



**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE**

**Faculty of Medical Sciences  
MD - Orthopedics  
New Syllabus**



**Bharati Vidyapeeth Deemed to be University,  
Pune**

**Faculty of Medical Sciences**

**Curriculum for MS in Orthopedics  
As per Guidelines of  
National Medical Commission**

**NATIONAL MEDICAL COMMISSION  
Postgraduate Medical Education Board**

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**GUIDELINES FOR COMPETENCY  
BASED  
POSTGRADUATE TRAINING  
PROGRAMME FOR MS IN  
ORTHOPEDICS**

# **GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MS IN ORTHOPAEDICS**

## **Preamble**

Competency based training programme in Orthopaedics aims to create postgraduate student who, after undergoing the requisite training, should be able to serve the needs of the community and should be competent to solve the problems pertaining to the speciality of Orthopaedics and Trauma.

A postgraduate undergoing training MS in Orthopaedics should be trained to identify and recognize various congenital, developmental, inflammatory, infective, traumatic, metabolic, neuromuscular, degenerative and oncologic disorders of the musculoskeletal system. She/he should be able to provide competent professional services to trauma and orthopaedic patients at a primary/ secondary/tertiary healthcare centres. The PG should acquire knowledge, skill and attitude to provide healthcare and education to the patients and students.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by subject-content specialists. The Expert Group of the NMC had attempted to render uniformity without compromise to the purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of “domains of learning” under the heading “competencies.

In order to achieve sustainable outcomes, certain competencies are essential to be achieved and assessed that will enable the qualified professional to perform the role in practice as an orthopaedic specialist. These roles would be to perform as a:

1. Clinical Expert
2. Professional
3. Scholar
4. Team Member

## ***SUBJECT SPECIFIC OBJECTIVES***

**The goal of M.S. Orthopaedics is to produce a competent doctor who:**

1. Is aware of contemporary advances & developments in medical sciences as related to Orthopaedics and Trauma.
2. Has acquired the competencies pertaining to the subject that are required to be practiced in the community and at all levels of health system.
3. Recognizes the health needs of the patient and family and carries out professional obligations in keeping with principles of the National Health Policy and professional ethics.
4. Is oriented to principles of research methodology.
5. Has acquired skills in educating medical and paramedical professionals.
6. Has acquired skills in effectively communicating with the person, family and the community.

There is need of competency based learning. Core competencies are the essential knowledge, values and skills vital to the successful performance of effective practice of Orthopaedic and Trauma care on patients. Competence-based training is distinctly different from traditional teaching process. Competence-based training focuses on learning by doing.

Competence in medicine has been defined as “the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and communities being served”. Competence is not an achievement but rather a habit of lifelong learning.

Ideally, the assessment of competence (what the student or physician is able to do) should provide insight into actual performance (what he or she does habitually when not observed), as a well as the capacity to adapt to change, find and generate new knowledge, and improve overall performance. The specific learning objectives based on core competence are common to all specialities. As an example of designing learning objectives in the seven domains of core competence are described below:

1. Professionalism
2. Patient care
3. Medical Knowledge
4. Practice-based learning and improvement
5. Interpersonal and Communication skills
6. Systems-based practice
7. Academic skills

The **Goal** of the MS Orthopedics course is to train a doctor to become a competent teacher, surgeon and researcher in who has acquired competence / skills as given below:

### **1. Professionalism**

- 1.1 Accepts personal responsibility for care of one's patients, consistent with good work ethics and empathy.
- 1.2 Demonstrates appropriate truthfulness and honesty with colleagues.
- 1.3 Recognizes personal beliefs, prejudices, and limitations. His / her personal beliefs and prejudices should not come in the way of providing service.
- 1.5 Respects patient confidentiality at all times in verbal and written communication with others.

### **2. Patient Care**

- 2.1 History of and physical examination
  - 2.1.1 Demonstrates ability to obtain a comprehensive and focused history of illness from patient/relatives.
  - 2.1.2 Demonstrates ability to perform a comprehensive and problem-focused physical examination of the concerned human organ.
- 2.2 Information Management
  - 2.2.1 Demonstrates mastery of the traditional organization of medical data in oral and written presentations.
  - 2.2.2 Demonstrates use and interpretation of diagnostic procedures and data.
  - 2.2.3 Demonstrate ability to use information to produce evidence for the diagnosis and treatment of relevant disease condition/s.
- 2.3 Procedural
  - 2.3.1 Demonstrates mastery of adequate medical record keeping.
  - 2.3.2 Demonstrates knowledge of accessing data and information systems.
  - 2.3.3 Demonstrates the ability to perform a specific set of procedures identified by the faculty.

### **3. Medical Knowledge**

- 3.1 Core Discipline
  - 3.1.1 Competencies unique to the discipline,
  - 3.1.2 Competencies derived from the clinical, pre-clinical and para-clinical disciplines.
- 3.2 Problem Solving
  - 3.2.1 Demonstrates the ability to identify and find information relevant to a clinical problem, using consultation, texts, and the archival literature and electronic media.

- 3.2.2 Demonstrates the ability to generate an initial list of differential diagnoses given a specific chief complaint and patient characteristics.
- 3.2.3 Demonstrates the ability to re-rank the differential diagnoses based on information gathered from the history, physical, and auxiliary studies (investigations).
- 3.2.4 Demonstrates the ability to explain a mechanism for each aspect of a patient's problem, including biological, behavioural, and social aspects.
- 3.2.5 Demonstrates the ability to evaluate scientific / clinical information and critically analyze conflicting data and hypotheses.
- 3.2.6 Demonstrates an ability to counsel a patient providing an option of treatment, conservative or operative.

#### **4. Practice-Based Learning and Improvement**

##### 4.1 Physician Scholar

- 4.1.1 Demonstrates the ability to analyze the quality and implications of medical literature and apply new knowledge in the delivery of health care.
- 4.1.2 Demonstrates an interest and ability to identify future areas of inquiry in medical research.
- 4.1.3 Demonstrates enthusiasm and positive attitude in the educational process and participates fully in educational activities.

#### **5. Interpersonal and Communication Skills**

##### 5.1 Human Relationships

- 5.1.1 Demonstrates knowledge of or appropriate inquiry about family and support systems.
- 5.1.2 Demonstrates an effective system for identifying and addressing ethical, cultural, and spiritual issues associated with health care delivery.
- 5.1.3 Demonstrates knowledge or applies an understanding of psychological, social, and economic factors which are pertinent to the delivery of health care.
- 5.1.4 Accurately assesses a patient's expectations and assumptions in accessing the health care system.
- 5.1.5 Effectively engages the patient and / or family in verbal communications and counselling.

#### **6. System – Based Practice**

##### 6.1 Health Care Management

- 6.1.1 Demonstrates a practical, efficient and cost effective approach to diagnosis and treatment planning and recognizes its social and economic impact.

- 6.1.2 Demonstrates the ability to engage the patient family in diagnosis and therapeutic treatment planning.
- 6.1.3 Demonstrates the ability to recognize and outline initial treatment for patient with life threatening emergencies regardless of aetiology.
- 6.1.4 Demonstrates knowledge of alternative medicine options and understands their role in health care delivery (AYUSH).
- 6.2 Health Service Delivery**
- 6.2.1 Demonstrates knowledge of health care financing and applies it in assisting patient to access the best possible care.
- 6.2.2 Utilizes knowledge of population-based and evidence-based medicine in making patient management decisions.
- 6.2.3 Utilizes knowledge of managed care systems in making patient treatment plans and health care maintenance plans.
- 6.3 Health Care Team approach to health care delivery.**
- 6.3.1 Demonstrates an understanding of the roles and competencies of other health care providers.
- 6.3.2 Demonstrates the ability to engage other health care professionals.
- 6.3.3 Demonstrates the ability to follow and lead in a team approach to health care delivery.
- 7. Academic Skills (Scholarly activity)**
- 7.1 Familiarity with basic research methodology, epidemiology, basic information technology skills.
- 7.2 Planning the protocol of a thesis, its execution and final report.
- 7.3 Skills to review of relevant literature and asking relevant research question with hypothesis development.
- 7.4 Conducting clinical sessions for undergraduate medical students, nurses and paramedical workers.

## ***SUBJECT SPECIFIC COMPETENCIES***

- 1. Predominant in cognitive domain:**



- 1.1. Describe the principles of injury and its mechanism and mode, its clinical presentation, plan appropriate investigations and interpret the results, and institute the management of musculoskeletally injured patient, different forces resulting in fractures, biomechanical principles of fracture fixation.
- 1.2. Identify and describe the surface anatomy and relationship within of the various bones, joints, ligaments, major arteries, veins and nerves of the musculoskeletal system of the spine, upper limb, lower limb and the pelvis, chest, abdomen and head & neck. Identify structural peculiarities of specific bony components and structural speciality of clinical importance during fixation.
- 1.3. Define and describe the pathophysiology of shock (circulatory failure), types of shock and principles of management.
- 1.4. Define and describe, types of respiratory failure, the pathophysiology of respiratory failure and management.
- 1.5. Describe the principles and stages of bone and soft tissue healing, types of bone healing and different intrinsic and extrinsic factors which influence fracture healing.
- 1.6. Understand and describe the metabolic, nutritional, endocrine, and social impact of trauma, critical illness and biomechanical principles involved in each.
- 1.7. Enumerate, classify and describe the various bony/soft tissue injuries affecting the axial and appendicular skeletal system in adults and children.
- 1.8. Describe the principles of internal and external fixation for stabilization of bone and joint injuries.
- 1.9. Describe the mechanism of homeostasis, fibrinolysis and methods to control haemorrhage and rationale for each management.
- 1.10. Describe the physiological coagulation cascade and its abnormalities.
- 1.11. Describe different techniques of pain management as well as recovery of function in specific disease and trauma scenario.
- 1.12. Describe the pharmacokinetics and pharmacodynamics of drug metabolism and excretion of analgesics, anti-inflammatory agents, antibiotics, disease - modifying agents and chemotherapeutic agents and biologicals.
- 1.13. Understand the principles of Early Total Care and Damage Control Orthopaedics and planning of definitive orthopaedic management.

- 1.14. Understand the principles of biostatistics and research methodology.
  - 1.15. Understand the principles of Angiography, CT/MR angiography, Doppler Ultrasound, Sinogram.
  - 1.16. Acquire the ability to order investigations.
2. Describe the clinical presentation, plan investigations, interpret results and institute steps for the management and prevention of the following disease conditions:
    - 2.1. Nutritional deficiency diseases affecting the bones and joints,
    - 2.2. Depositional arthropathies,
    - 2.3. Endocrine abnormalities of the musculoskeletal system,
    - 2.4. Metabolic abnormalities of the musculoskeletal system,
    - 2.5. Congenital anomalies of the musculoskeletal system,
    - 2.6. Developmental skeletal disorder of the musculoskeletal system,
    - 2.7. Bone and soft tissue tumours affecting the musculoskeletal system.
3. Describe the pathogenesis and clinical features of the following conditions in adults and children, plan appropriate investigations, interpret the results and institute appropriate management of:
    - 3.1. Tubercular infections of bone and joints (musculoskeletal system),
    - 3.2. Pyogenic infections of musculoskeletal system,
    - 3.3. Mycotic infections of musculoskeletal system,
    - 3.4. Autoimmune disorders of the musculoskeletal system (HIV),
    - 3.5. Rheumatoid arthropathy, Ankylosing spondylitis, seronegative arthropathy.
      - 3.5.1. Osteoarthritis and spondylosis
4. Describe the pathogenesis and clinical presentation, plan and interpret results of investigations and institute appropriate treatment in the following conditions:
    - 4.1. Post-polio residual paralysis
    - 4.2. Cerebral palsy
    - 4.3. Muscular dystrophies and myopathies
    - 4.4. Nerve injuries
    - 4.5. Entrapment neuropathies
    - 4.6. Spinal dysraphism
    - 4.7. Spinal anomalies.

5. Diagnose musculoskeletal manifestation of AIDS and HIV infection and its management.
6. Describe the aetiopathogenesis and clinical presentation, plan and interpret results of investigations and institute appropriate treatment for the management of osteonecrosis of bones.
7. Identify situations requiring rehabilitation services, prescribe suitable orthotic and prosthetic appliances and act as a member of the team providing rehabilitation care.
8. Identify and manage emergency situation in disorders of the musculoskeletal system.
9. Understand the basics of diagnostic imaging in orthopaedics like how and when to order and how to interpret the results of:
  - 9.1. Plain x-ray
  - 9.2. Ultrasonography
  - 9.3. Computerised axial tomography
  - 9.4. Magnetic resonance imaging
  - 9.5. PET scan
  - 9.6. Radio Isotope bone scan
  - 9.7. Digital Subtraction Angiography (DSA)
  - 9.8. Dual energy x-ray Absorptiometry
  - 9.9. Arthrography.
10. Describe the aetiopathogenesis, clinical presentation, identification, plan investigation/s and institute appropriate treatment for oncologic problems of musculoskeletal system (both benign and malignant: primary and secondary).
11. Understand the basics and principles of biomaterials and orthopaedic metallurgy.
12. Describe the principles of normal and abnormal gait and understand the biomedical principles of posture and replacement surgeries.
13. Describe social, economic, environmental, biological and emotional determinants of health in a given patient with a musculoskeletal problem.
14. Identify a research problem, prepare a research protocol, conduct a study, record observations, analyse data, interpret the results, discuss and disseminate the findings

## **II. Predominant in the Psychomotor domain**

- 1. At the end of the first year of M.S. Orthopaedics programme, the student should be able to:**

- 1.1. Elicit a clinical history from a patient, do a physical examination, document in a case record, order appropriate investigations and make a clinical diagnosis. (Records of all competencies achieved should be documented in log book/E-Portfolio)
- 1.2. Impart wound care, where applicable, including different types of wound, and different chemotherapeutic agents for wound care, including VAC application and its care, and local antibiotic delivery system.
- 1.3. Apply all types of POP casts/slabs, splints and tractions as per need. Learn different types of bandaging.
- 1.4. Identify shock and provide resuscitation.
- 1.5. Perform aspiration of joints and local infiltration of appropriate drugs.
- 1.6. Perform appropriate wound debridement.
- 1.7. Perform arthrotomy of knee joint and also assist in arthrotomy of hip, ankle and shoulder.
- 1.8. Perform incision and drainage of abscess.
- 1.9. Perform split thickness skin grafting.
- 1.10. Perform fasciotomies.
- 1.11. Apply external fixators.
- 1.12. Apply skeletal tractions including skull tongs.
- 1.13. Triage a disaster situation and multiple trauma patients in an emergency room.
- 1.14. Perform on bone models, interfragmentary compression screws, external fixation, Tension band wiring and Broad plating.
- 1.15. Perform closed reduction of common dislocations like shoulder and common fractures like collar fracture, supracondylar fracture.
- 1.16. Perform on a cadaver standard surgical approaches to the musculo-skeletal system.

**2. At the end of the second year of M.S. Orthopaedics course, the student should be able to:**

- 2.1. Take an informed consent for standard orthopaedic procedures.
- 2.2. Perform closed/open biopsies for lesions of bone, joints and soft tissues.
- 2.3. Perform split thickness skin grafting and local flaps.
- 2.4. Perform on bone models, internal fixation with k-wires, screws, plates, Dynamic hip/condylar screws/nailing.
- 2.5. Perform sequestrectomy and saucerisation.
- 2.6. Perform arthrotomy of joints like hip/shoulder, ankle, elbow.
- 2.7. Perform repair of open hand injuries including tendon repair.

- 2.8. Perform arthodesis of small joints.
- 2.9. Perform diagnostic arthroscopy on models and their patients.
- 2.10. Perform carpal tunnel/tarsal tunnel release.
- 2.11. Apply Ilizarov external fixator.
- 2.12. Perform soft tissue releases in contractures, tendon lengthening and correction of deformities.
- 2.13. Perform amputations at different levels.
- 2.14. Perform corrective surgeries for Congenital talipes equino-varus (CTEV), DDH, Perthes/ skeletal dysplasia.
- 2.15. Perform cadaver based procedures, arthroscopy, arthrotomy.

**3. At the end of the third year of M.S. Orthopaedics programme, the student should be able to:**

- 3.1. Assist in the surgical management of poly trauma patient.
- 3.2. Assist in Arthroplasty surgeries of hip, knee, shoulder and the ankle.
- 3.3. Assist in spinal decompressions and spinal stabilizations.
- 3.4. Assist in operative arthroscopy of various joints.
- 3.5. Assist /perform arthrodesis of major joints like hip, knee, shoulder, elbow.
- 3.6. Assist in corrective osteotomies around the hip, pelvis, knee, elbow, finger and toes.
- 3.7. Assist in surgical operations on benign and malignant musculoskeletal tumour including radical excision and custom prosthesis replacement.
- 3.8. Assist in open reduction and internal fixations of complex fractures of acetabulum, pelvis, IPSI lateral floating knee/elbow injuries, shoulder girdle and hand.
- 3.9. Assist in spinal deformity corrections.
- 3.10. Independently perform closed/open reduction and internal fixation with DCP, LCP, intra- medullary nailing, LRS.
- 3.11. Assist in limb lengthening procedures.
- 3.12. Assist in revision surgeries.
- 3.13. Provide pre- and post- OP care. This care should be exercised from first year.
- 3.14. Perform all clinical skills as related to the speciality.

**III. Predominant in Affective Domain:**

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.

- 1.1. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
- 1.2. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

#### **IV. Attitudes including Communication skills and Professionalism**

##### **1. Communication skills: The PG student should:**

- 1.1. Exhibit participation in honest, accurate health related information sharing in a sensitive and suitable manner.
  - 1.2. Recognize that being a good communicator is essential to practice effectively.
  - 1.3. Exhibit effective and sensitive listening skills.
  - 1.4. Recognise the importance and timing of breaking bad news and know how to communicate.
  - 1.5. Exhibit participation in discussion of emotional issues.
  - 1.6. Exhibit leadership in handling complex and advanced communication.
  - 1.7. Recognize the importance of patient confidentiality and the conflict between confidentiality and disclosure.
  - 1.8. Be able to establish rapport in therapeutic bonding with patients, relatives and other stakeholders through appropriate communication.
  - 1.9. Able to obtain comprehensive and relevant history from patients/relatives.
  - 1.10. Able to counsel patients on their condition and needs. Add counselling of diagnosis, prognosis, complications as well as planning for the management.
2. **Team work:** Seek cooperation. Coordination and communication among treating specialties and paramedical staff.
  3. **Counselling of relatives:** regarding patient's condition, seriousness, bereavement and counselling for organ donation in case of brain stem death.
  4. **Leadership:** Trauma prevention, education of the public, paramedical and medical persons.
  5. **Advocacy:** with the government and other agencies towards cause of trauma care.
  6. **Ethics:** The Code of Medical Ethics as proposed by National Medical Commission of India will be learnt and observed.

***SUBJECT SPECIFIC PRACTICE-BASED OR PRACTICAL  
COMPETENCIES***

Name/ Description of practice based competencies	Expected quantum
<p>1. Taking a Clinical History from a patient with appropriate physical exam</p> <ol style="list-style-type: none"> <li>a. Hip-pain, Limp, Deformity, Instability, Both in child and adult</li> <li>b. Knee-pain, Deformity, Instability in child and adult</li> <li>c. Ankle, Foot</li> <li>d. Shoulder</li> <li>e. Elbow</li> <li>f. Wrist</li> <li>g. Head</li> <li>h. Spine</li> </ol>	<p>At least 3 clinical encounters in each region</p>
<p><b>2. In the Bone Skills Lab</b></p> <p><b><u>Basic</u></b></p> <ol style="list-style-type: none"> <li>1. Introduction and tension band wiring</li> <li>2. Lag screw interfragmentary compression</li> <li>3. Broad plating</li> <li>4. Narrow plating</li> <li>5. Ex-Fix</li> <li>6. Cancellous screw fixation</li> <li>7. Umex</li> </ol> <p><b><u>Intermediary</u></b></p> <ol style="list-style-type: none"> <li>1. DHS</li> <li>2. DCS</li> <li>3. Tibia nailing</li> <li>4. Femur nailing</li> <li>5. Tibia condyle</li> <li>6. Elbow</li> <li>7. Ankle</li> </ol> <p><b><u>Advanced:</u></b></p> <ol style="list-style-type: none"> <li>1. Pelvis</li> <li>2. Pubic symphysis</li> <li>3. Acetabulum</li> <li>4. MIPPO</li> <li>5. Hemiarthroplasty</li> <li>6. Spine posterior</li> <li>7. Spine anterior</li> </ol>	<p>Practice at least twice on bone models and record</p>

### **3. On Patients**

#### **i. At the end of the first year of M.S. Orthopaedics programme, the student will be able to perform:**

- a. Wound care - different types of wound, and different chemotherapeutic agents for wound care, including VAC application
- b. POP casts/slabs, splints and tractions as per need. Learning of different types of bandaging.
- c. Identify shock and provide resuscitation
- d. Aspiration of joints and infiltration of appropriate drugs
- e. wound debridement
- f. Arthrotomy of knee joint and assist in arthrotomy of Hip, ankle, shoulder.
- g. Incision and drainage of abscess
- h. Split thickness skin grafting
- i. Fasciotomes
- j. External fixators
- k. Skeletal tractions including skull tongs
- l. Triage a disaster situation and multiple trauma patients in an emergency room
- m. Perform on bone models, interfragmentary compression screws, external fixation, Tension band wiring and Broad plating
- n. Closed reduction of common dislocations like shoulder and common fractures like collar fracture, supracondylar fracture.
- o. Perform on a cadaver standard surgical approaches to the musculo skeletal system.

#### **ii. At the end of the second year of M.S. Orthopaedics course, the student should be able to:**

- a. Perform closed/open biopsies for lesions of bone, joints and soft tissues
- b. Perform split thickness skin grafting and local flaps

As per the clinical volume available in each institution



<ul style="list-style-type: none"> <li>c. Perform on bone models, internal fixation with k-wires, screws, plates. Dynamic hip/condylar screws/nailing.</li> <li>d. Perform sequestrectomy and saucerisation</li> <li>e. Perform arthrotomy of joints like hip/shoulder, ankle, elbow</li> <li>f. Perform repair of open hand injuries including tendon repair</li> <li>g. Perform arthodesis of small joints</li> <li>h. Perform diagnostic arthroscopy on models and their patients</li> <li>i. Perform carpal tunnel/tarsal tunnel release</li> <li>j. Apply ilizarov external fixator</li> <li>k. Perform soft tissue releases in contractures, tendon lengthening and correction of deformities</li> <li>l. Perform amputations at different levels</li> <li>m. Perform corrective surgeries for CTEV, DDH, perthes/ skeletal dysplasia</li> <li>n. Perform cadaver based procedures, Arthroscopy, Arthrotomy.</li> </ul>	<p>As per the clinical volume available in each institution</p>
<p><b>iii. At the end of the third year of M.S. Orthopaedics programme, the student should be able to:</b></p> <ul style="list-style-type: none"> <li>a. Assist in the surgical management of poly trauma patient</li> <li>b. Assist in Arthroplasty surgeries of hip, knee, shoulder and the ankle</li> <li>c. Assist in spinal decompressions and spinal stabilizations</li> <li>d. Assist in operative arthroscopy of various joints</li> <li>e. Assist /perform arthrodesis of major joints like hip, knee, shoulder, elbow</li> <li>f. Assist in corrective osteotomies around the hip, pelvis, knee, elbow, finger and toes</li> <li>g. Assist in surgical operations on benign and malignant musculoskeletal tumour including radical excision and custom prosthesis replacement.</li> <li>h. Assist in open reduction and internal fixations of complex fractures of acetabulum, pelvis, IPSI lateral floating knee/elbow injuries, shoulder girdle and hand</li> <li>i. Assist in spinal deformity corrections</li> </ul>	<p>As per the clinical volume available in each institution</p>

<ul style="list-style-type: none"> <li>j. Independently perform closed/open reduction and internal fixation with DCP, LCP, intra meduallary nailing, LRS</li> <li>k. Assist in limb lengthening procedures</li> <li>l. Assist in Revision surgeries</li> <li>m. Provide pre and post OP care This care should be exercised from first year</li> <li>n. Perform all clinical skills as related to the speciality.</li> </ul>	
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## ***SYLLABUS***

### **I. COGNITIVE DOMAIN**

**At the end of the M.S. Orthopaedics programme, the post graduate student should be competent and show sufficient understanding of Basic Sciences as applicable to Orthopaedics and Trauma through a problem based approach.**

#### **1. Basic Sciences as related to Orthopaedics and Trauma**

- a) Embryogenesis of all organ systems
- b) Structure and function of Central Nervous System
- c) Structure and function of the peripheral Nervous System
- d) Structure and function of the arterial and venous system
- e) Structure and functions of the head & neck, abdomen, thorax and extremities.

#### **2. Physiological basis and Pathophysiology in Health and Disease**

- a) Physical Growth
- b) Temperature regulation
- c) Acid Base Balance
- d) Fluid Balance
- e) Hematopoiesis
- f) Hemostasis
- g) Electrolyte balance
- h) Bone mineralization: Calcium-Phosphate balance
- i) Renal functions

- j) Hepatic function
- k) Respiratory functions
- l) Cardiac functions
- m) Gastrointestinal functions
- n) Endocrine functions
- o) Developmental Milestones
- p) Nutritional Needs of Orthopaedic/Trauma Patients
- q) Allergy

**3. Clinical Microbiology as related to Orthopaedic infections**

- a) Virology
- b) Bacteriology
- c) Mycology
- d) Parasitology (Protozoology and Helminthology)
- e) Waste disposal, Sterilization, Disinfection

**4. Clinical Pharmacology as related to Orthopaedics & Trauma**

- a) Pharmacokinetics – of common medications used in Orthopaedics & Trauma
- b) Antimicrobials
- c) Analgesia, Sedation
- d) Drug Interactions
- e) Adverse effects
- f) Antidotes for Poisons
- g) Drug induced disease

**5. Professionalism and Ethics**

- a) Professionalism
- b) Ethics
- c) Medico legal essentials

## **6. Wound healing principles**

- a) Types of wounds
- b) Stages of wound healing
- c) Biochemical & Molecular factors in wound healing
- d) Chemotherapeutic and other Pharmaceuticals in wound care
- e) Host, Environment and agent factors

## **7. Bone Healing**

- a) Principles of bone healing
- b) Biological bone healing
- c) Factors influencing bone healing
- d) Biomechanism of bone healing

# ***TEACHING AND LEARNING METHODS***

## **General principles**

Acquisition of competencies being the keystone of doctoral medical education, such training should be skills oriented. Learning in the program, essentially autonomous and self-directed, and emanating from academic and clinical work, shall also include assisted learning. The formal sessions are meant to supplement this core effort.

All students joining the postgraduate (PG) courses shall work as full-time (junior) residents during the period of training, attending not less than 80% of the training activity during the calendar year, and participating in all assignments and facets of the educational process. They shall maintain a log book for recording the training they have undergone, and details of the procedures done during laboratory and clinical postings in real time.

## **Teaching-Learning methods**

This should include a judicious mix of demonstrations, symposia, journal clubs, clinical meetings, seminars, small group discussion, bed-side teaching, case-based learning, simulation-based teaching, self-directed learning, integrated learning, interdepartmental meetings and any other collaborative activity with the allied departments. Methods with exposure to the applied aspects of the subject relevant to basic/clinical sciences should also be used. **The suggested examples of teaching-learning methods are given below but are not limited to these. The frequency of various below mentioned teaching-learning methods**

can vary based on the subject's requirements, competencies, work load and overall working schedule in the concerned subject.

**A. Lectures:** Didactic lectures should be used sparingly. A minimum of 10 lectures per year in the concerned PG department is suggested. Topics to be selected would be as per subject requirements. All postgraduate trainees will be required to attend these lectures. Lectures can cover topics such as:

1. Subject related important topics as per specialty requirement
2. Recent advances
3. Research methodology and biostatistics
4. **Salient features of Undergraduate/Postgraduate medical curriculum**
5. Teaching and assessment methodology.

Topic numbers 3, 4, 5 can be done during research methodology/biostatistics and medical education workshops in the institute.

**B 1. Journal club:** Minimum of twice a month is suggested.

Topics will include presentation and critical appraisal of original research papers published in peer reviewed indexed journals. The presenter(s) shall be assessed by faculty and grades recorded in the logbook.

**B 2. ORTHO RADIOLOGY MEETS:** Twice a month discussions amongst Ortho & Radiology Residents under facilitation of faculty on various imaging modalities used and its interpretation.

**B.3. ORTHO SURGICAL PATHOLOGICAL MEET:** Special emphasis on the surgical pathology radiological aspect of the case in the pathology department. Clinician (Ortho resident) presents the clinical details of the case, radiology PG student describes the Radiological findings and its interpretation and Pathology student describes the morbid anatomy and histopathology of the same case.

**B. 4. SKILLS LAB SESSIONS:** Once a fortnight for first 2 years.

**C. Student Seminar:** Minimum of twice a month is suggested.

Important topics should be selected as per subject requirements and allotted for in-depth study by a postgraduate student. A teacher should be allocated for each seminar as faculty moderator to help the student prepare the topic well. It should aim at comprehensive evidence-based review of the topic. The student should be graded by the faculty and peers.

**D. Student Symposium: Minimum of once every 3 months.**

A broad topic of significance should be selected, and each part shall be dealt by one postgraduate student. A teacher moderator should be allocated for each symposium and moderator should track the growth of students. The symposium should aim at an evidence-based exhaustive review of the topic. All participating postgraduates should be graded by the faculty and peers.

**E. Laboratory work / Bedside clinics/case presentation:** Case presentation once a week in the ward, outpatient department/special clinics.

Laboratory work/Clinics/bedside teaching should be coordinated and guided by faculty from the department. Various methods like DOAP (Demonstrate, Observe, Assist, Perform), simulations in skill lab, and case-based discussions etc. are to be used. Faculty from the department should participate in moderating the teaching-learning sessions during clinical rounds.

**F. Interdepartmental colloquium**

Faculty and students must attend monthly meetings between the main Department and other department/s on topics of current/common interest or clinical cases; eg., combined clinical round with Radiology, Pathology etc.

**G. a. Rotational clinical / community / institutional postings**

Depending on local institutional policy and the subject specialty needs, postgraduate trainees may be posted in relevant departments/ units/ institutions. The aim would be to acquire more in-depth knowledge as applicable to the concerned specialty. Postings would be rotated between various units/departments and details to be included in the specialty-based Guidelines. Few examples are listed below:

**1. Clinical postings**

A major portion of posting should be in Orthopaedics department. It should include in-patients, out-patients, ICU, trauma, emergency room and speciality clinics.

**Rotation of posting**

- Inter-unit rotation in the department should be done for a period of up to one year.
- Rotation in appropriate related subspecialties for a total period not exceeding 06 months.

- Medical Education Unit (MEU) or Department of Medical Education (DOME) (optional)

### **T/L Education**

- Bone Skills Lab sessions – Twice a week
- Surgical Audit sessions – Once every week
- Cadaver based education – Twice a month
- Web based e-learning sessions – Once a fortnight
- Simulated environment learning – Two sessions in a week
- **Mortality & Morbidity meetings with SURGICAL AUDIT:** Once a month

### **G b. Posting under “District Residency Programme” (DRP):**

All postgraduate students pursuing MS/MS in broad specialities in all Medical Colleges/Institutions shall undergo a compulsory rotation of three months in District Hospitals/District Health System as a part of the course curriculum, as per the Postgraduate Medical Education (Amendment) Regulations (2020). Such rotation shall take place in the 3<sup>rd</sup> or 4<sup>th</sup> or 5<sup>th</sup> semester of the Postgraduate programme and the rotation shall be termed as “District Residency Programme” and the PG medical student undergoing training shall be termed as “District Resident”.

Every posting should have its defined learning objectives. It is recommended that the departments draw up objectives and guidelines for every posting offered in conjunction with the collaborating department/s or unit/s. This will ensure that students acquire expected competencies and are not considered as an additional helping hand for the department / unit in which they are posted. The PG student must be tagged along with those of other relevant departments for bedside case discussion/basic science exercises as needed, under the guidance of an assigned faculty.

**Opportunities to present and discuss infectious disease cases through bedside discussion and ward/grand rounds with specialists / clinicians in different hospital settings must be scheduled to address antimicrobial resistance issues and strategies to deal with it.**

### **H. Teaching research skills**

Writing a thesis should be used for inculcating research knowledge and skills. All postgraduate students shall conduct a research project of sufficient depth to be presented to the University as a postgraduate thesis under the supervision of an eligible faculty member of the department as guide and one or more co-guides who may be from the same or other departments.

In addition to the thesis project, every postgraduate trainee shall participate in at least one additional research project that may be started or already ongoing in the department. It is preferable that this project will be in an area different from the thesis work. For instance, if a clinical research project is taken up as thesis work, the additional project may deal with community/field/laboratory work. Diversity of knowledge and skills can thereby be reinforced.

### **I. Training in teaching skills**

MEU/DOME should train PG students in education methodologies and assessment techniques. The PG students shall conduct UG classes in various courses and a faculty shall observe and provide feedback on the teaching skills of the student.

### **J. Log book**

During the training period, the postgraduate student should maintain a Log Book indicating the duration of the postings/work done in Wards, OPDs, Casualty and other areas of posting. This should indicate the procedures assisted and performed and the teaching sessions attended. The log book entries must be done in real time. The log book is thus a record of various activities by the student like: (1) Overall participation & performance, (2) attendance, (3) participation in sessions, (4) record of completion of pre-determined activities, and (5) acquisition of selected competencies.

The purpose of the Log Book is to:

- a) help maintain a record of the work done during training,
- b) enable Faculty/Consultants to have direct information about the work done and intervene, if necessary,
- c) provide feedback and assess the progress of learning with experience gained periodically.



The Log Book should be used in the internal assessment of the student, should be checked and assessed periodically by the faculty members imparting the training. The PG students will be required to produce completed log book in original at the time of final practical examination. It should be signed by the Head of the Department. A proficiency certificate from the Head of Department regarding the clinical competence and skillful performance of procedures by the student will be submitted by the PG student at the time of the examination.

The PG students shall be trained to reflect and record their reflections in log book particularly of the critical incidents. Components of good teaching practices must be assessed in all academic activity conducted by the PG student and at least two sessions dedicated for assessment of teaching skills must be conducted every year of the PG program. The teaching faculty are referred to the MCI Logbook Guidelines uploaded on the Website.

**K. Course in Research Methodology:** All postgraduate students shall complete an online course in Research Methodology within six months of the commencement of the batch and generate the online certificate on successful completion of the course.

#### **Other aspects**

- The Postgraduate trainees must participate in the teaching and training program of undergraduate students and interns attending the department.
- Trainees shall attend accredited scientific meetings (CME, symposia, and conferences) at least once a year.
- Department shall encourage e-learning activities.
- The Postgraduate trainees should undergo training in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS).
- The Postgraduate trainees must undergo training in information technology and use of computers.

**During the training program, patient safety is of paramount importance; therefore, relevant clinical skills are to be learnt initially on the models, later to be performed under supervision followed by independent performance. For this purpose, provision of skills laboratories in medical colleges is mandatory.**

### ***ASSESSMENT***

**FORMATIVE ASSESSMENT, ie., assessment to improve learning**

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

### **General Principles**

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

The Internal Assessment should be conducted in theory and practical/clinical examination, should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

### **Quarterly assessment during the MS training should be based on:**

1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self-directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs
6. Mini Cex encounter – at least 4
7. Clinical encounter cards - at least -4
8. Direct observation of procedural skills – at least 6 including Cadaver dissection
9. OSCE/Theory, Essay, Short notes
10. MCQS
11. Bone Skill Lab performance assessment

**Note:** These sessions may be organized and recorded as an institutional activity for all postgraduates.

- Attendance at Scientific meetings, CME programmes (at least 02 each)

**The student to be assessed periodically as per categories listed in the student appraisal form (Annexure I).**

### **SUMMATIVE ASSESSMENT, ie., assessment at the end of training**

**Essential pre-requisites for appearing for examination include:**

1. **Log book** of work done during the training period including rotation postings, departmental presentations, and internal assessment reports should be submitted.
2. At least **two presentations** at national level conference. One research paper should be published / accepted in an indexed journal. **(It is suggested that the local or University Review committee assess the work sent for publication).**

The summative examination would be carried out as per the Rules given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination.

The postgraduate examination shall be in three parts:

1. **Thesis**

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student in broad specialty shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. **Theory examination**

The examinations shall be organized on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training, as given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ M.S shall be held at the end of 3<sup>rd</sup> academic year.

There shall be four theory papers (as per PG Regulations).

**Paper I:** Basic sciences as applied to the subject

**Paper II:** Traumatology and Rehabilitation

**Paper III:** Orthopaedic diseases

**Paper IV:** Recent advances in Orthopaedic surgery & General Surgery as applied to Orthopaedics

### 3. Practical/clinical and Oral/viva voce examination

#### Practical examination

Practical examination should be spread over **two** days and include various major components of the syllabus focusing mainly on the psychomotor domain.

**Oral/Viva voce examination** on defined areas should be conducted by each examiner separately. Oral examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject focusing on psychomotor and affective domain.

It should include:

- Stations for clinical, procedural and communication skills
- Log Book Records and reports of day-to-day observation during the training
- Should test the post graduate student's overall knowledge of the subject in:
  - Ortho Radiology
  - Ortho Pathology
  - Histopathology & Gross anatomy
  - Instruments
  - Orthotics and Prosthetics

#### Recommended Reading:

1. Campbell's Operative Orthopaedics, Vols 1, 2, 3 & 4 Campbell's Operative Orthopaedics, 4-Volume Set, 14<sup>th</sup> Edition by Frederick M Azar, MD, S. Terry Canale, MD and James H. Beaty, MD
2. Mercer's Orthopaedic Surgery Vol. 1 & 2, Author(s) : Robert B Duthie Edition: Ninth, Year of Publication: 2003
3. Rockwood And Greens – Fractures in Adults, Vol 1& 2 Rockwood and Green's Fractures in Adults Author(s): Paul Tornetta , William Ricci MD, FAAOS, Charles M. Court-Brown MD, FRCS Ed (Orth), Margaret M. McQueen MD, Michael McKee MD, FRCS (C) Publication Date: March 27, 2019
4. Fractures in Children – Rockwood & Wilkins - Rockwood and Wilkins Fractures in Children Edition: 9. Author(s): Peter M Waters MD, David L. Skaggs MD, John M. Flynn. Publication Date: March 19, 2019

5. Paediatric Orthopaedics – Tachidjian, Vol 4 Tachdjian's Pediatric Orthopaedics: From the Texas Scottish Rite Hospital for Children, 6th edition - November 27, 2020 Author: John Herring
6. Concise System Of Orthopaedics And Fractures – Graham Apley Apley's Concise System of Orthopaedics and Fractures Louis Solomon, David Warwick, Selvadurai Nayagam CRC Press, 31-Mar-2005
7. Textbook of Orthopaedics and Trauma – Kulkarni, Vol 1 Textbook of Orthopedics and Trauma (4 Volumes) GS Kulkarni, Sushrut Babhulkar, Publish Year 2016
8. B.D. Chaurasia's Human Anatomy, Vol1, Vol 2, Vol 3 B D Chaurasia's Handbook of Anatomy English Editions 2022 Eighth Editions Volume 2 (paperpack, CHAURASIAS), Author: CHAURASIAS, Publisher: CBS Publishers, Publishing Date 2022
9. Pharmacology and Pharmacotherapeutics – Satoskar- Pharmacology and Pharmacotherapeutics, 24<sup>th</sup> Edition - June 30, 2015, Authors: RS Satoskar, Nirmala Rege, SD Bhandarkar
10. Orthopaedics Anatomy and Surgical Approaches Frederick Wreckling Orthopaedic Anatomy and Surgical Approaches Edited by Frederick W. Reckling, Jo Anne B. Reckling and Melvyn P. Mohn, S. P. Frostick, First Published August 1, 1991
11. Green's Operative Hand Surgery-Vol. 1&. 2, Green, David P; Hotchkiss, Robert N Green's Operative Hand Surgery, 2-Volume Set 7<sup>th</sup> Edition - February 24, 2016, Authors: Scott W. Wolfe, William C. Pederson, Scott H. Kozin, Mark S. Cohen
12. Surgical Exposures in Orthopedics: The Anatomic Approach, Hoppenfeld, Stanley; De Boer, Piet Surgical Exposures in Orthopaedics: The Anatomic Approach, Edition: 6, Author(s): Piet de Boer MD, Richard Buckley MD, FRCSC, Stanley Hoppenfeld MD, Publication Date: October 7, 2021
13. Text Book of Ilizarov Surgical Techniques Bone Correction And Lengthening, Golyakhovsky, Vladimir; Frankel, Victor H Textbook of Ilizarov Surgical Techniques: Bone Correction and Lengthening by Vladimir Golyakhovsky, Victor H Frankel, Publishing Year 2010
14. Applied Orthopaedic Biomechanics, Dutta, Santosh; Datta, Debasis Applied Orthopaedic Biomechanics, by Debasis Datta Santosh K Dutta Publisher : B.I.Publications, Year 2008.

## **Journals**

03-05 international Journals and 02 national (all indexed) journals.

**National Medical Commission**

Student appraisal form for MS in Orthopedics											
	Element	Less than Satisfactory			Satisfactory			More than satisfactory			Comments
		1	2	3	4	5	6	7	8	9	
<b>1</b>	<b>Scholastic Aptitude and Learning</b>										
1.1	Has Knowledge appropriate for level of training										
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc.)										
1.3	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc.)										
1.4	Documentation of acquisition of competence (eg. Log book)										
1.5	Performance in work based assessments										
1.6	Self- directed Learning										
<b>2</b>	<b>Care of the patient</b>										
2.1	Ability to provide patient care appropriate to level of training										
2.2	Ability to work with other members of the health care team										
2.3	Ability to communicate appropriately and empathetically with patients families and care givers										
2.4	Ability to do procedures appropriate for the level of training and assigned role										

2.5	Ability to record and document work accurately and appropriate for level of training																			
2.6	Participation and contribution to health care quality improvement																			
<b>3</b>	<b>Professional attributes</b>																			
3.1	Responsibility and accountability																			
3.2	Contribution to growth of learning of the team																			
3.3	Conduct that is ethical appropriate and respectful at all times																			
<b>4</b>	<b>Space for additional comments</b>																			
<b>5</b>	<b>Disposition</b>																			
	Has this assessment been discussed with the trainee?	Yes	No																	
	If not explain																			
	Name and Signature of the assessee																			
	Name and Signature of the assessor																			
	Date																			



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**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE**

**Faculty of Medical Sciences  
MD - Orthopedics  
Old Syllabus**

# **GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MS IN ORTHOPAEDICS**

## **Preamble**

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

A postgraduate undergoing training MS in Orthopaedics should be trained to identify and recognize various congenital, developmental, inflammatory, infective, traumatic, metabolic, neuromuscular, degenerative and oncologic disorders of the musculoskeletal systems. She/he should be able to provide competent professional services to trauma and orthopaedic patients at a primary/ secondary/tertiary healthcare centres.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of “domains of learning” under the heading “competencies”.

## ***SUBJECT SPECIFIC LEARNING OBJECTIVES***

This will be dealt with under the following headings:

- Theoretical knowledge (Cognitive domain)
- Practical and clinical skills (psychomotor domain)
- Attitudes including communication skills (Affective domain)
- Writing thesis / Reviewing Research activities (Scholarly activity)
- Training in Research Methodology (Practice based learning, Evidence based practice)
- Professionalism
- Teaching skills

## ***SUBJECT SPECIFIC COMPETENCIES***

### **A. Cognitive domain**

**At the end of the M.S. Orthopaedics programme, the post graduate student should be able to:**

1. Demonstrate sufficient understanding of the basic sciences relevant to orthopaedic speciality through a problem based approach.
2. Describe the Principles of injury, its mechanism and mode, its clinical presentation, plan and interpret the appropriate investigations, and institute the management of musculoskeletally injured patient.

3. Identify and describe the surface anatomy and relationships within of the various bones, joints, ligaments, major arteries, veins and nerves of the musculoskeletal system of the spine, upper limb, lower limb and the pelvis, chest, abdomen and head & neck.
4. Define and describe the pathophysiology of shock (circulatory failure).
5. Define and describe the pathophysiology of Respiratory failure
6. Describe the principles and stages of bone and soft tissue healing
7. Understand and describe the metabolic, nutritional, endocrine, social impacts of trauma and critical illness.
8. Enumerate, classify and describe the various bony/soft tissue injuries affecting the axial and appendicular skeletal system in adults and children.
9. Describe the principles of internal and external fixation for stabilization of bone and joint injuries.
10. Describe the mechanism of homeostasis, fibrinolysis and methods to control haemorrhage
11. Describe the physiological coagulation cascade and its abnormalities
12. Describe the pharmacokinetics and dynamics of drug metabolism and excretion of analgesics, anti inflammatory, antibiotics, disease modifying agents and chemotherapeutic agents.
13. Understanding of biostatistics and research methodology
14. Describe the clinical presentation, plan and interpret investigations, institute management and prevention of the following disease conditions
  - a. Nutritional deficiency diseases affecting the bones and joints
  - b. Deposition arthropathies
  - c. Endocrine abnormalities of the musculoskeletal system
  - d. Metabolic abnormalities of the musculoskeletal system
  - e. Congenital anomalies of the musculoskeletal system
  - f. Developmental skeletal disorder of the musculoskeletal system
15. Describe the pathogenesis, clinical features plan and interpret investigations and institute the management in adults and children in
  - a. Tubercular infections of bone and joints (musculoskeletal system)
  - b. Pyogenic infections of musculoskeletal system
  - c. Mycotic infections of musculoskeletal system
  - d. Autoimmune disorders of the musculoskeletal system
  - e. Rheumatoid arthropathy, Ankylosing spondylitis, seronegative arthropathy
  - f. Osteoarthritis and spondylosis
16. Describe the pathogenesis, clinical presentation, plan and interpret investigations and institute appropriate treatment in the following conditions:
  - a. Post polio residual paralysis
  - b. Cerebral palsy
  - c. Muscular dystrophies and myopathies
  - d. Nerve Injuries
  - e. Entrapment neuropathies
17. Identify the diagnosis and describe management of musculoskeletal manifestation of AIDS and HIV infection

18. Describe the aetiopathogenesis, identify, plan and interpret investigation and institute the management of osteonecrosis of bones.
19. Identify situations requiring rehabilitation services and prescribe suitable orthotic and prosthetic appliances and act as a member of the team providing rehabilitation care
20. Identify a problem, prepare a research protocol, conduct a study, record observations, analyse data, interpret the results, discuss and disseminate the findings.
21. Identify and manage emergency situation in disorders of musculoskeletal system
22. Understanding of the basics of diagnostic imaging in orthopaedics like:
  - a. Plain x-ray
  - b. Ultrasonography
  - c. Computerised axial tomography
  - d. Magnetic resonance imaging
  - e. PET scan
  - f. Radio Isotope bone scan
  - g. Digital Subtraction Angiography (DSA)
  - h. Dual energy x-ray Absorptiometry
  - i. Arthrography
23. Describe the aetiopathogenesis, clinical presentation, Identification, Plan investigation and institute treatment for oncologic problems of musculoskeletal system both benign and malignancies, primary and secondary.
24. Understand the basics, principles of biomaterials and orthopaedic metallurgy
25. Describe the principles of normal and abnormal gait and understand the biomedical principles of posture and replacement surgeries.
26. Describe social, economic, environmental, biological and emotional determinants of health in a given patient with a musculoskeletal problem.

## **B. Affective Domain:**

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

## **Attitudes including Communication skills and Professionalism**

### **a. Communication skills:**

- Exhibits participation in honest, accurate health related information sharing in a sensitive and suitable manner
- Recognizes that being a good communicator is essential to practice effectively

- Exhibits effective and sensitive listening skills
  - Recognises the importance and timing of breaking bad news and knows how to communicate
  - Exhibits participation in discussion of emotional issues
  - Exhibits leadership in handling complex and advanced communication
  - Recognizes the importance of patient confidentiality and the conflict between confidentiality and disclosure
  - Able to establish rapport in therapeutic bonding with patients, relatives and other stakeholders through appropriate communication
  - Able to obtain comprehensive and relevant history from patients/relatives
  - Able to counsel patients on their condition and needs
- b. **Teamwork:** Seek cooperation. Coordination and communication among treating specialties and paramedical staff
- c. **Counseling of relatives:** regarding patients condition, seriousness, bereavement and counseling for organ donation in case of brain stem death
- d. **Leadership:** Trauma prevention, education of the public, paramedical and medical persons.  
**Advocacy:** with the government and other agencies towards cause of trauma care
- e. **Ethics:** The Code of Medical Ethics as proposed by Medical Council of India will be learnt and observed.

### C. Psychomotor domain

#### 1. At the end of the first year of M.S. Orthopaedics programme, the student should be able to:

1. Elicit a clinical history from a patient, do a physical examination, document in a case record, order appropriate investigations and make a clinical diagnosis
2. Impart wound care where applicable
3. Apply all types of POP casts/slabs, splints and tractions as per need
4. Identify shock and provide resuscitation
5. Perform aspiration of joints and local infiltration of appropriate drugs
6. Perform appropriate wound debridement
7. Perform arthrotomy of knee joint
8. Perform incision and drainage of abscess
9. Perform split thickness skin grafting
10. Perform fasciotomes
11. Apply external fixators
12. Apply skeletal tractions including skull tongs
13. Triage a disaster situation and multiple trauma patients in an emergency room
14. Perform on bone models, interfragmentary compression screws, external fixation, Tension band wiring and Broad plating
15. Perform closed reduction of common dislocations like shoulder and common fractures like collar fracture, supracondylar fracture.

16. Perform on a cadaver standard surgical approaches to the musculo skeletal system

**2. At the end of the second year of M.S. Orthopaedics course, the student should be able to:**

1. Take an informed consent for standard orthopaedic procedures
2. Perform closed/open biopsies for lesions of bone, joints and soft tissues
3. Perform split thickness skin grafting and local flaps
4. Perform on bone models, internal fixation with k-wires, screws, plates. Dynamic hip/condylar screws/nailing.
5. Perform sequestrectomy and saucerisation
6. Perform arthrotomy of joints like hip/shoulder, ankle, elbow
7. Perform repair of open hand injuries including tendon repair
8. Perform arthodesis of small joints
9. Perform diagnostic arthroscopy on models and their patients
10. Perform carpal tunnel/tarsal tunnel release
11. Apply ilizarov external fixator
12. Perform soft tissue releases in contractures, tendon lengthening and correction of deformities
13. Perform amputations at different levels
14. Perform corrective surgeries for CTEV, DDH, perthes/ skeletal dysplasia

**3. At the end of the third year of M.S. Orthopaedics programme, the student should be able to:**

1. Assist in the surgical management of polytrauma patient
2. Assist in Arthroplasty surgeries of hip, knee, shoulder and the ankle
3. Assist in spinal decompressions and spinal stabilizations
4. Assist in operative arthroscopy of various joints
5. Assist /perform arthrodesis of major joints like hip, knee, shoulder, elbow
6. Assist in corrective osteotomes around the hip, pelvis, knee, elbow, finger and toes
7. Assist in surgical operations on benign and malignant musculoskeletal tumour including radical excision and custom prosthesis replacement.
8. Assist in open reduction and internal fixations of complex fractures of acetabular, pelvis, IPSI lateral floating knee/elbow injuries, shoulder girdle and hand
9. Assist in spinal deformity corrections
10. Independently perform closed/open reduction and internal fixation with DCP, LCP, intramedullary nailing, LRS
11. Assist in limb lengthening procedures
12. Assist in Revision surgeries
13. Provide pre and post OP care
14. Perform all clinical skills as related to the speciality.

# Syllabus

## Course contents:

### 1. Basic Sciences

- Anatomy and function of joints
- Bone structure and function
- Growth factors and fracture healing
- Cartilage structure and function
- Structure and function of muscles and tendons
- Tendon structure and function
- Metallurgy in Orthopaedics
- Stem Cells in Orthopaedic Surgery
- Gene Therapy in Orthopaedics

### 2. Diagnostic Imaging in Orthopaedics

(Should know the interpretation and Clinical Correlation of the following): -

- Digital Subtraction Angiography (DSA)
- MRI and CT in Orthopaedics
- Musculoskeletal USG
- PET Scan
- Radio-isotope bone scan

### 3. Metabolic Bone Diseases

- Rickets and Osteomalacia
- Osteoporosis
- Scurvy
- Mucopolysaccharoidoses
- Fluorosis
- Osteopetrosis

### 4. Endocrine Disorders

- Hyperparathyroidism
- Gigantism, Acromegaly

### 5. Bone and Joint Infections

- Pyogenic Haematogenous Osteomyelitis - Acute and Chronic
- Septic arthritis
- Fungal infections
- Miscellaneous infections
- Gonococcal arthritis



- Bone and joint brucellosis
- AIDS and the Orthopaedic Surgeon (universal precautions)
- Musculoskeletal Manifestations of AIDS
- Pott's spine
- Tubercular synovitis and arthritis of all major joints

## **6. Poliomyelitis**

- General considerations
- Polio Lower limb and spine
- Management of Post Polio Residual Palsy (PPRP)

## **7. Orthopaedic Neurology**

- Cerebral Palsy
- Myopathies

## **8. Peripheral Nerve Injuries**

- Traumatic
- Entrapment Neuropathies

## **9. Diseases of Joints**

- Osteoarthritis
- Calcium Pyrophosphate Dihydrate (CPPD), Gout
- Collagen diseases

## **10. Systemic Complications in Orthopaedics**

- Shock
- Crush syndrome
- Disseminated Intravascular Coagulation (DIC)
- Acute Respiratory Distress Syndrome (ARDS)

## **11. Bone Tumors**

- Benign bone tumors
- Malignant bone tumors
- Tumor like conditions
- Metastatic bone Tumors

## **12. Miscellaneous Diseases**

- Diseases of muscles
- Fibrous Dysplasia
- Unclassified diseases of bone
- Paget's disease

- Peripheral vascular disease
- Orthopaedic manifestations of bleeding disorders

### **13. Regional Orthopaedic Conditions of Adults and Children**

- The spine
- The shoulder
- The elbow
- The hand
- The wrist
- The hip
- The knee
- The foot and ankle
- The pelvis

### **14. Biomaterials**

- Orthopaedic metallurgy
- Bio-degradable implants in Orthopaedics
- Bone substitutes
- Bone Banking

### **15. Fracture and Fracture-Dislocations**

General considerations

- Definitions, types, grades, patterns and complications
- Pathology of fractures and fracture healing
- Clinical and Radiological features of fractures and dislocations
- General principles of fracture treatment
- Recent advances in internal fixation of fractures
- Locking plate osteosyntheses
- Less Invasive Stabilisation System (LISS)
- Ilizarov technique
- Bone grafting and bone graft substitutes
- Open fractures and soft tissue coverage in the lower extremity
- Compartment syndrome
- Fractures of the upper extremity and shoulder girdle
- Fractures of the lower extremity
- Fractures of the hip and pelvis
- Malunited fractures
- Delayed union and non union of fractures
- Fractures/dislocations and fracture - dislocations of spine

### **16. Dislocations and Subluxations**

- Acute dislocations
- Old unreduced dislocations

- Recurrent dislocations

### **17. Traumatic Disorders of Joints (Sports Injuries)**

- Ankle injuries
- Knee injuries
- Shoulder and elbow injuries
- Wrist and hand injuries

### **18. Arthrodesis**

- Arthrodesis of lower extremity and hip
- Arthrodesis of upper extremity
- Arthrodesis of spine

### **19. Arthroplasty**

- Biomechanics of joints and replacement of the following joints.
- Knee
- Ankle
- Shoulder
- Elbow

### **20. Minimally Invasive Surgery (MIS)**

#### **Arthroscopy**

- General principles of Arthroscopy
- Arthroscopy of knee and ankle
- Arthroscopy of shoulder and elbow

### **21. Amputations and Disarticulations**

- Amputations and disarticulations in the lower limb
- Amputations and disarticulations in the upper limb

### **22. Rehabilitation - Prosthetics and Orthotics**

#### **23. Pediatric orthopaedics:**

- Fractures and dislocations in children
- Perthes' disease
- Slipped capital femoral epiphysis
- Congenital Dislocation of Hip (CDH)
- Neuromuscular disorders

#### **24. Spine**

- a) **Spinal trauma:** diagnosis and management including various types of fixations
  - i. Rehabilitation of paraplegics/quadruplegics
  - ii. Management of a paralyzed bladder
  - iii. Prevention of bed sores and management of established bed sores

- iv. Exercise programme and Activities of Daily Living (ADL)
- v. Psychosexual counseling

**b) Degenerative disorders of the spine**

- i. Prolapsed Inter Vertebral Disc (PIVD)
- ii. Lumbar Canal Stenosis (LCS)
- iii. Spondylolysis/Spondylolisthesis
- iv. Lumbar Spondylosis
- v. Ankylosing Spondylitis
- vi. Spinal fusion: various types and their indications.

**25. Triage, Disaster Management, BTLS and ATLS**

**26. Recent advances in orthopaedics**

- Autologous chondrocyte implantation
- Mosaicplasty
- Video assisted Thoracoscopy (VATS)
- Endoscopic spine surgery
- Metal on metal arthroplasty of hip
- Surface replacements of joints
- Microsurgical techniques in Orthopaedics
- Designing a modern orthopaedic operation theatre
  - Sterilization
  - Theatre Discipline
  - Laminar air flow
  - Modular OTs

***TEACHING AND LEARNING METHODS***

- Emphasis should be given to various small group teachings rather than didactic lectures.
- CASE PRESENTATION once a week in the ward, in the outpatient department and special clinics.
- Seminars / Symposia – Twice a month; Theme based student centered
- Journal club/ Review : Twice a month
- Academic grand ward rounds: Twice a month presentation of cases by residents and clinically applicable discussions.
- **ORTHO RADIOLOGY MEETS:** Twice a month discussions amongst Ortho & Radiology Residents under facilitation of faculty on various imaging modalities used and its interpretation
- **ORTHO SURGICAL PATHOLOGICAL MEET:** Special emphasis on the surgical pathology radiological aspect of the case in the pathology department. Clinician (Ortho resident) presenting the clinical details of the case, radiology PG student describes the Radiological findings and its interpretation and Pathology student describes the morbid anatomy and histopathology of the same case.
- **SKILLS LAB SESSIONS:** Once a fortnight for all two years.
- **Clinical teaching** in the OPD, Emergency room, ICU, OR as per the situation.
- **Mortality & Morbidity meetings with SURGICAL AUDIT:** Once a month

- Maintenance of log book: to be signed by the faculty in charge
- The post graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- A post graduate student of a postgraduate degree course in broad specialities/super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the post graduate degree examination.
- Should have attended two conferences/CMEs/Workshops during his tenure as a postgraduate
- Department should encourage e-learning activities.

### **Rotations:**

#### **1. Clinical postings**

A major portion of posting should be in Orthopaedics department. It should include in-patients, out-patients, ICU, trauma, emergency room and speciality clinics.

#### **Rotation of posting**

- Inter-unit rotation in the department should be done for a period of up to one year.
- Rotation in appropriate related subspecialties for a total period not exceeding 06 months.

#### **Clinical meetings:**

There should be intra- and inter- departmental meetings for discussing the uncommon /interesting cases involving multiple departments.

**Log book:** Each student must be asked to present a specified number of cases for clinical discussion, perform procedures/tests/operations/present seminars/review articles from various journals in inter-unit/interdepartmental teaching sessions. They should be entered in a Log Book. The Log books shall be checked and assessed periodically by the faculty members imparting the training.

**During the training programme, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of surgical skills laboratories in medical colleges is mandatory.**

### **ASSESSMENT**

Assessment should be comprehensive and objective assessing the competencies stated in the course. The assessment is both formative and summative. Formative is spread over the entire duration of the programme and the summative is as per university examination pattern.

## **FORMATIVE ASSESSMENT, during the training,**

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

### **General Principles**

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and clinical examination.

**Quarterly assessment during the MS training should be based on following educational activities:**

- 1. Journal based / recent advances learning**
- 2. Patient based /Laboratory or Skill based learning**
- 3. Self directed learning and teaching**
- 4. Departmental and interdepartmental learning activity**
- 5. External and Outreach Activities / CMEs**

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

## **SUMMATIVE ASSESSMENT, at the end of the course,**

### **Post Graduate Examination**

The summative examination would be carried out as per the Rules given in **POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.**

The Post Graduate examination shall be in three parts: -

#### **1. Thesis**

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

#### **2. Theory:**

The examinations shall be organized on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There shall be four theory papers as follows:

**Paper I:** Basic Sciences as applied to Orthopaedics

**Paper II:** Traumatology and Rehabilitation

**Paper III:** Orthopaedic diseases

**Paper IV:** Recent advances in Orthopaedic surgery + General Surgery as applied to Orthopaedics

3. **Practical/Clinical:** The practical examination should consist of the following and should be spread over two days, if the number of post graduate students appearing is more than five.

1. One long case: History taking, physical examination, interpretation of clinical findings, differential diagnosis, investigations, prognosis and management.
2. Short cases from various sections of the speciality (three)

**4. Oral/Viva-voce Examination**

- Surgical Anatomy including Osteology
- Instruments
- Radiology
- Surgical Pathology
- Orthotics and prosthetics

**Recommended Reading:**

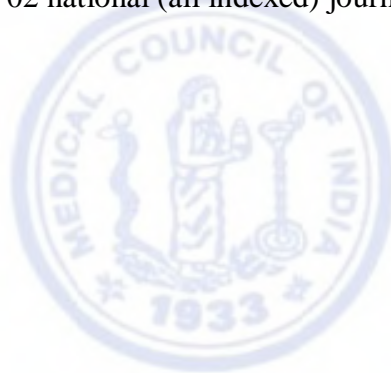
**Books (latest edition)**

1. Campbell's Operative Orthopaedics, Vols 1,2,3 & 4
2. Mercer's Orthopaedic Surgery
3. Rockwood And Greens – Fractures In Adults, Vol 1& 2
4. Fractures In Children – Rockwood & Wilkins
5. Physiological Basis Of Medical Practice – Best And Taylor's
6. Arthroscopic Surgery Of The Knee – Johannes
7. Paediatric Orthopaedics – Tachidjian, Vol 4
8. Concise System Of Orthopaedics And Fractures – Graham Apley
9. Orthopaedics And Traumatology – Natarajan
10. Outline Of Fractures Adams, Hamblen
11. Textbook Of Orthopaedics And Trauma – Kulkarni, Vol 1
12. B.D. Chaurasia's Human Anatomy, Vol 1, Vol 2, Vol 3
13. Pharmacology And Pharmacotherapeutics – Satoskar
14. Orthopaedics Anatomy And Surgical Approaches Frederick Wreckling

15. The Art Of Aesthetic Plastic Surgery – John R Levis, Vol 1
16. Current Concepts In Orthopaedics Dr. D. K. Tareja
17. Custom Mega Prosthesis & Limb Salvage Surgery Dr. Mayilvahanan
18. Advances In Operative Orthopaedics
19. Green's Operative Hand Surgery-Vol. 1&. 2, Green, David P; Hotchkiss, Robert N
20. Tachdjian's Pediatric Orthopaedics-Vol. 1, Vol 2, Vol 3, Herring, John Anthony
21. Surgical Exposures In Orthopedics:The Anatomic Approach, Hoppenfeld, Stanley; De Boer,Piet
22. Adams's Outline Of Orthopaedics, Hamblen, David L; Simpson, Hamish R
23. Text Book Of Ilizarov Surgical Techniques Bone Correction And Lengthening, Golyakhovsky, Vladimir; Frankel, Victor H
24. Current Techniques In Total Knee Arthroplasty, Sawhney G S
25. Applied Orthopaedic Biomechanics, Dutta, Santosh; Datta,Debasis
26. Essential Orthopaedics And Trauma, Dandy, David J; Edwards, Dennis J
27. Adams's Outlines Of Fractures;Including Joint Injuries, Hamblen, David L; Simpson, A Hamish R W
28. Orthopedic Physical Assessment, Magee, David J
29. Turek's Textbook Of Orthopaedics Vol 1 & 2, Turek's
30. Orthopaedics Surgical Approach, Miller

#### **Journals**

03-05 international Journals and 02 national (all indexed) journals





## Postgraduate Students Appraisal Form

Pre / Para /Clinical Disciplines

Name of the Department/Unit :

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1.	Journal based / recent advances learning										
2.	Patient based /Laboratory or Skill based learning										
3.	Self directed learning and teaching										
4.	Departmental and interdepartmental learning activity										
5.	External and Outreach Activities / CMEs										
6.	Thesis / Research work										
7.	Log Book Maintenance										

Publications

Yes/ No

Remarks\*

\*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD