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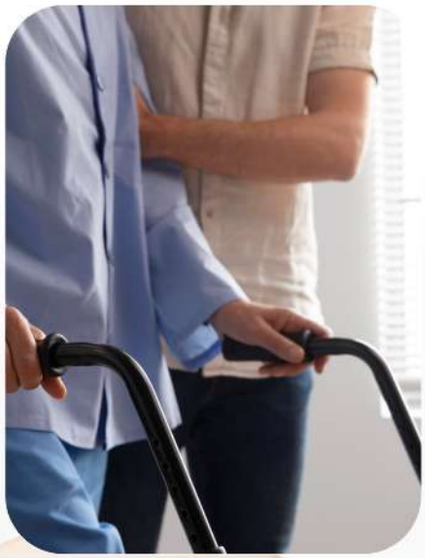

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# Advanced Therapeutics in
# ORTHOPEDIC CONDITIONS

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Advanced Therapeutics in
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*As per Physiotherapy Curriculum of National Commission for Allied and Healthcare Professions (NCAHP)*

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*Dedicated to*

My beloved family and aspiring physiotherapy students

# Foreword

It is with great pleasure and pride that I write the foreword for *Advanced Therapeutics in Orthopedic Conditions* authored by Dr Jeyanthi S. This textbook stands as a timely and essential resource for undergraduate physiotherapy students, meticulously aligned with the latest National Commission for Allied and Healthcare Professions (NCAHP) syllabus for physiotherapy education in India.

Physiotherapy as a profession continues to evolve rapidly, driven by advancements in medical science, and patient-centered care. In the realm of orthopedic rehabilitation, this evolution is especially pronounced. The increasing complexity of musculoskeletal conditions, the rise in orthopedic surgical interventions, and the growing emphasis on quality of life and functional independence demand a higher level of clinical precision, critical thinking, and adaptability from physiotherapists. Today's practice is no longer limited to routine exercise protocols or symptomatic relief; it requires the integration of evidence-based practices, functional outcome measures, and individualized rehabilitation strategies. Emerging technologies such as motion analysis, and digital health tools are also reshaping how care is delivered. As a result, physiotherapists must continuously update their knowledge and refine their skills to deliver interventions that are not only effective but also scientifically justified, ethically sound, and tailored to the unique needs of each patient.

Dr Jeyanthi has drawn on her extensive experience as a clinician and educator to compile a textbook that is both academically rigorous and practically oriented. The book not only introduces fundamental orthopedic concepts but also dives deep into complex conditions and advanced therapeutic approaches. What sets this book apart is its integration of academic content with clinical applicability. The structured layout, relevant case examples, and clear therapeutic guidance make it an indispensable learning companion.

As you engage with the content of this book, I encourage you to view it as a transformational tool, one that not only expands your clinical knowledge but also strengthens your role in improving patient outcomes. This book aims to nurture real professionals, those with a deeper understanding of healing, patient education, and evidence-informed care.

Dr Jeyanthi's dedication to the physiotherapy profession is evident on every page. Her work will undoubtedly contribute to raising the standard of orthopedic physiotherapy education in India and inspire a generation of competent, compassionate, and reflective practitioners.

Hearty Congratulations and My Best Wishes

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**Jeyanthi S** BPT, MPT (Advanced Orthopedics), PhD, is presently serving as Professor cum Principal of Sri Venkateshwaraa College of Physiotherapy, affiliated with Pondicherry University, where she has been instrumental in shaping the academic and research culture of the institution. She is an accomplished academician and researcher in the field of physiotherapy, with over a decade of experience in teaching, clinical practice, and research.

Her expertise spans neuro-musculoskeletal rehabilitation, gait analysis, and innovative approaches in patient care. She has contributed extensively to scientific literature through research publications, conference presentations, and collaborative projects with national and international institutions. Dr Jeyanthi has also been an invited speaker and resource person at global conferences, including the prestigious WCPT Congress, and has delivered lectures for postgraduate programmes in leading universities.

With a strong commitment to advancing physiotherapy education, she has spearheaded initiatives to integrate cutting-edge technologies into clinical training, including EMG analysis, nerve conduction studies, gait labs, and cognitive rehabilitation systems. She has mentored numerous undergraduate and postgraduate students, fostering a passion for research and evidence-based practice.

Beyond academics, Dr Jeyanthi is deeply engaged in community outreach programmes, ensuring access to quality rehabilitation services for rural populations through satellite centers and free clinics. Her dedication to bridging the gap between research and practice reflects her vision of physiotherapy as a dynamic and impactful profession.

# Preface

It gives me immense pleasure to present *Advanced Therapeutics in Orthopedic Conditions*, a comprehensive textbook designed to meet the academic and clinical needs of undergraduate and postgraduate physiotherapy students. This book is a culmination of my years of teaching and continued interaction with students and fellow professionals in the field of orthopedic physiotherapy.

The content of this book is aligned with the latest curriculum prescribed by leading health universities and regulatory bodies in India. It aims to serve as a definitive guide, offering knowledge of therapeutic interventions in a wide range of orthopedic conditions. The structure and scope of the text are intended to help learners understand not only the theoretical foundation but also the practical application of advanced physiotherapy techniques in real-world clinical settings.

A unique feature of this book is its holistic approach—integrating both clinical aspects and rehabilitation perspectives. Special attention has been given to the clinical reasoning process, evidence-based practices, and the development of individualized rehabilitation plans. Each chapter is organized in a systematic manner, starting from the pathomechanics of the condition to the therapeutic strategies involved in restoring optimal function and quality of life.

Visual aids, case-based questions, clinical pearls and practical tips have been incorporated wherever relevant to enhance clarity and retention. The book also reflects recent advances and emerging trends in orthopedic physiotherapy, ensuring that learners are prepared to meet the demands of modern clinical practice.

I hope this textbook proves to be a valuable resource not only for students but also for educators and practicing clinicians. I welcome feedback from readers and colleagues to further refine and enrich future editions of this work.

**Jeyanthi S**

# Acknowledgments

With immense gratitude, I acknowledge the individuals and institutions who have played a significant role in the creation of this book. Writing a book is never a solitary journey, and I am truly indebted to those whose presence, encouragement, and guidance have illuminated my path.

First and foremost, I extend my sincere thanks to my mentors and guides, whose expertise and constructive criticism have not only shaped the content of this work but also deepened my understanding of the subject. Your patience, generosity in sharing knowledge, and commitment to excellence have been a constant source of inspiration.

I am grateful to my colleagues and peers for their valuable suggestions, thoughtful debates, and willingness to share ideas. Your perspectives have enriched my work and helped me approach this subject with a broader vision.

My heartfelt appreciation goes to my past institution, Amar Jyoti Institute of Physiotherapy, Delhi and the present organization Sri Venkateshwaraa College of Physiotherapy, Pondicherry for providing the resources, infrastructure, and a nurturing academic environment that enabled me to carry out the research and writing of this book. I also wish to acknowledge the administrative and technical teams whose behind-the-scenes support has been invaluable.

To my students, past and present—thank you for inspiring me to keep learning, questioning, and exploring. Your curiosity and enthusiasm have kept my passion for this field alive and vibrant. Special mention to my PG students Lakshmipriya V, Suhara S, Lakshna G.B, Santhiya P, and Santhiya N.

I am deeply indebted to my friends, who have been a constant source of encouragement and understanding, especially during the challenging phases of this journey.

Most importantly, I owe my deepest gratitude to my family. To my parents, for instilling in me the values of perseverance and integrity; to my partner, for being my anchor and greatest cheerleader; and to my children, for their patience and unconditional love. This book is as much yours as it is mine.

Finally, I would like to thank all those unnamed yet significant individuals whose contributions, big and small, have touched this work. Whether through a word of encouragement, a shared reference or a simple gesture of kindness, you have left an imprint on these pages.

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I sincerely thank the entire CBS team for bringing out the book with utmost care and attractive presentation. I would like to thank Ms Nitasha Arora (Assistant General Manager – Publishing) and Dr Anju Dhir (Sr. Product Manager cum Commissioning Editor) for their publishing support. I would also extend my thanks to Ms Surbhi Gupta (Sr. Editor cum Team Lead), Mr Ashutosh Pathak (Assistant Production Manager cum TL) and all the production team members for devoting laborious hours in designing and typesetting the book.

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*The names of the contributors and reviewers are arranged in alphabetical order.*

# Special Features of the Book

**Learning Objectives** in the beginning of every Chapter help readers understand the purpose of the chapter.

## LEARNING OBJECTIVES

*After the completion of the chapter, the readers will be able to:*

- Understand the scope of orthopedic conditions.
- Appreciate the role of physiotherapy in the management of various orthopedic conditions.
- Understand sequence of assessment/testing used to identify source of pain and in turn patient's disability.

## CHAPTER OUTLINE

- Introduction
- Types of Pain
- Animal Models of Pain
- Basic Molecular Biology of Pain
- Pain Modulation
- Multidisciplinary Pain Management
- Pain Management Therapies

**Chapter Outline** gives a glimpse of the content covered in the chapter.

**Key Terms** are added in each chapter to help understand difficult scientific terms in easy language.

## KEY TERMS

**Analgesia:** It is the inability to feel pain or experience pain relief without losing consciousness or other sensations. A good analgesic can produce analgesia.

**Anesthesia:** It is defined as the loss of sensations with or without loss of consciousness. Drugs that cause loss of sensation are called anesthetics.

**Inflammogen:** Any substance that generates an inflammatory response.

**Nociception:** In physiology, it refers to the detection of painful stimuli. It provides a means of neural feedback that allows the central nervous system (CNS) to detect and avoid noxious and potentially damaging stimuli in both active and passive settings.

**TABLE 3.2:** The Moll and Wright classification criteria for psoriatic arthritis

| Sl. no. | Clinical patterns of psoriatic arthritis |
|---|---|
| 1. | Distal interphalangeal (DIP) joint arthritis |
| 2. | Arthritis mutilans |
| 3. | Symmetrical polyarthritis |
| 4. | Asymmetrical oligoarthritis |
| 5. | Spondylitis |

Numerous **Tables** have been used in the chapters to facilitate learning in a quick way.

Various **Figures** are added which offer quick insights and aid in conceptual understanding.

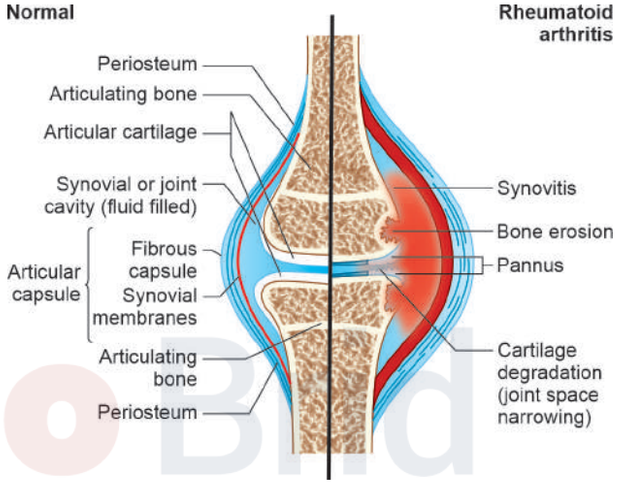


**Fig. 5.1:** Pathological features of rheumatoid arthritis

## Did You Know?

**Management of Orthopedic Congenital and Developmental Disorders**
Early detection and appropriate management of orthopedic congenital and developmental disorders are essential to address underlying issues, promote normal growth and development, and prevent long-term complications. Orthopedic specialists, including pediatric orthopedic surgeons, play a crucial role in the diagnosis and management of these conditions. Treatment plans are often individualized based on the specific disorder and the child's unique needs.

**Did You Know?** boxes give an overview of important facts and terms of the concerned topic.

Evolving conceptual details for application in clinical situations are depicted in **Clinical Pearl** boxes.

## Clinical Pearls

**Chief Complaint**
Chief complaints are always recorded in the patient's own words. Examiner should not modify the language of the chief complaint.

**MNEMONIC**

**Mnemonic used: HEADSS**
**H**ome and environment, **E**ducation, **E**mployment, **E**ating
**A**ctivities, **D**rugs, **S**exuality and **S**uicide/Depression.

**Mnemonics** given help in remembering complex information easily.

## Recent Advancement

There are few evidence-based guidelines for acquired scoliotic deformity (ASD) rehabilitation. Rehabilitation both before and after surgery may hasten healing and lower the chance of complications. To identify these early postoperatively disabled individuals who might benefit from tailored rehabilitation programs, more research is required. Additionally, people with movement phobias may benefit from individualized rehabilitation programs that use behavioral approaches.

Updated and latest information are provided in the **Recent Advancement** boxes.

**Practical Aspects** boxes help in better understanding and application of theoretical knowledge.

## PRACTICAL ASPECTS

**Spinal Stability**

The aging of joints, combined with a fracture at a level above a previous fusion, can also cause a significant deformity. Simply removing material from the spine can cause a problem down the road. It may reduce or eliminate pain in the near term, but symptoms can return later because of instability of the spine. Think of the game, Jenga. When you remove a block from the tower, other blocks can be affected. Like the Jenga tower, what goes on globally in the spinal balance and pathology is important.

## SUMMARY

- Tendon transfers are appropriate to restore function following damage to the muscles, tendons, brachial plexus, the spinal cord, and peripheral nerves.
- Contraindications involve donor availability, muscle strength, denervation issues, and progressive neuropathy.
- The principles of tendon transfers are:
  - Supple joints prior to transfer
  - Soft tissue equilibrium
  - Donor of adequate excursion
  - Donor of adequate strength
  - Expendable donor

Important takeaway points of respective chapters have been highlighted under **Summary** boxes.

To give extra edge to the study, **Bibliography** have been included at the end of every chapter.

## BIBLIOGRAPHY


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- Kapoor A, Anand KP, Chattopadhyay D, Vathulaya M, Roy C. Early rehabilitation of victims of traumatic ulnar injury using tendon transfer. Injury. 2020 Jul;51(7):1603-1607. doi: 10.1016/j.injury.2020.04.007. Epub 2020 Apr 21. PMID: 32359816.

## STUDENT ASSIGNMENT

### LONG ANSWER QUESTIONS

1. Describe the principles of the tendon transfer technique.
2. Write in detail about the biomechanical factors influencing successful tendon transfers. Discuss the physiotherapy management after tibialis posterior tendon transfer in a patient with foot drop.

### SHORT ANSWER QUESTIONS

1. State the indications and contraindications of tendon transfer.
2. Enlist the technical considerations for tendon transfer.

### MULTIPLE CHOICE QUESTIONS

1. **Which of the following muscles is commonly involved in a low radial nerve injury (posterior interosseous nerve)?**
   a. Triceps
   b. Supinator
   c. Brachioradialis
   d. Extensor carpi radialis longus (ECRL)
2. **Which of the following tendon transfer is commonly used to treat foot drop in the lower limb?**
   a. Flexor hallucis longus tendon (FHLT) transfer
   b. Tibialis anterior tendon transfer
   c. Tibialis posterior tendon transfer
   d. Extensor hallucis longus (EHL) transfer

### CASE-BASED QUESTION

1. Mr Arun, a 35-year-old factory worker, sustained a traumatic injury to his upper arm six months ago, leading to radial nerve palsy with wrist drop and inability to extend the fingers and thumb. After failing to recover with conservative treatment and splinting, he underwent tendon transfer surgery, where the pronator teres was transferred to the extensor carpi radialis brevis, the palmaris longus to the extensor pollicis longus, and the flexor carpi ulnaris to the extensor digitorum communis. He is now referred to physiotherapy 2 weeks postoperative with a well-padded splint in place, limited active motion, and concerns about stiffness and regaining hand function. The surgeon has instructed to follow a protocol-based rehabilitation plan over the next few months.

**Discussion questions:**

1. What are the rehabilitation goals during the different phases (immobilization, mobilization, strengthening) following tendon transfer for radial nerve palsy?
2. Which precautions must be taken in the early post-operative phase to protect the tendon transfer while preventing joint stiffness?

***ANSWER KEY***

**1.** b **2.** c

At the end of chapters, **Student Assignment** section is given which contains frequently asked questions in exams and multiple choice questions to help students attain mastery over the subject.

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# Syllabus

## PHYSIOTHERAPY IN ADULT AND PEDIATRIC ORTHOPEDIC CONDITIONS

### THEORY

**Time: 180 Hours**

1. **PT assessment for orthopedic conditions:**
   - SOAP format
   - Subjective—history taking, informed consent, personal, past, medical and socioeconomic history, chief complaints, history of present illness.
   - Pain assessment—intensity, character, aggravating and relieving factors, site and location.
   - Objective
     - On observation—body built swelling, muscle atrophy, deformities, posture and gait.
     - On palpation—tenderness-grades, muscle spasm, swelling—methods of swelling assessment, bony prominences, soft tissue texture and integrity, warmth and vasomotor disturbances.
     - On examination—ROM—active and passive, resisted isometric tests, limb length-apparent, true and segmental, girth measurement, muscle length testing—tightness, contracture and flexibility, manual muscle testing, peripheral neurological examination—dermatomes, myotomes and reflexes, special tests and functional tests.
   - Prescription of home program.
   - Documentation of case records, and follow-up.
2. **Fractures:**
   - Types, classification, signs and symptoms, complications.
   - Fracture healing—factors affecting fracture healing.
   - Principles of fracture management
     - Reduction—open and closed.
     - Immobilization—sling, cast, brace, slab, traction—manual, mechanical, skin, skeletal, lumbar and cervical traction.
     - External fixation.
     - Functional cast bracing.
   - PT management in complications—early and late—shock, compartment syndrome, VIC, fat embolism, delayed and malunion, RSD, myositis ossificans, AVN, pressure sores, etc.
   - Physiotherapy assessment and management in fracture cases
     - Aims of PT management—short and long-term goals.
     - Principles of PT management in fractures.
     - Guidelines for fracture treatment during period of immobilization
     - Guidelines for treatment after immobilization period.
3. **Principles of various schools of thought in manual therapy:**
   - Maitland
   - McKenzie
4. **Orthopedic surgeries:**
   - Principles of pre- and postoperative PT assessment, goals, and precautions.
   - PT management of orthopedic surgeries
     - Arthrodesis
     - Osteotomy

- Arthroplasty—partial and total—Excision arthroplasty, excision arthroplasty with implant, interpositional arthroplasty and total replacement
- Tendon transplant
- Soft tissue release—tenotomy, myotomy, lengthening
- Arthroscopy
- Synovectomy
- Spinal stabilization
- Re-attachment of limbs
- External fixators

5. **Degenerative and inflammatory conditions:**
   - Definition, signs and symptoms, clinical features, pathophysiology, radiological features, deformities, medical and surgical management.
   - Describe the PT assessment and management and home program for the following conditions.
     - Osteoarthritis (emphasis mainly on knee, hip and hand)
     - Rheumatoid arthritis
     - Ankylosing spondylitis
     - Gout
     - Perthes disease
     - Periarthritis Shoulder
6. **Infective conditions:**
   - Definition, signs and symptoms, clinical features, pathophysiology, radiological features, medical and surgical management
   - Describe PT assessment and management for following conditions
     - Osteomyelitis—acute and chronic
     - Septic arthritis
     - Pyogenic arthritis
     - TB spine and major joints (knee and hip)
7. **Traumatic conditions of upper limb:**
   - Conservative and perioperative PT management in traumatic conditions of shoulder, arm, elbow, forearm, wrist and hand
   - Fractures and dislocations, sprains
   - Hand injuries—flexor tendon, extensor tendon
   - Compartment syndrome
8. **Nontraumatic conditions of upper limb:** Conservative and postoperative PT management of
   - Shoulder instabilities
   - Thoracic Outlet syndrome
   - Reflex sympathetic dystrophy
   - Impingement syndrome
   - AC joint injuries
   - Rotator cuff tears—Subacromial decompression
   - Carpal tunnel syndrome—deformities
9. **Upper limb surgeries:** Pre- and perioperative PT management following upper limb surgeries
   - Total shoulder replacement, hemi replacement, Repair of ruptured extensor tendons.
   - Total wrist arthroplasty, flexor and extensor tendon lacerations, excision of radial head.
   - Total elbow arthroplasty.
10. **Amputations:**
    - Amputations of upper limb—Definition, levels, indications, types, PT assessment, aims, management pre- and postoperatively.
    - Amputations of lower limb—Definition, levels, indications, types, PT assessment, aims, management pre- and postoperatively.
    - PT management with emphasis on stump care and bandaging.
    - Pre- and postprosthetic training, checking out prosthesis.
    - Complications of amputations and their management.
11. **Traumatic conditions of lower limb:**
    - Conservative and perioperative PT management in traumatic conditions of pelvis, hip, knee, ankle and foot.
    - Fractures and dislocations, sprains.
12. **Nontraumatic conditions of lower limb:** Nontraumatic conditions of hip, knee, ankle and foot.
    - Tendonitis and bursitis.
    - Plica syndrome, patellar dysfunction and Hoffa's syndrome.
13. **Lower limb surgeries:** Pre- and perioperative PT management following lower limb surgeries
    - Hemi and total hip replacement
    - Lateral retinacular release, chondroplasty
    - ACL and PCL reconstruction surgeries
    - Realignment of extensor mechanism
    - Menisectomy and meniscal repair
    - Total Knee Replacement (TKR)
    - Patellectomy
    - Ligamentous tears
14. **Traumatic conditions of spine:** Conservative and perioperative PT management in
    - Spinal fractures—cervical, thoracic, lumbar
    - Spinal cord injury
    - Intervertebral disc prolapsed (PIVD)
    - Sprain
    - Contusion
15. **Nontraumatic condition of spine:**
    - Cervical and lumbar spinal disorders
      - Spondylosis
      - Spondylolisthesis

- Spinal canal stenosis
- Spondylolisthesis
- Spondylolysis

- Sacroiliac joint dysfunction, sacralization, lumbarization
- Intervertebral disc prolapse
- Coccydynia
- Spina bifida occulta
- Thoracic Outlet syndrome
- TB spine
- Nonspecific low back pain, sway back
- Ankylosing spondylitis
- Scoliosis, kyphosis, lordosis
- Torticollis

16. **Pre- and perioperative PT management following spine surgeries**
17. **Deformities:** Review the causes, clinical features, complications, radiological features, medical and surgical management of the following:
    - Congenital deformities
      - CTEV
      - CDH
      - Torticollis
      - Scoliosis
      - Flat foot
      - Vertical talus
      - Hand anomalies—syndactyly, polydactyly and ectrodactyly
      - Arthrogryposis multiplex congenital (amyoplasia congenita)
      - Limb deficiencies—Amelia and Phocomelia
      - Klippel feil syndrome
      - Osteogenesis imperfecta (fragile ossium)
    - Acquired deformities
      - Acquired Torticollis
      - Scoliosis, Kyphosis, Lordosis
      - Genu varum, Genu valgum, Genu recurvatum
      - Coxa vara
      - Pes cavus, pes planus
18. **Diseases of bones and joints:** Introduction, causes, clinical features, types, complications, investigations and medical and surgical management of the following conditions
    - Infective—Osteomyelitis, TB spine and other major joints.
    - Perthes, slipped capital femoral epiphysis, avascular Necrosis.
    - Metabolic—Rickets, osteomalacia.
19. **Pediatric conditions:**
    - Soft tissue injuries—Overview, investigations and management.
    - Fractures and dislocations of upper extremity, lower extremity and spine—Introduction, investigations and orthopedic management.
    - Low back pain and neck pain—Introduction, causes, types, investigations and management.
    - Sports injuries—Introduction, types, investigations and management.
    - Surgeries for cerebral palsy—Rhizotomy, tendon lengthening, osteotomies, arthrodesis.
    - Illizarov's technique.

## PRACTICAL

**Time: 120 Hours**

**Practical shall be conducted for all the relevant topics discussed in theory in the following forms:**

- Bedside case presentations and case discussions.
- Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.
- Student should be able to execute independently the following procedures on self/human model/patient History taking: examination observation palpation tests, investigation, diagnosis, functional diagnosis [impairment, functional restriction, activity limitation] documentation.
- Planning and execution of management protocol for various conditions of upper limb, lower limb, and spine in various clinical settings with respect to adult and pediatric conditions.
- Active exercise regimen.
- Passive mobilization procedures
- Selection of electrotherapeutic modalities.
- Patient education.
- Functional training programme.
- Orthotic and prosthetic checkout and training.
- Ergonomic advice.

# Contents