	C
viii. Types of bone formation 1. Endochondral 2. Intramembranous 3. Appositional	C
ix. Distraction Osteogenesis	C
b. Conditions of Bone Mineralization, bone mineral density and bone viability	
i. Normal Bone Metabolism 1. Calcium 2. Phosphate 3. Parathyroid hormone 4. Vitamin D 5. Calcitonin 6. Other Hormones affecting bone metabolism: Estrogen, Steroids, Thyroid hormone, Growth hormone and Growth factors 7. Interactions: Calcium and Phosphate metabolism 8. Bone aging 9. Bone loss	C
ii. Conditions of Bone Mineralization 1. Hypercalcemia 2. Hypocalcemia 3. In relation to renal function 4. Hypophosphatemia	C

5. Disorders of collagen	
iii. Conditions of Bone Mineral Density 1. Bone mass regulation 2. Osteoporosis 3. Other causes: a. Idiopathic transient osteoporosis of hip b. Osteomalacia c. Scurvy d. Marrow packing disorders e. Osteogenesis Imperfecta f. Lead poisoning 4. Increased Osteodensity a. Osteopetrosis b. Osteopoikilosis c. Paget's disease of bone 5. Conditions of bone viability: a. Osteonecrosis b. Osteochondrosis	C
c. Joints i. Hyaline Cartilage Structure and Function 1. Hyaline cartilage 2. Composition of hyaline cartilage 3. Articular cartilage layers 4. Lubrication and wear mechanism 5. Damage and healing 6. Aging cartilage 7. Cartilage of osteoarthritis 8. Other joint tissue a. Synovium b. Synovial fluid c. Meniscus 9. Non inflammatory arthritis a. Osteoarthritis b. Neuropathic arthropathy c. Hemochromatosis arthropathy d. Hypertrophic osteoarthropathy 10. Inflammatory arthritis a. Rheumatoid arthritis b. Juvenile idiopathic arthritis c. Relapsing polychondritis d. Systemic lupus erythematosus e. Polymyalgia rheumatic f. Seronegative spondyloarthritis g. Ankylosing spondylitis h. Reactive arthritis i. Psoriatic arthropathy j. Enteropathic arthritis k. Crystal deposition arthropathy l. Hemarthrosis 11. Infectious arthritis a. Bacterial b. Fungal	C

c. TB d. Acute rheumatic fever e. Lyme arthritis f. Whipple disease g. Viral arthritis	
d. Neuromuscular and Connective Tissues i. Skeletal Muscles 1. Noncontractile elements 2. Contractile elements 3. Muscle contraction and motor unit 4. Agents affecting impulse transmission 5. Types of contractions 6. Types of muscle fibers 7. Energetics 8. Athletes and training 9. Anabolic steroids and growth hormone 10. Nutrition 11. Muscle injury 12. Delayed-onset muscle soreness (DOMS) 13. Denervation 14. Immobilization ii. Nervous system 1. Spine and spine trauma 2. Organization of nervous system and spinal cord anatomy 3. Injury to nervous system 4. Testing and spinal cord monitoring 5. Nerve repair iii. Connective tissues 1. Skin 2. Tendons 3. Ligaments 4. Intervertebral disc 5. Blood Vessels	C
2. Orthopedic Biology	
a. Cellular and Molecular Biology i. Chromosomes ii. Immunity iii. Genetics	C
b. Infection and Microbiology	
i. Soft Tissue Infection ii. Necrotizing Soft tissue infection iii. Surgical site infection iv. Special soft tissue infection 1. Bite infections 2. Paronychia 3. Septic bursitis 4. Tetanus 5. Fungal infections	C
v. Bone infections 1. Acute osteomyelitis 2. Subacute osteomyelitis 3. Chronic osteomyelitis 4. Peri implant infections 5. Post Traumatic infections 6. Imaging in osteomyelitis	C

7. Empirical treatment 8. Unusual organisms a. Salmonella osteomyelitis b. Pseudomonas osteomyelitis c. Bartonella henselae (cat scratch fever) d. TB osteomyelitis e. Syphilitic osteomyelitis f. Fungal osteomyelitis g. Chronic sclerosing osteomyelitis of Garre h. Chronic regional multifocal osteomyelitis (CRMO)	
c. Joint Infections: septic arthritis	C
d. Musculoskeletal Tuberculosis	C
e. Infectious risks of practice i. HIV infection ii. Hepatitis	C
f. Antibiotics i. Prophylactic treatment ii. Gustilo classification iii. Mechanism of action of antibiotics iv. Antibiotic indications and side effect	C
3. Perioperative and Orthopaedic Medicine	
a. Shock	C
b. Bleeding and hemeostasis	C
c. Perioperative Problems	
i. Cardiac disease	B
ii. Pulmonary complications (Acute Respiratory Distress Syndrome)	B
iii. Fat Embolism Syndrome	C
iv. Thromboembolic disease	C
v. Renal and urologic issues	B
vi. GI motility disorders	B
vii. Hepatic issues	B
viii. CNS	B
ix. Special anesthesia issues:	
1. Obstructive sleep apnea	A
2. Cervical stability	C
3. Malignant hyperthermia	A
x. Wound healing 1. Granulation tissue 2. Diabetes 3. Smoking 4. Glucocorticoids 5. Nutrition	C
4. Other Basic Principles	
a. Imaging and Special Studies	
i. Radiation safety	C
ii. Nuclear medicine	A
iii. Arthrography	B
iv. MRI	B
v. CT scan	B
vi. Ultrasound	B
vii. Measurement of bone density (non-invasive)	B
viii. Vascular Studies	B
b. Electrodiagnostic studies i. Nerve conduction studies ii. Electromyography	B
5. Biomaterials and Biomechanics	
a. Basic concepts	B

i. Definitions ii. Classes of levers and cantilever mechanics iii. Principle qualities iv. Newton's law v. Scalar and vector quantities vi. Free-body analysis vii. Other concepts 1. Work 2. Energy 3. Friction 4. Piezoelectricity	
b. Biomaterials i. Strength of materials ii. Materials and structures iii. Orthopaedic structures 1. Bone 2. Ligaments and tendons 3. Bone tendon interface 4. Articular cartilage 5. Metal Implants 6. Total hip replacement 7. Total knee replacement	B
c. Biomechanics i. Bone ii. Joint 1. Kinesiology 2. Lubrication 3. Friction coefficient 4. Joint reaction force 5. Stability iii. Hip iv. Knee 1. Patellofemoral joint 2. Tibiofemoral joint v. Ankle vi. Foot vii. Shoulder viii. Elbow ix. Wrist x. Hand xi. Spine 1. Spinal stability 2. Functional spinal unit 3. Spinal motion 4. Kinematics	B

II. GENERAL ORTHOPEDICS

Applied Clinical Knowledge	
1. Basic Science • Endocrine and metabolic disorders affecting musculoskeletal system • Musculoskeletal inflammatory disorders (Autoimmune) • Musculoskeletal degenerative disorders • Osteonecrosis • Musculoskeletal infections • Neuromuscular disorders • Hematological disorders involving the musculoskeletal system • Musculoskeletal issues and concerns in pregnancy	
a. Must have knowledge of the epidemiology of common orthopaedic problems	C
b. Must have knowledge of the pathoanatomy and pathophysiology of common musculoskeletal diseases	B
c. Must have knowledge of the cellular and molecular biology of common musculoskeletal diseases.	B
d. Must have knowledge of the principles of management of musculoskeletal disease	A
2. Clinical Assessment	
a. Must be able to take a comprehensive history and perform a complete clinical examination on a patient with musculoskeletal disease and relate effectively and professionally with the patient and family members	C
b. Must be able to make a proper diagnosis and perform further evaluations to confirm the diagnosis based on objective clinical parameters	C
c. Must be able to make appropriate management decisions based on sound orthopaedic principles	C
3. Investigations including imaging and specific test	
a. Must have knowledge of the indications for basic laboratory and radiological investigations	C
b. Must have knowledge of the indications for specific laboratory and radiological test and must have the ability to interpret the corresponding	C
c. Must have the ability to correlate pathology with clinical course.	C
4. Antibiotics in Orthopaedics	
a. Prophylactic antibiotics	C
b. Therapeutic antibiotics	C
c. Antibiotic guidelines (national and local)	C
5. Principles and techniques of general orthopaedic basic surgery	
a. Tourniquet	C
b. Diathermy	C
c. Sterilization	C
d. Surgical instrument	C
e. Suture and needles	C
f. Bone grafts and bone substitutes including allografts	C
g. Wound management	C
h. Surgical drains	C
i. Local block for surgery hand and foot	B
j. Skin and skeletal traction applications	C
k. Incisions and drainage – debridement of infected tissue	C
l. Principle of three point fixation in application of casts	
m. Common lower limb amputation – trans-femoral, trans-tibial, Symes and Ray amputations	C

6. General orthopaedic problems including presentation, radiologic characteristics and natural history, formulating appropriate investigation and management options.	
a. Musculoskeletal infection and principles of treatment	
i. Acute Osteomyelitis	C
ii. Chronic osteomyelitis	C
iii. Septic arthritis	C
iv. Gonococcal arthritis	A
v. Tuberculosis of bones and joints	C
vi. Mycotic infection of bones and joints	A
vii. Necrotising soft tissue infection	C
viii. Gas gangrene	C
ix. Tetanus	B
x. Diabetic foot	C
xi. Bites – human or animal	B
xii. Incision and drainage: debridement of infected tissue	C
xiii. Post-surgical infection	C
xiv. Peri-implant infections	B
xv. Blood transmitted disease (HIV, HBV& HCV, etc.)	B
xvi. Prevention of retroviral transmission	C
b. Endocrine and metabolic disorder	
i. Calcium metabolism and clinical applied	C
ii. Osteoporosis/Osteomalacia	C
i. BMD assessment and principle of osteoporosis treatment	C
ii. Chronic steroid usage	B
iii. Hyperparathyroidism – primary / renal osteodystrophy	B
iv. Gouty arthritis	B
a. Neuromuscular disorders (Contracture – post CVA and head/spinal injury)	B
i. Myositis ossificants and heterotrophic ossification	B
7. Management of acute and chronic pain	
a. Peri-operative pain control - Opioids, regional block and epidural	B
b. Non-steroidal anti-inflammatory agent including COX inhibitors	C
c. Physical and local treatment for chronic pain	B
8. General principles of medical research and application in clinical practice	
a. Evidence based orthopaedics / level of evidence and surgical guidelines	C
b. Medical/Scientific writing	B
c. Critical appraisal of journal articles	C
d. Research ethics	C
e. Personal and professional integrity	C
9. Role of physiotherapy, orthotic and prosthetic and its clinical application	
a. Physiotherapy / rehabilitation	B
b. Occupational therapy	B
c. Prosthetics	B
d. Orthotics	B
10. Fragility Fractures	
a. Background: Epidemiology, Pathophysiology, Fracture cascade, Management Gaps	B
b. Recognition and diagnosis: Risk factors determination, Secondary causes	C

c. Principles of Surgical Management: Timing of surgery, use of special implants for osteoporotic fractures, bone fillers	C
d. Non pharmacologic management	B
e. Pharmacologic management	C
f. Rehabilitation	B
g. Prevention strategies (Nutrition, Lifestyle changes, FLS, Fracture and Fall Prevention)	C
h. Monitoring: Efficacy, complications, subsequent fractures, treatment duration, compliance	C
i. Complications: Atypical fractures (diagnosis & treatment)	C

Applied Clinical Skills	
1. General surgical techniques	
a. Tourniquet application	C
b. Draping and sterility	C
c. Positioning and its rationale	C
2. Incision and drainage/debridement of infected tissue	
a. Arthrotomy	C
b. Debridement in osteomyelitis/sequestrectomy	B
3. Management of ulcers and chronic wounds	B
4. Flaps: principles of wound cover with flaps	B
5. Tendon lengthening/tendon transfer	B
6. Bone graft and technique	
a. Cancellous illiac crest graft	C
b. Vascularised fibula graft	A
c. Allografts and bone substitutes	B
7. General Amputations	
a. Ray amputation in foot	C
b. Foot amputation	B
c. Below knee	C
d. Above knee	C
e. Hip disarticulation	B
8. Muscle biopsy	B
9. Fragility fracture surgical strategies	
a. Use of arthroplasty in osteoporotic hip fractures	B
b. Fixation of fragility fractures- (use of special implants)	B
c. Surgical and medical management of Atypical fractures	B

III. TRAUMA

Applied Clinical Knowledge	
1. Clinical Assessment (Trauma / Polytrauma)	
a. Comprehensive Clinical assessment of the trauma/polytrauma patient (primary and secondary survey) including triage, working within a multidisciplinary trauma team and prioritization of care (ABC's)	C
b. Assessment of open and closed fractures and dislocations, their early and late complications	C
c. Identification of life threatening / limb threatening injuries	C
d. Understanding priorities of treatment	C
e. Special considerations in pregnancy	B
2. Management	
a. Treatment of Fractures and Dislocations	
i. Closed treatment of fractures and dislocations	C
i. Surgical treatment of fractures & dislocations	C
ii. Minimally Invasive surgical approaches	B
iii. Biomechanics of implants and fracture fixation systems in particular the principles of lag screw fixation, plate fixation, bridge plating, buttress plating, external fixation, three point nail fixation and interlocking nail fixation.	C
b. Treatment of other Special Orthopaedic Trauma conditions	
i. Ability to co-manage the overall care of the severely injured, within a multidisciplinary team	B
ii. Ability to manage open fractures	C
iii. Ability to undertake the treatment of pathological fractures	C
iv. Principles of reconstructive surgery for the injured, including treatment of nonunion and mal-union of fractures, bone regeneration, chronic post –traumatic osteomyelitis and delayed treatment of nerve injury; principles of soft tissue	B
v. Management of traumatic amputation of the injured patient	C
vi. The principles of rehabilitation of the injured patient	B

Applied Clinical Skills	
1. Basic Surgical Skills	
a. Incision & Closure of skin and subcutaneous tissue	C
b. Knot Tying	C
c. Homeostasis	C
d. Tissue handling & retraction	C
e. Use of drains	C
2. Clavicle	
a. Non-surgical treatment of closed fractures	C
b. ORIF	B
3. Shoulder	
a. Closed reduction of shoulder dislocation	C
b. Open reduction for shoulder dislocation	C
c. Fixation of acromio-clavicular joint dislocation	B
d. ORIF of proximal humerus fracture	B

4. Humerus	
a. Non-surgical strategies for treatment of humeral shaft fractures	C
b. ORIF for diaphyseal fracture	B
c. ORIF for nonunion of diaphyseal fracture	B
5. Elbow	
a. Closed reduction of dislocation	C
b. Open reduction of dislocation	B
c. ORIF of fracture/dislocation	B
d. ORIF of radial head	B
e. ORIF of supracondylar fractures	B
f. ORIF of intercondylar fractures	B
6. Forearm - Fasciotomy for compartment syndrome	C
7. Fracture of the Distal Radius	
a. Strategies for non-operative management	C
b. External Fixation	C
c. ORIF	C
d. Percutaneous fixation	C
8. Fracture, Shaft of Radius/Ulna	
a. Closed Treatment	C
b. External Fixation	C
c. ORIF	C
d. Percutaneous fixation	B
9. Pelvis	
a. Closed Reduction & External fixation application for fracture/dislocation	C
b. ORIF for fracture/dislocation	A
c. Acetabular fracture ORIF	A
10. Hip	
a. Dislocation	
i. Closed treatment	C
ii. ORIF Femoral Head	A
b. Femoral Neck fracture	
i. Closed reduction Fixation	C
ii. Open reduction and fixation	B
iii. Hemiarthroplasty	C
iv. Total Hip Arthroplasty	B
c. Intertrochanteric fracture	
i. Closed/ORIF	C
ii. Arthroplasty	A
d. Subtrochanteric fracture	
i. Intramedullary fixation	B
ii. Plate fixation	C
11. Femur	
a. Closed shaft fractures	
i. Intramedullary nailing	C
ii. Plate and Screw fixation	C
iii. External Fixation	C
b. Supracondylar Femoral fracture	
i. Distal Femoral Locked Plating Device ORIF	B

ii. Intramedullary Nailing (Retrograde, close or open)	B
12. Knee	
a. Closed reduction of knee dislocation	C
b. ORIF for intra-articular distal femur fracture	B
c. Closed treatment of patella dislocation	C
d. Open treatment of patella dislocation	B
e. ORIF, patella fracture	C
f. ORIF, tibial plateau fracture	B
g. External Fixation, tibial plateau fracture	C
13. Tibia and Fibula	
a. External fixation for diaphyseal fracture	C
b. Intramedullary nailing for diaphyseal fracture	C
c. Manipulation under anesthesia + CASTING for diaphyseal fracture	C
d. Plating, tibial shaft	C
e. Fasciotomy for compartment syndrome	C
14. Tibial Non-Union	
a. Bone transport	A
b. Internal fixation with or without bone grafting	C
15. Ankle fracture dislocation	
a. Manipulation under anesthesia + cast	C
b. ORIF	C
16. Pilon fracture	
a. ORIF	B
b. Initial Ex-Fix Management	C
17. Tendon of Achilles rupture	
a. Open repair	C
b. Percutaneous Technique	A
c. Non-Surgical treatment	C
18. Calcaneus fracture	
a. Nonsurgical treatment	C
b. Manipulation under anesthesia + pins + cast	B
c. ORIF	B
19. Talar/Subtalar/Midtarsal fracture/dislocation	
a. Nonsurgical treatment	C
b. Manipulation under anesthesia + fixation + cast	B
c. ORIF	A
20. Metatarsal/Phalangeal Fracture	
a. Non-surgical management	C
b. Manipulation under anesthesia + fixation + cast	B
c. ORIF	B

IV. ADULT ORTHOPEDICS/HIP & KNEE

Applied Clinical Knowledge	
1. Basic Science	
a. Knowledge of metabolic, degenerative, infectious and neoplastic diseases that affect the musculoskeletal system in the adult	C
b. Knowledge of the pathoanatomic and pathophysiologic response of the musculoskeletal system to the above diseases	C
c. Knowledge of the materials used in joint replacement and their biomechanics related to implant longevity and alignment.	B
d. Knowledge of the materials and design of braces and prosthetic limbs	B
2. Clinical Assessment	
a. The resident must be able to make proper management decisions in adult orthopaedic practice and to refer appropriately for treatment	C
b. The resident must be able to make a rational choice of implants for any particular condition and age of patient with reference to reported studies or established registries.	C
3. Investigations	
a. Knowledge of the indications for plain x-ray, arthrogram, CT scan, MRI and the ability to interpret the images	C
b. Knowledge of the indications for the use of ultrasound and nuclear imaging	C
c. Awareness of the limitations of certain investigations	C
4. Pathophysiology, incidence, types, clinical characteristics, diagnostic features, principles of management and prognosis	
a. Diseases of Joints	
i. Osteoarthritis	C
ii. Rheumatoid arthritis	B
iii. Palindromic rheumatism	A
iv. Neuroarthropathy (Charcot joint)	C
v. Hemophilic arthritis	B
vi. Post Traumatic arthritis	C
vii. Psoriatic arthritis	A
b. Bone and Joint Infections	
i. Acute osteomyelitis	C
ii. Chronic osteomyelitis	C
iii. Suppurative arthritis	C
iv. Gonococcal arthritis	A
v. Reiter's syndrome	A
vi. Tuberculosis of bones and joints	C
vii. Mycotic infection of bones and joints	A
viii. Implant infections	B
c. Osteonecrosis	C

Applied Clinical Skills	
1. Hip	
a. Arthrodesis	A
b. Arthroscopy, diagnostic	A
c. Arthroscopy, therapeutic	A

d. Arthrotomy	C
e. Excision arthroplasty (Girdlestone)	A
f. Primary Total hip replacement	
i. Cemented	B
i. Uncemented	B
ii. Hybrid	B
g. Revision Total hip replacement	A
h. Hemiarthroplasty	C
i. Core decompression	B
j. Vascularized pedicle grafting for osteonecrosis	A
2. Knee	
a. Synovectomy (Arthroscopic or Open)	B
b. Osteotomy, distal femur	A
c. Osteotomy, proximal tibia	B
d. Primary TKR	B
e. Revision TKR	A
f. Knee disarticulation	B
g. Arthrotomy	C

V. SPORTS MEDICINE

Applied Clinical Knowledge	
1. Basic knowledge : Basic Science	
a. Applied anatomy and kinematics	C
b. Injury and healing process of musculoskeletal tissues	C
c. History taking and physical examination	C
d. Evaluation and management of ligamentous and joint injuries	C
e. Principles of arthroscopy	C
2. Hip Joint	
a. Muscle and tendon injuries around the hip	B
b. Intra-articular conditions	B
c. Femoroacetabular impingement	A
3. Knee Joint	
a. Acute dislocation of knee and patella	C
b. Ligamentous injuries and instabilities	
i. Acute	C
ii. Chronic	C
c. Knee Pain	B
d. Meniscus injuries and conditions	B
e. Osteochondral fracture	B
f. Articular cartilage conditions	B
4. Ankle Joint	
a. Fracture and dislocation	C
b. Ligamentous injuries and instabilities	
i. Acute	C
ii. Chronic	A
c. Ankle pain	C
5. Shoulder joint	
a. Fracture and dislocation	C
b. Rotator cuff tendinitis and tears	B
c. Shoulder pain	C
6. Elbow joint	
a. Fracture and dislocation	C
b. Ligamentous injuries and instabilities	B
c. Elbow pain	C

Applied Clinical Skills	
1. Basic Surgical Skills	
a. Open repair of uncomplicated muscle, tendon and ligament injuries	C
b. Synovectomy, Arthroscopic and Open	B
c. Joint debridement	B
2. Hip joint	
a. Hip joint aspiration / injection	C
b. Open repair of injured muscles and tendons around the hip joint	B

c. Femoroacetabular impingement surgery	A
d. Diagnostic hip arthroscopy	B
e. Arthroscopic procedures of hip	A
3. Knee joint	
a. Knee aspiration / injection	C
b. Open repair of injured ligaments and tendons around the knee joints	C
c. Open drainage of knee	C
d. Open ligament reconstructions around the knee	B
e. Diagnostic knee arthroscopy	C
f. Arthroscopic procedures and reconstructions of knee	B
g. ACL reconstruction, all variants	B
h. Arthroscopic retinacular release	B
i. Arthroscopic meniscectomy	B
j. Arthroscopic removal of loose bodies	B
k. Patellar management	A
4. Ankle joint	
a. Arthroscopic procedure of the ankle	A
b. Repair of injured ligaments and tendons	C
c. Repair of Achilles tendon rupture	C
5. Shoulder joint	
a. Shoulder joint, subacromion, Acromioclavicular joint aspiration / injection	C
b. Open repair of ligaments and tendons around shoulder joints	C
c. Open drainage of shoulder	C
d. Open ligament reconstructions around the shoulder	B
e. Diagnostic shoulder arthroscopy	B
f. Arthroscopic procedures and reconstructions of shoulder	A
6. Elbow joint	
a. Elbow joint aspiration / injection	C
b. Open repair of ligaments around elbow joint	B
c. Diagnostic elbow arthroscopy	A
d. Arthroscopic procedures of elbow	A

VI. UPPER LIMB/HAND

Applied Clinical Knowledge	
1. Anatomy	
a. Bones of the hand and upper limb	C
b. Flexor and extensor tendons	C
c. Muscles of the hand and upper limb & compartments	C
d. Brachial plexus and nerve supply of the upper limb	C
e. Vascular system of the upper limb and hand	C
f. Flexor and extensor mechanism of the fingers including interaction between extrinsic and intrinsic mechanism	C
g. Wrist, MCP, PIP, DIP joints and the CMC joint of the thumb	C
2. Trauma	
a. Fingertip/nail bed injuries	C
b. Tendon injury and healing	C
c. Nerve injury and healing	C
d. Bony injury – distal radius fracture, scaphoid fracture, metacarpal fractures, phalangeal fractures, carpal bones dislocation and instabilities	C
e. Compartment syndrome	C
f. Brachial plexus injury	B
g. Principles of Replantation	C
3. Pathological & Inflammatory Conditions	
a. Common hand infections	C
b. Rheumatoid hand	B
c. Tumours of the Hand	C
d. Congenital disorders of hand and upper limb	B
4. Clinical Assessment	
a. History and examination of hand and wrist	C
b. Ability to elicit median, ulnar and radial nerve function and disorders	C
c. Assessment of tendons	C
d. Assessment of distal radioulnar and radiocarpal joints	C
e. Recognition of patterns of presentation of common compressive neuropathies of the upper extremity, including brachial plexus problems	C
f. Assessment of intrinsic and extrinsic motors in digits and recognition of common deformities and deficiencies	C
g. Awareness of cumulative trauma disorders and work-related hand problems	C
h. Ability to examine and assess common rheumatoid hand deformities	B
5. Investigations	
a. Knowledge and interpretation of plain and stress views of the hand and wrist	B
b. The role of MRI, bone scan, arthrography and arthroscopy in the assessment of hand problems	B
6. Treatment	
a. Management of the common stenosing tenosynovitis of the hand and wrist (e.g., trigger finger, de Quervain's)	C
b. Principles of treatment of common flexor and extensor tendon injuries	C
c. Common surgical approaches to the digital flexor and extensor compartments	C
d. Surgical treatment of Dupuytren's contracture	A

e. Splinting techniques and rehabilitation principles	B
f. Management of fingertip injuries	B
g. Surgical approach to digits with particular regard to the restoration of function and prevention of stiffness	B
h. Management of digital amputation	B
i. Injuries of ulnar collateral ligament of thumb	A
j. Dislocations of the carpal bones and carpal instability	B
k. Treatment for intra- articular distal radius fractures and common carpal injuries including scaphoid nonunion	B
l. Treatment of common compressive neuropathy of the upper extremity (cubital tunnel and carpal tunnel)	B
m. Management of common hand infections	C
n. Management of metacarpal and phalangeal fractures	B

Applied Clinical Skills	
1. Trauma: Carpal fracture/dislocation	
a. Manipulation under anesthesia with casting	B
b. Manipulation under anesthesia with percutaneous wires	B
c. ORIF	A
2. Scaphoid fractures	
a. Strategies for non-operative management	B
b. Manipulation under anesthesia with percutaneous wires	A
3. Metacarpal fractures: Strategies for non-operative management	C
4. Phalanges/IPJ/MCP fracture dislocation	
a. Strategies for non-operative management	C
b. Various strategies for management of fingertip injuries	B
5. Infection	
a. Drainage of hand abscess	C
b. Drainage of tendon sheath	B
6. Tendon Repair	
a. Extensor	B
b. Flexor	B
7. Wrist	
a. Carpal tunnel release	C

b. De Quervain's release	B
c. Ganglion cyst excision	C
d. Distal ulna Shortening	B
8. Hand	
a. Excision of cysts	B
b. Trigger finger release	C
c. Trigger thumb release	C

VII. FOOT & ANKLE

Applied Clinical Knowledge	
1. Basic Sciences	
a. Functional Anatomy & Biomechanics of the Foot & Ankle	A
b. Radiological Examination including MRI, CT and Ultrasound	B
c. Structure and Function of Bone & Cartilage	B
a. Structure and Function of Tendon and Ligaments	B
b. Orthotics and Prosthetics	A
2. Assessment	
a. History taking and Physical Examination of Foot & Ankle	B
b. Diagnostic Imaging	B
c. Decision Making	B
3. Management: Conservative and Operative Management	
a. Surgical Approaches to Foot & Ankle	B
b. Hallux Valgus	
i. Conservative Management	C
ii. Operative Management of Hallux Valgus	C
c. Gastrocnemius & Achilles Tendon Tightness and Contracture	
i. Conservative Management	C
ii. Operative Management	C
d. Achilles tendinopathy – Insertional & Non-Insertional	
i. Conservative Management	B
ii. Operative Management – Open debridement and Gastrocnemius release/recession	B
e. Osteoarthritis of Tibio-talar Joint	
i. Conservative Management	C
ii. Operative Management – Tibio-talar Fusion (Open or Arthopscopic & Arthroscopic Debridement)	B
f. Diabetic Foot	
i. Assessment to identify Neuropathic and Non-Neuropathic Ulcers. Conservative Management – Off loading – including Total Contact Cast and other Off-loading devices	
1. Toe Disarticulation and Ray Amputation	C
2. Forefoot, Midfoot & Syme Amputation	C
3. Below Knee (Transtibial) and Above Knee (Transfemoral) Amputation	C
ii. Charcot Foot & Ankle	
1. Diagnosis of Charcot Foot from Sepsis	C
2. Staging of Charcot Foot – Eichenholtz staging	B
3. Conservative Management	C
iii. Management of the Amputee	
1. Prosthetics and Orthotics – including assessment of fitting of prosthetics	A
2. Follow-up of amputees	B

g. Pes Cavus: Conservative Management - Use of Orthotics	B
h. Pes Planus: Conservative - Management Use of Orthotics	B
i. Operative Management of Septic Arthritis	C
a. Ankle Sprains	
a. Conservative Management – Physiotherapy and taping	C
b. Operative Management – Anatomic Repair	B

VIII. SPINE

Applied Clinical Knowledge	
1. Basic Science	
a. Anatomy	
i. Surgical anatomy of the cervical, thoracic and lumbosacral spine	C
ii. Anterior and posterior surgical approaches to the spine at various levels	B
2. Biomechanics	
a. knowledge of the biomechanics of the Global Sagittal Alignment	A
b. Understanding biomechanics of spinal instability as applied to various clinical condition	A
c. Knowledge of the basic biomechanics of spinal instrumentation	A
d. Biomechanics of spinal instability as applied to various clinical condition	B
e. Biomechanics of spinal instrumentation	B
f. Biomaterials	
i. knowledge on materials of spinal screws and rods	B
ii. knowledge on materials of interbody cages	B
3. Investigations	
a. Basic investigations for spine problems such as blood tests, plain X rays, CT scan, MRI, bone scan, PET scan, BMD, EMG-NCV	C
b. Clinical correlation and interpretation of investigations	C
4. Treatment : Non-operative methods for the treatment of spinal pain, sciatica, claudication, spine deformity, instability medication	
a. Analgesics, NSAIDs	C
b. Physical therapy	C
c. Acute and chronic pain management	C
d. Use of orthosis	C
e. Radiotherapy and chemotherapy	B
5. Treatment : Operative knowledge	
a. Indications and treatment principles in acute spinal injury for decompression and/or instrumentation	C
b. Indications and treatment principles in acute herniated lumbar disc, lumbar stenosis, spondylolisthesis	C
c. Indications and treatment principles in spine tuberculosis: anterior debridement, posterior decompression, and instrumentation	C
d. Indications and treatment principles in mild and moderate kyphotic deformity	B
e. Indications and treatment principles in tumours of the spine	B
f. Indications and treatment principles of open and closed biopsy of the spine, lumbar facet injection	B
6. Spine Trauma	
a. Spinal Cord Injury	C
b. Cauda Equina Syndrome	C
c. Conus Medullaris Syndrome	C
d. Cervical subluxation, dislocation	C
e. Thoracic and Lumbar subluxations , dislocations	C
f. Cervical fractures	C
g. Thoracic and Lumbar fractures	C
h. Vertebral fragility fractures	C

7. Spinal Infections	
a. Tuberculous spondylitis	C
b. Pyogenic spondylitis	C
c. Fungal spondylitis	A
d. Disciitis	C
8. Degenerative Disorders	
a. Neck Pain	C
b. Cervical, Thoracic and Lumbar Disc Disease	C
c. Low Back Pain	C
d. Herniated Cervical and Lumbar Disc	C
e. De novo scoliosis	C
f. Ankylosing Spondylitis	C
g. DISH	C
h. OPLL	C
9. Spine Deformity	
a. Idiopathic Scoliosis	C
b. Congenital Scoliosis	B
c. Neuromuscular Scoliosis	B
d. Neurofibromatosis	B
e. Scheurmann's disease	B
f. Early Onset Scoliosis	B
10. Spinal Congenital Anomalies	
a. Congenital Muscular Torticollis	B
b. Klippel-Feil syndrome	A
c. Spine Deformity in Myelodysplasia	A
d. Diastematomyelia	A
e. Early Onset Spondylolisthesis	B
11. Spine Deformity with Skeletal Dysplasia	
a. Achondroplasia	A
b. Spondyloepiphyseal Dysplasia	A
c. Hypochondroplasia	A
d. Diastrophic Dysplasia	A
e. Kniest's Dysplasia	A
f. Larsen syndrome	A
12. Metabolic Disease	
a. Osteoporosis	C
b. Osteomalacia	B
c. Rickets	B
d. Hyperparathyroidism	A
13. Spinal Metastatic Disease	
a. Diagnosis (Classification System)	B
b. Pain Management	B
c. Medical Management	B
d. Radiation Therapy	B
e. Surgical Treatment	B

Applied Clinical Skills: Procedures	
1. General Skills	
a. Anterior cervical procedure	B
b. Anterior thoracic procedure	B
c. Anterior lumbar procedure	B
d. Posterior cervical procedure	B
e. Posterior thoracic and lumbar procedures	B
2. Cervical procedures	
a. Applications of Gardner-Well or Crutchfield tongs	C
b. Closed reduction of cervical fracture, subluxation/dislocation with tongs traction	B
c. Anterior cervical decompression and fusion	B
d. Posterior cervical fusion :	
i. Gallie fusion	B
ii. C1-2 transarticular screw fixation	B
iii. Triple wire fusion	B
iv. Lateral mass screws and rods	B
i. Pedicle screws and rods	A
3. Thoracic procedures	
a. Anterior thoracic procedures with thoracotomy	B
b. Posterior thoracic fusion	B
4. Lumbar procedures	
a. Anterior lumbar fusion with lumbotomy	B
b. Posterior lumbar fusion (PLIF, TLIF)	B
c. Posterior lumbar fusion (posterolateral fusion)	B
d. Lumbar discectomy	B

IX. PEDIATRIC ORTHOPAEDICS

Applied Clinical Knowledge	
1. Basic Science	
a. Knowledge of normal growth and development of a child including developmental milestones, common torsional and angular deformities and effects of puberty	C
b. Knowledge of genetic basis of common orthopaedic disorders (e.g. chromosomal disorders, autosomal dominant and sex-linked disorders, Skeletal Dysplasias) … include specific examples	C
c. Knowledge of the growth of bones, endochondral and intramembranous ossification, normal physeal anatomy and fracture patterns and pathological processes affecting the growth.	C
d. Knowledge of the mechanisms, patterns, assessment, management and potential complications of common paediatric fractures and dislocations	C
e. Knowledge of the neurological processes involved in the production of deformity in neuromuscular disorders (e.g., spina bifida, cerebral palsy, muscular dystrophy)	B
f. Knowledge of the normal gait patterns in the growing child and the assessment of the causes of a limping child	C
2. Clinical Assessment	
a. Able to take a thorough history, examine the child competently and communicate effectively and professionally with the family	C
b. Able to make proper management decisions in pediatric practice and to refer appropriately for treatment	B
3. Investigations	
a. Knowledge of the indications for common imaging modalities such as plain x-ray, arthrogram, ultrasound, nuclear imaging, CT scan, and MRI and the ability to correlate clinically	C
b. Knowledge of basic haematological and biochemical investigations and the ability to correlate clinically.	C
c. Knowledge of limitations of certain investigations in pediatric orthopaedics	B
4. Pathophysiology, incidence, clinical characteristics, diagnostic features, principles of management, potential complications and prognosis of the following:	
a. Congenital Disorders of the Upper Limb	
i. Sprengel's deformity	A
ii. Congenital trigger thumb	B
iii. Polydactyly, syndactyly, camptodactyly, clinodactyly	B
iv. Ankylosis of the elbow, radioulnar synostosis, dislocation of the radial head	A
v. Radial club hand	A
b. The Child's Hip	
i. Developmental Dysplasia of the Hip	C
ii. Perthes Disease	C
iii. Transient Synovitis of the Hip	C
iv. Slipped Capital Femoral Epiphysis	C
v. Septic Arthritis	C
c. Congenital Disorders of the Lower Limb	
i. Leg deformities: torsional and angular deformities (normal vs pathologic)	C

ii.	Limb deficiencies (e.g. proximal femoral focal deficiency, fibular hemimelia)	A
iii.	Leg length discrepancy	C
iv.	Congenital dislocation of the knee	A
v.	Blount's disease	B
d. The Child's Foot		
i.	Clubfoot	C
ii.	Flat feet (flexible and rigid) normal vs pathologic	C
iii.	Pes cavus and cavovarus feet	B
iv.	Vertical talus	A
e. Miscellaneous Congenital Disorders		
i.	Congenital Muscular Torticollis	B
ii.	Constriction Band Syndrome	B
iii.	Arthrogryposis	A
iv.	Marfan's syndrome	A
v.	Ehlers-Danlos syndrome	A
vi.	Trisomy 21 (Down's) syndrome	B
f. Skeletal Dysplasias		
i.	Osteogenesis imperfecta	B
ii.	Achondroplasia and Hypochondroplasia	B
iii.	Hereditary Multiple Exostosis	B
iv.	Multiple epiphyseal dysplasia	B
v.	Osteopetrosis	A
vi.	Spondyloepiphyseal dysplasia	A
vii.	Mucopolysaccharidosis	A
g. Metabolic and Endocrine Disorders		
i.	Rickets (all forms)	B
ii.	Hypophosphatasia	A
iii.	Hypoparathyroidism and Hyperparathyroidism	A
iv.	Hypothyroidism	A
h. Osteochondroses		
i.	Osgood Schlatter's Disease	C
ii.	Kohler's Disease	C
iii.	Sever's Disease	C
iv.	Freiberg's Disease	C
v.	Osteochondritis Dissecans	C
i. Bone Tumours (See Oncology Section)		
j. Infections of Bones and Joints		
i.	Osteomyelits - Acute and Chronic	C
ii.	Acute pyogenic arthritis	C
iii.	Tuberculous arthritis	C
iv.	Arthritis associated with viral disease	B
v.	Fungus infections of joints	B
k. Joint disorders		
i.	Arthritis of childhood	C
ii.	Hemophilic arthropathy	B
iii.	Discoid meniscus	B
iv.	Popliteal cyst	B

v.	Recurrent subluxation/dislocation of the patella	C
l.	Neuromuscular Disorders	
i.	Cerebral palsy	B
ii.	Spina bifida (Meningocoele and Myelomeningcocoele)	B
iii.	Spinal dysraphism	A
iv.	Duchenne Muscular Dystrophy	B
v.	Spinal muscular atrophy	B
vi.	Poliomyelitis	B
vii.	Peroneal muscular atrophy (Charcot-Marie-Tooth Disease)	A
m.	The Child's Spine	
i.	Nonstructural scoliosis	C
ii.	Congenital scoliosis	B
iii.	Congenital kyphosis (Scheurmann's disease)	B
iv.	Atlanto-axial instability	B
v.	Spondylolisthesis	B
vi.	Idiopathic scoliosis (infantile, juvenile and adolescent)	C
vii.	Neuromuscular (paralytic) scoliosis	B
viii.	Scoliosis in neurofibromatosis	B
ix.	Intervertebral disc calcification	B
x.	Discitis	B
xi.	Herniated intervertebral disc	B
xii.	Slipped vertebral apophysis	B
n.	Fractures and Dislocations in Children	
i.	Non-accidental injuries	C
ii.	Acute fractures and dislocations in specific bones and joints of the upper and lower limbs	C
iii.	Fractures involving the physis	C
iv.	Incomplete fractures (buckle and greenstick)	C
v.	Malunited and non-united fractures or dislocations	C
o.	Birth Injuries	
i.	Obstetric brachial plexus injury	B
ii.	Birth fractures	C

Applied Clinical Skills	
1. Manipulation and closed reduction of simple paediatric fractures and application of cast	C
2. Application of skin and skeletal traction	C
3. Closed reduction and percutaneous pinning of fractures	B
4. Open reduction and internal fixation of selected fractures	B
5. Surgical management of osteomyelitis and septic arthritis	C
6. Paediatric Hip	
a. Application of Pavlik harness for DDH	B
b. Arthrography, adductor tenotomy, closed reduction and application of hip spica for CDH and DDH	A
c. Open reduction, varus derotation osteotomy of the femur, pelvic osteotomies for DDH (Salter, Pemberton, Dega, Chiari)	A
d. Trochanteric advancement/epiphysiodedis	A

e. Femoral and/or pelvic osteotomies for Perthes Disease	A
f. Pinning for SCFE	B
g. Femoral osteotomies for SCFE	A
7. Surgery for the Lower Extremities	
a. Serial casting for congenital hyperextension of the knee	A
b. Capsular release and quadriceps lengthening of congenital knee dislocation	A
c. Surgery for congenital/habitual dislocation of the patella	A
d. Surgery for recurrent dislocation of the patella	A
e. Epiphysiodesis for limb length discrepancy	A
f. Limb lengthening procedures	A
g. Synovectomy of joints	A
h. Release of circumferential constricting band	A
8. Paediatric foot	
a. Ponseti management for clubfoot	C
b. Posteromedial release of clubfoot	A
c. Surgical treatment for resistant clubfoot (Dwyer osteotomy, Evans osteotomy, triple arthrodesis, talectomy)	A
d. Triple arthrodesis	A
e. Reconstruction of cavovarus foot	A
f. Reconstruction for adolescent hallux valgus	A
g. Amputation of polydactyly	B
h. Reconstruction of polydactyly	A
i. Release of syndactyly	A
9. Surgery for Neck and the Upper Extremities	
a. Sternomastoid release for congenital muscular torticollis	A
b. Release of congenital trigger thumb	B
c. Amputation and reconstruction for polydactyly	A
d. Release and reconstruction of Syndactyly	A
e. Reconstruction for radial club hand	A
10. Cerebral Palsy and its Sequelae	
a. Soft tissue release (lengthening, recession)	B
b. Open reduction and reconstruction of dislocated hip	A
c. Iliopsoas recession	A
d. Split tendon transfers (tibialis posterior and tibialis anterior)	A
e. Combined one stage correction of spastic dislocated hip	A
f. Subtalar arthrodesis	A
g. Calcaneal osteotomy	A
11. Neuromuscular/Paralytic Disorders	
a. Muscle biopsy	B
b. Soft tissue release	B
c. Tendon transfers	A
d. Osteotomies for deformities (e.g. genu recurvatum)	A
e. Rotational osteotomy of the humerus	A
f. Reconstruction for obstetric brachial plexus injury	A
12. Paediatric Spine	
a. Atlanto-axial fusion	A
b. Bracing for scoliosis	B
c. Surgery for idiopathic scoliosis	A

d. Surgery for neuromuscular and congenital scoliosis	A
13. Fractures and Dislocations in Children	
a. Closed reduction and percutaneous pinning of supracondylar fracture	C
b. Closed/Open reduction of Monteggia fracture	B
c. Closed reduction of forearm and wrist fractures	C
d. Closed intramedullary nailing of fractures of the middle third of the forearm	A
e. Open reduction of chronic Monteggia fracture-dislocation	A
f. Closed reduction and percutaneous pinning of lateral condylar fractures	B
g. Open reduction and fixation for neglected elbow fractures (medial or lateral condyle)	A
h. Closed/Open reduction of radial neck fractures	B
i. Open reduction of chronic posterior dislocation of the elbow in children	A
j. Open reduction and internal fixation of displaced medial epicondyle fractures	B
k. Open reduction and internal fixation with bone grafting for nonunion	A
l. Osteotomies for established cubitus valgus secondary to nonunion or growth arrest	A
m. Open reduction and internal fixation of physeal fractures of phalanges and metacarpals	A
n. Osteotomies for cubitus varus	B
o. Closed reduction and casting of fractures of the shaft and proximal end of the humerus	C
p. Percutaneous pinning of fractures of the shaft and proximal end of the humerus	A
q. Closed/Open reduction and fixation of hip fractures	A
r. Spica cast application for femoral shaft fractures	B
s. Flexible intramedullary nail fixation for femoral/tibial fractures	B
t. Closed/open reduction and fixation of fractures of the distal femoral physis	B
u. Open reduction and fixation of tibial tuberosity/spine fracture	A
v. Open reduction and internal fixation of distal tibial and fibular epiphyseal fractures	B
w. Open reduction and internal fixation of triplane fractures	A
x. Open reduction and internal fixation of Tillaux fracture	A
y. Excision of osteochondral fragments of the talus	A
z. Physeal bar resection	A

X. ONCOLOGY

Applied Clinical Knowledge	
1. BasicScience	
a. Epidemiology of common musculoskeletal tumours	C
b. Patho-anatomy and pathophysiology of musculoskeletal tumours and the response of the musculoskeletal system	B
c. Cellular and molecular biology of musculoskeletal tumours	A
d. Tissue and materials used in reconstruction of bone and soft tissue defects after tumour resection.	B
e. Materials and design of braces and prosthetic limbs used after limb amputations for musculoskeletal tumours.	A
2. Clinical Assessment	
a. Perform a complete clinical examination on a patient with a musculoskeletal tumour and to relate effectively and professionally with the patient and family members	C
b. Distinguish between an aggressive and a non-aggressive lesion based on objective clinical parameters	C
c. Make–proper management decisions based on sound orthopaedic oncology principles and to make timely and appropriate consultations with and referrals to allied oncologic subspecialties, e.g. pathology, pediatric oncology, medical oncology, radiation oncology, interventional radiology	B
3. Investigations including imaging and tissue diagnosis	
a. Indications for basic laboratory investigations	C
b. Indications for staging studies, both local and systemic, including the plain x-ray, CT scan, MRI, Total Body Bone Scan (TBBS), PET scan and must have the ability to interpret the corresponding imaging results	C
c. Indications for different types of biopsy, i.e. closed, including core and needle biopsies, and open biopsy	C
d. Correlate pathology with clinical course.	C
4. Common systems of musculoskeletal tumour staging	
a. Enneking Musculoskeletal tumour staging system	
i. Malignant tumours	C
ii. Benign bone tumours (latent, active, aggressive)	C
b. TNM staging system of the American Joint Commission on Cancer	A
5. Principles and techniques of biopsy of musculoskeletal tumours	
a. Pre-biopsy evaluation and strategy	C
b. Principles of biopsy of bone and soft tissue tumours	C
c. Anatomical considerations for biopsy placement	C
d. Techniques of open and closed biopsy	C
e. Principles of frozen section	B
f. Handling and transport of biopsy specimen	C
g. Interpretation of histopathologic findings, including tumour margin and tumour necrosis	C
h. Principles of appropriate immunohistochemical staining for specific tumours	A
6. Primary benign and malignant bone and soft tissue tumours (based on the WHO Classification of Bone & Soft Tissue Tumours), including presentation, radiologic characteristics and natural history, formulating appropriate investigation and management options.	
a. **Bone tumours**	
i. Chondrogenic tumours (Chondroma, chondrosarcoma)	B
ii. Osteogenic tumours (Osteosarcoma)	B

iii. Fibrogenic tumours	B
iv. Fibrohistiocytic tumours	A
v. Ewing sarcoma / Primitive neuroectodermal tumour (PNET)	B
vi. Hematopoietic tumours (Multiple Myeloma/ Lymphoma)	B
vii. Giant cell tumours	B
viii. Notochordal tumours	A
ix. Vascular tumours	A
x. Myogenic, lipogenic, neural and epithelial tumours	A
xi. Tumours of undefined neoplastic nature (ABC/UBC)	B
xii. Congenital and inherited syndromes	A
xiii. Undifferentiated high-grade pleomorphic sarcoma	A
b. **Soft tissue tumours**	
i. Adipocytic tumours	B
ii. Fibroblastic/Myofibroblastic tumours	B
iii. So-called fibrohistiocytic tumours	A
iv. Smooth-muscle tumours	A
v. Pericytic tumours (perivascular)	A
vi. Skeletal-muscle tumours	B
vii. Vascular tumours	B
viii. Chondro-osseous tumours	A
ix. Nerve sheath tumours (neurofibroma/ schwannoma)	B
x. Tumours of uncertain differentiation	A
xi. Undifferentiated / unclassified sarcomas	A
1. Tumours of joints (PVNS; Synovial chondromatosis)	B
2. Metastatic bone tumours (See also Spinal Metastatic Disease)	B
7. Concept of surgical margins	
a. Concept of compartments	B
b. Tumour behavior and margin	B
c. Classification of surgical oncologic margins (Intralesional, Marginal, Wide,	B
d. Surgical margin and local recurrence	B
e. The role of chemotherapy and radiotherapy	B
8. General principles of medical and radiation treatment	
a. **Principles of radiation therapy**	
i. Role of radiation therapy in musculoskeletal tumours	B
ii. Types of radiation therapy	A
iii. Complications and management of complications of radiation therapy	A
b. **Principles of medical management and chemotherapy**	
i. Role of medical management and chemotherapy in	B
ii. Agents commonly used and their mechanisms of action	A
iii. Complications of medical and chemotherapy and their management	A
c. **Concept of counseling for cancer patients**	
i. Breaking the news/ Disclosure	C
ii. Discussion of the stages, options for treatment and prognosis of the disease	C

Applied Clinical Skills	
1. Biopsy of musculoskeletal tumours	
a. Closed core and needle biopsy	C
b. Open biopsy	B
2. Benign soft tissue tumour	
a. Excision biopsy	C
b. Marginal excision of benign soft tissue tumour	C
3. Benign bone tumour	
a. Intralesional curettage	C
b. Extended curettage and adjuvant treatment	B
c. Excision of benign bone tumour	B
4. Soft tissue sarcoma	
a. Wide resection	A
b. Reconstruction of soft tissue defect	A
5. Malignant bone tumour	
a. Wide resection	A
b. Reconstruction of bony defect	A
6. Major amputation in Oncology	
a. Hip disarticulation	B
b. Hindquarter amputation	B
c. Forequarter amputation	B
d. Above knee amputation	B
e. Below knee amputation	B
7. Metastatic bone disease	
a. Nailing	B
b. Plating and cementation	B
c. Endoprosthetic reconstruction	A


EXIT