PHYSICAL MEDICINE AND REHABILITATION

Musculoskeletal Disorders, Pain, and Rehabilitation

THIRD EDITION

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Essentials of Physical Medicine and Rehabilitation

Musculoskeletal Disorders, Pain, and Rehabilitation

THIRD EDITION



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ESSENTIALS OF PHYSICAL MEDICINE AND REHABILITATION: MUSCULOSKELETAL DISORDERS, PAIN, AND REHABILITATION

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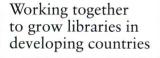
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Essentials of Physical Medicine and Rehabilitation

Musculoskeletal Disorders, Pain, and Rehabilitation

We dedicate this book to our mentors, teachers, colleagues, and students, who have encouraged us to pursue academic careers with their enthusiasm for knowledge and learning; to our patients, who often are our greatest teachers; and to our families, who support us and provide the foundation for our pursuits.

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Temporomandibular Joint Dysfunction

RAFAEL MASCARINAS, MD

Attending Physician, Physical Medicine and Rehabilitation Service, James A. Haley Veterans' Hospital; Assistant Professor, Department of Neurology, Division of Physical Medicine and Rehabilitation, Morsani College of Medicine, University of South Florida, Tampa, Florida

Polytrauma Rehabilitation

JILL MASSENGALE, MS, ARNP

Physical Medicine and Rehabilitation Service, James A. Haley Veterans' Hospital, Tampa, Florida Temporomandibular Joint Dysfunction

Polytrauma Rehabilitation

KOICHIRO MATSUO, DDS, PhD

Professor, Department of Dentistry, School of Medicine, Fujita Health University, Aichi, Japan Dysphagia

MARISSA McCARTHY, MD

Assistant Professor, Department of Neurology, Division of Physical Medicine and Rehabilitation, Morsani College of Medicine, University of South Florida: Medical Director, Traumatic Brain Injury/Polytrauma Unit, James A. Haley Veterans' Hospital, Tampa, Florida

Temporomandibular Joint Dysfunction Polytrauma Rehabilitation

KELLY C. McINNIS, DO

Instructor, Physical Medicine and Rehabilitation, Harvard Medical School; Clinical Associate, Physical Medicine and Rehabilitation, Massachusetts General Hospital, Boston, Massachusetts

Repetitive Strain Injuries

PETER M. McINTOSH, MD

Assistant Professor, College of Medicine, Mayo Clinic, Rochester, Minnesota; Consultant, Department of Physical Medicine and Rehabilitation, Mayo Clinic, Jacksonville, Florida

Scapular Winging Adhesive Capsulitis of the Hip

ALEC L. MELEGER, MD

Assistant Professor of Physical Medicine and Rehabilitation, Harvard Medical School, Boston, Massachusetts; Medical Director, Spaulding Outpatient Center, Medford, Massachusetts

Cervical Spinal Stenosis

BRYAN MERRITT, MD

Physical Medicine and Rehabilitation Service, James A. Haley Veterans' Hospital; Assistant Professor, Department of Neurology, Division of Physical Medicine and Rehabilitation, Morsani College of Medicine, University of South Florida, Tampa, Florida

Polytrauma Rehabilitation

LYLE J. MICHELI, MD

Program Director, Sports Medicine, Harvard University, Boston, Massachusetts

Posterior Cruciate Ligament Sprain Quadriceps Tendinopathy and Tendinitis

WILLIAM MICHEO, MD

Professor and Chairman, Physical Medicine and Rehabilitation and Sports Medicine Department; Sports Medicine Program Director, University of Puerto Rico, San Juan, Puerto Rico

Glenohumeral Instability Anterior Cruciate Ligament Tear

MATTHEW E. MILLER, MD

Captain, United States Army Medical Corps; Residency Associate Program Director and Staff Physiatrist. Physical Medicine and Rehabilitation, Walter Reed National Military Medical Center, Bethesda, Maryland

Plantar Fasciitis

GERARDO MIRANDA, MD

Assistant Professor, Physical Medicine and Rehabilitation and Sports Medicine, San Juan, Puerto Rico

Glenohumeral Instability

NATHAN MOHR, BA

Pre-medical Student, University of Northern Iowa, Cedar Falls, Iowa

Cervical Sprain or Strain

DANIEL P. MONTERO, MD

Mayo Clinic Florida, Jacksonville, Florida

Hammer Toe

S. JIT MOOKERJEE, DO

Physical Medicine and Rehabilitation Service, James A. Haley Veterans' Hospital; Assistant Professor, Department of Neurology, Division of Physical Medicine and Rehabilitation, Morsani College of Medicine, University of South Florida, Tampa, Florida

Polytrauma Rehabilitation

ALI MOSTOUFI, MD, FAAPMR, FAAPM

Assistant Professor, Physical Medicine and Rehabilitation, Tufts University; Medical Director, Boston Spine Center, Boston, Massachusetts

Cervical Radiculopathy Chronic Pain Syndrome

CHAITANYA S. MUDGAL, MD, MS (Orth), MCh (Orth)

Chief and Director, Hand Fellowship Program, Orthopaedic Hand Service, Massachusetts General Hospital, Boston, Massachusetts

Wrist Osteoarthritis Wrist Rheumatoid Arthritis

LARRY V. NAJERA III, MD

Schwab Rehabilitation Hospital, Chicago, Illinois; Pain Treatment Centers of Illinois, Orland Park, Illinois

Cervical Sprain or Strain

SHANKER NESATHURAI, MD, MPH, FRCP(C)

Professor of Medicine and Division Director of Physical Medicine and Rehabilitation, Michael G. DeGroote School of Medicine, McMaster University; Chief of Physical Medicine and Rehabilitation, Hamilton Health Sciences and St. Joseph's Healthcare, Hamilton, Ontario, Canada; Lecturer in Physical Medicine and Rehabilitation, Harvard Medical School, Spaulding Hospital, Boston, Massachusetts

Spinal Cord Injury (Thoracic)

JESS NORDIN, DO

Resident, Johns Hopkins Department of Physical Medicine and Rehabilitation, Baltimore, Maryland

Neural Tube Defects

CARINA J. O'NEILL, DO

Physical Medicine and Rehabilitation, Spaulding Rehabilitation, Braintree, Massachusetts; Clinical Instructor, Physical Medicine and Rehabilitation, Harvard Medical School, Boston, Massachusetts

de Quervain Tenosynovitis

ANDREA K. ORIGENES

Pre-medical Student, University of Illinois, Chicago, Illinois

Cervical Sprain or Strain

CEDRIC J. ORTIGUERA, MD

Consultant, Department of Orthopedics, Mayo Clinic, Jacksonville, Florida; Assistant Professor, Mayo Clinic, College of Medicine, Rochester, Minnesota

Labral Tears of the Shoulder

MICHAEL D. OSBORNE, MD

Assistant Professor, Physical Medicine and Rehabilitation, Mayo Clinic, Jacksonville, Florida

Chronic Ankle Instability Arachnoiditis

JEFFREY B. PALMER, MD

Lawrence Cardinal Shehan Professor and Chair,
Department of Physical Medicine and Rehabilitation;
Professor, Physical Medicine and Rehabilitation,
Otolaryngology—Head and Neck Surgery, and
Functional Anatomy and Evolution; Johns Hopkins
University; Physiatrist-in-Chief, Department of
Physical Medicine and Rehabilitation, Johns Hopkins
Hospital; Chair, Department of Physical Medicine
and Rehabilitation, Medstar Good Samaritan Hospital,
Baltimore, Maryland

Dysphagia

Speech and Language Disorders

PAUL F. PASQUINA, MD

United States Army Medical Corps (Colonel Ret.); Residency Director and Chair, Physical Medicine and Rehabilitation, Uniformed Services University of the Health Sciences, Walter Reed National Military Medical Center, Bethesda, Maryland

Plantar Fasciitis

ATUL T. PATEL, MD, MHSA

Kansas City Bone and Joint Clinic, Overland Park, Kansas; Medical Director of Adult Program, Rehabilitation Institute of Kansas City; Adjunct Associate Professor, Physical Therapy, University of Kansas Medical Center, Kansas City, Kansas

Trapezius Strain Pubalgia

JOSEMARIA PATERNO, MD

Fellow, Interventional Pain, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts

Trigeminal Neuralgia

INDER PERKASH, MD, FRCS, FACS

Professor of Urology (emeritus), Paralyzed Veterans of America Professor of Spinal Cord Injury Medicine (emeritus), Professor of Medicine (Gastrointestinal) and Physical Medicine and Rehabilitation, Stanford University, Stanford, California

Neurogenic Bladder Neurogenic Bowel

EDWARD M. PHILLIPS, MD

Assistant Professor of Physical Medicine and Rehabilitation; Director and Founder, Institute of Lifestyle Medicine, Joslin Diabetes Center, Harvard Medical School; Adjunct Scientist, United States Department of Agriculture, Jean Mayer Human Nutrition Research Center on Aging, Tufts University, Boston, Massachusetts

Knee Osteoarthritis Osteoarthritis

DANIEL C. PIMENTEL, MD

Interventional Physiatrist, Director of Spine Center HCor; Assistant Professor, University of São Paolo, School of Medicine, São Paulo, Brazil

Thoracic Radiculopathy Thoracic Sprain or Strain

THOMAS E. POBRE, MD

Director of Outpatient Services, Physical Medicine and Rehabilitation, Nassau University Medical Center, East Meadow, New York

Radial Neuropathy

REBECCA POSTHUMA, MD

Clinical Research Fellow, Female Pelvic and Reconstructive Surgery, Massachusetts General Hospital, Boston, Massachusetts Pelvic Pain

ALISON R. PUTNAM, DO

Department of Physical Medicine and Rehabilitation, Virginia Mason Medical Center, Seattle, Washington Iliotibial Band Syndrome

JAMES RAINVILLE, MD

Assistant Clinical Professor, Physical Medicine and Rehabilitation, Harvard Medical School; Chief, Physical Medicine and Rehabilitation, Orthopedics, New England Baptist Hospital, Boston, Massachusetts

Lumbar Spondylolysis and Spondylolisthesis

V.S. RAMACHANDRAN, MD, PhD

Professor, Department of Psychology, University of California, San Diego, California Complex Regional Pain Syndrome

DAVID RING, MD, PhD

Associate Professor of Orthopaedic Surgery,
Harvard Medical School, Chief of Hand Surgery,
Massachusetts General Hospital,
Boston, Massachusetts
Hand Osteoarthritis
Hand Rheumatoid Arthritis

JUSTIN RIUTTA, MD, FAAPMR

Department of Physical Medicine and Rehabilitation, William Beaumont Hospital, Royal Oak, Michigan

Post-Mastectomy Pain Syndrome Post-Thoracotomy Pain Syndrome

ALEXANDRA RIVERA-VEGA, MD

Assistant Professor, Department of Physical Medicine and Rehabilitation at University of Arkansas for Medical Sciences, Little Rock, Arkansas

Glenohumeral Instability

THOMAS D. RIZZO, JR., MD

Consultant, Department of Physical Medicine and Rehabilitation, Mayo Clinic, Jacksonville, Florida; Assistant Professor, Physical Medicine and Rehabilitation, Mayo Clinic College of Medicine, Rochester, Minnesota

Acromioclavicular Injuries

DARREN ROSENBERG, DO

Assistant Professor, Physical Medicine and Rehabilitation, Harvard Medical School, Boston, Massachusetts Thoracic Radiculopathy Thoracic Sprain or Strain

Baker Cyst

SEWARD B. RUTKOVE, MD

Professor, Neurology, Harvard Medical School/Beth Israel Deaconess Medical Center, Boston, Massachusetts

Peripheral Neuropathies

SUNIL SABHARWAL, MD

Assistant Professor, Department of Physical Medicine and Rehabilitation, Harvard Medical School; Chief, Spinal Cord Injury, Veterans Affairs Boston Health Care System, Boston, Massachusetts

Spinal Cord Injury (Cervical)
Spinal Cord Injury (Lumbosacral)

FRANCISCO H. SANTIAGO, MD

Attending Physician, Physical Medicine and Rehabilitation, Bronx-Lebanon Hospital, Bronx, New York

Median Neuropathy Ulnar Neuropathy (Wrist)

ROBERT J. SCARDINA, DPM

Chief, Podiatry Service; Residency Program Director, Podiatry Service, Massachusetts General Hospital; Instructor in Orthopaedic Surgery, Harvard Medical School, Boston, Massachusetts

Mallet Toe Metatarsalgia Morton Neuroma

MICHAEL K. SCHAUFELE, MD

Pain Solutions Treatment Centers, Marietta, Georgia Lumbar Degenerative Disease

JEFFREY C. SCHNEIDER, MD

Medical Director, Trauma, Burn, and Orthopedic Program, Spaulding Rehabilitation Hospital; Assistant Professor, Physical Medicine and Rehabilitation, Harvard Medical School, Boston, Massachusetts

Burns

STEVEN SCOTT, DO

Assistant Professor, Department of Neurology, Division of Physical Medicine and Rehabilitation; Chief, Physical Medicine and Rehabilitation, University of South Florida, Tampa, Florida

Temporomandibular Joint Dysfunction Polytrauma Rehabilitation

MICHAEL SEIN, MD

Department of Anesthesiology, University of California, San Diego, San Diego, California

Knee Osteoarthritis

FERNANDO SEPÚLVEDA, MD

Chief Resident, Physical Medicine and Rehabilitation Residency Training Program, University of Puerto Rico School of Medicine, San Juan, Puerto Rico

Anterior Cruciate Ligament Tear

IOHN SERGENT, MD

Professor of Medicine, Division of Rheumatology, Department of Internal Medicine, Vanderbilt University Medical Center, Nashville, Tennessee

Systemic Lupus Erythematosus

VIVEK M. SHAH, MD

Clinical Instructor in Orthopaedic Surgery, New England Baptist Hospital, Longwood Orthopedic Associates, Inc., Chestnut Hill, Massachusetts

Kienböck Disease

NUTAN SHARMA, MD, PhD

Associate Professor, Neurology, Harvard Medical School; Associate Neurologist, Massachusetts General Hospital; Associate Neurologist, Brigham and Women's Hospital, Boston, Massachusetts

Parkinson Disease

HUMA SHEIKH, MD

Clinical Instructor, Brigham and Women's Hospital– Neurology, Harvard Medical School, Boston, Massachusetts

Headaches

SARAH SHUBERT, MD

Falmouth Orthopaedic Center, Falmouth, Maine

Olecranon Bursitis

IMRAN J. SIDDIQUI, MD

Department of Physical Medicine and Rehabilitation, Spaulding Rehabilitation Hospital, Harvard Medical School, Boston, Massachusetts

Lumbar Spondylolysis and Spondylolisthesis

JULIE K. SILVER, MD

Associate Professor, Department of Physical Medicine and Rehabilitation, Harvard Medical School, Boston, Massachusetts

Trigger Finger

KENNETH H. SILVER, MD

Department of Physical Medicine and Rehabilitation, Johns Hopkins University School of Medicine; Medstar Good Samaritan Hospital, Baltimore, Maryland

Movement Disorders

ANEESH SINGLA, MD, MPH

Physician, National Spine and Pain Centers; Medical Director, Rockville, Maryland; Lecturer, Harvard Medical School, Boston, Massachusetts

Occipital Neuralgia Trigeminal Neuralgia

MICHAEL SLESINSKI, DO

Instructor, Department of Physical Medicine and Rehabilitation, Michigan State University–College of Osteopathic Medicine, East Lansing, Michigan

Quadriceps Contusion

DAVID M. SLOVIK, MD

Associate Professor of Medicine, Harvard Medical School, Boston, Massachusetts; Chief, Division of Endocrinology, Newton-Wellesley Hospital, Newton, Massachusetts; Physician, Endocrine Unit, Massachusetts General Hospital, Boston, Massachusetts

Osteoporosis

KURT SPINDLER, MD

Vanderbilt Orthopaedic Institute, Nashville, Tennessee

Knee Chondral Injuries

JOSEPH STANDLEY, DO

Physical Medicine and Rehabilitation Service, James A. Haley Veterans' Hospital, Tampa, Florida Polytrauma Rehabilitation

JOEL STEIN, MD

Simon Baruch Professor and Chair, Rehabilitation and Regenerative Medicine, Columbia University College of Physicians and Surgeons; Professor and Chief, Division of Rehabilitation Medicine, Weill Cornell Medical College; Physiatrist-in-Chief, New York–Presbyterian Hospital, New York, New York

Stroke

SONJA K. STILP, MD

Boulder, Colorado

Iliotibial Band Syndrome

TODD P. STITIK, MD

Professor, Physical Medicine and Rehabilitation; Director, Occupational/Musculoskeletal Medicine, Rutgers New Jersey Medical School, Newark, New Jersey

Hip Osteoarthritis

MICHAEL F. STRETANSKI, DO

Medical Director/Fellowship Director, Interventional Spine and Pain Rehabilitation Center, Mansfield, Ohio; Spine and Pain Services Director, Wyandot Memorial Hospital, Upper Sandusky, Ohio; Full Professor, Rehabilitation Medicine, Pain Medicine, Ohio University College of Osteopathic Medicine, Columbus, Ohio

Biceps Tendon Rupture Shoulder Arthritis Dupuytren Contracture Shin Splints Achilles Tendinopathy

MICHAEL D. STUBBLEFIELD, MD

Associate Attending Physiatrist and Chief, Rehabilitation Service, Department of Neurology, Memorial Sloan Kettering Cancer Center; Associate Professor of Rehabilitation Medicine, Weill Cornell Medical College, New York, New York

Radiation Fibrosis Syndrome

JORDAN L. TATE, MD, MPH

Physical Medicine and Rehabilitation, Emory University, Atlanta, Georgia

Lumbar Degenerative Disease

MAYA THERATTIL, MD

Assistant Professor, Clinical Rehabilitation Medicine, Albert Einstein College of Medicine, Bronx, New York

Scoliosis and Kyphosis

ANN-MARIE THOMAS, MD, PT

Assistant Professor, Physical Medicine and Rehabilitation, Harvard Medical School; Staff Physiatrist, Physical Medicine and Rehabilitation, Spaulding Rehabilitation Hospital; Clinical Associate, Physical Medicine and Rehabilitation, Massachusetts General Hospital; Associate Physiatrist in Medicine, Brigham and Women's Hospital, Boston, Massachusetts

Multiple Sclerosis

MARK A. THOMAS, MD

Associate Professor, Physical Medicine and Rehabilitation, Albert Einstein College of Medicine; Program Director, Physical Medicine and Rehabilitation, Montefiore Medical Center, Bronx, New York

Scoliosis and Kyphosis

JIAXIN TRAN, MD

Rutgers New Jersey Medical School, Newark, New Jersey
Complex Regional Pain Syndrome

GUY TRUDEL, MD, MSc, FRCPC, DABPMR

Professor of Medicine, Surgery, and Biochemistry, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada

Joint Contractures

TONY URBISCI, BS

Morsani College of Medicine, University of South Florida, Tampa, Florida

Temporomandibular Joint Dysfunction

SATHYA VADIVELU, DO

Fellow, Pediatric Rehabilitation Medicine, Kennedy Krieger Institute, Physical Medicine and Rehabilitation, Johns Hopkins University, Baltimore, Maryland Cerebral Palsy

RAMON VALLARINO, JR., MD

Attending Physician, Department of Neurosciences, New York Methodist Hospital, Brooklyn, New York; Clinical Assistant Professor, Department of Physical Medicine and Rehabilitation, Albert Einstein College of Medicine of Yeshiva University, Bronx, New York

Median Neuropathy Ulnar Neuropathy (Wrist)

MONICA VERDUZCO-GUTIERREZ, MD

Assistant Professor, Department of Physical Medicine and Rehabilitation, University of Texas Medical School at Houston (UTHealth), Houston, Texas **Spasticity**

ARIANA VORA, MD

Instructor, Physical Medicine and Rehabilitation, Harvard Medical School; Staff Physiatrist, Massachusetts General Hospital; Staff Physiatrist, Spaulding Rehabilitation Hospital, Boston, Massachusetts

Coccydynia Postherpetic Neuralgia

ADAM WALLACE, MD

Pain Management of Tulsa, Tulsa, Oklahoma Arachnoiditis

BETH M. WEINMAN, DO

Sports Medicine Fellow, Department of Orthopedic Surgery, Medical College of Wisconsin, Milwaukee, Wisconsin

Hamstring Strain

JAY M. WEISS, MD

Medical Director, Long Island Physical Medicine and Rehabilitation, Jericho, New York Lateral Epicondylitis

Medial Epicondylitis
Ulnar Neuropathy (Elbow)