

# The MERCK Manual

## Of Diagnosis and Therapy

**NINETEENTH EDITION**

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Professor and Vice Chairman, Department of Emergency Medicine, Drexel University College of Medicine; Chair, Department of Emergency Medicine and Director, Division of Toxicology, Mercy Catholic Medical Center  
*Fractures, Dislocations, and Sprains; Heat Illness*

**KENNETH B. ROBERTS, MD**

Professor of Pediatrics, University of North Carolina School of Medicine; Director, Pediatric Teaching Program, Moses Cone Health System, Greensboro  
*Dehydration and Fluid Therapy*

**BERYL J. ROSENSTEIN, MD**

Professor of Pediatrics, Johns Hopkins University School of Medicine  
*Cystic Fibrosis*

**STEVEN ROSENZWEIG, MD**

Clinical Associate Professor, Drexel University College of Medicine  
*Complementary and Alternative Medicine*

**NOELLE ROTONDO, DO**

Clinical Assistant Professor of Emergency Medicine, Penn State Hershey Medical Center; Adjunct Clinical Professor of Emergency Medicine, Drexel University College of Medicine  
*Approach to the Trauma Patient*

**ROBERT J. RUBEN, MD**

Distinguished University Professor, Department of Otorhinolaryngology–Head & Neck Surgery, Albert Einstein College of Medicine and Montefiore Medical Center  
*Hearing Loss*

**FRED H. RUBIN, MD**

Professor of Medicine, University of Pittsburgh, School of Medicine; Chair, Department of Medicine, University of Pittsburgh Medical Center Presbyterian Shadyside Hospital, Shadyside Campus  
*Immunization*

**MICHAEL RUBIN, MD**

Professor of Clinical Neurology, Weill Cornell Medical College; Director, Neuromuscular Service and EMG Laboratory, New York Presbyterian Hospital–Cornell Medical Center  
*Craniocervical Junction Abnormalities; Inherited Muscular Disorders; Spinal Cord Disorders; Peripheral Nervous System and Motor Unit Disorders*

**ATENODORO R. RUIZ, Jr., MD**

Senior Attending Physician, Department of Medicine–Gastroenterology, Kaiser Permanente, Santa Clara  
*Malabsorption Syndromes*

**J. MARK RUSCIN, PharmD**

Professor, Department of Pharmacy Practice, Southern Illinois University Edwardsville School of Pharmacy  
*Drug Therapy in the Elderly*

**JULIE E. RUSSAK, MD**

Melanoma Fellow, Rigel Dermatology (Private Practice Associated With New York University Medical Center)  
*Bullous Diseases*

**PAUL S. RUSSELL, MD**

John Homans Distinguished Professor of Surgery, Harvard Medical School; Senior Surgeon, Massachusetts General Hospital  
*Transplantation*

**CHARLES SABATINO, JD**

Adjunct Professor, Georgetown University Law Center; Director, Commission on Law and Aging, American Bar Association  
*Medicolegal Issues*

**DAVID B. SACHAR, MD**

Clinical Professor of Medicine, Mount Sinai School of Medicine; Director (Emeritus), Dr. Henry D. Janowitz Division of Gastroenterology, The Mount Sinai Hospital  
*Inflammatory Bowel Disease*

**SEYED-ALI SADJADI, MD**

Associate Professor of Medicine, Loma Linda University School of Medicine  
*Approach to the Genitourinary Patient; Renovascular Disorders*

**SCOTT SAMUELSON, MD**

Instructor of Medicine, Hematology Division, University of Utah; Attending Physician, Utah Cancer Specialists  
*Myeloproliferative Disorders*

**CHRISTOPHER SANFORD, MD, MPH, DTM&H**

Clinical Assistant Professor, Department of Family Medicine; Co-Director, Travel Clinic, Hall Health Center, University of Washington  
*Medical Aspects of Travel*

**RAVINDRA SARODE, MD**

Professor of Pathology and Director, Transfusion Medicine and Hemostasis Laboratory, The University of Texas Southwestern Medical Center at Dallas  
*Transfusion Medicine*

**CLARENCE T. SASAKI, MD**

The Charles W. Oshe Professor of Surgery and Chief of Otolaryngology, Yale School of Medicine; Director, Head and Neck Tumor Board, Yale Comprehensive Cancer Center  
*Laryngeal Disorders, Oral and Pharyngeal Disorders*

**PETER C. SCHALOCK, MD**

Instructor in Dermatology, Harvard Medical School; Assistant in Dermatology, Massachusetts General Hospital  
*Psoriasis and Scaling Diseases*

**STEVEN SCHMITT, MD**

Head, Section of Bone and Joint Infections, Department of Infectious Disease, Cleveland Clinic  
*Infections of Joints and Bones*

**MARVIN I. SCHWARZ, MD**

The James C. Campbell Professor of Pulmonary Medicine, Division of Pulmonary Sciences and Critical Care Medicine, University of Colorado Denver  
*Diffuser Alveolar Hemorrhage and Pulmonary-Renal Syndromes*

**ELDON A. SHAFFER, MD**

Professor of Medicine, Faculty of Medicine, University of Calgary  
*Testing for Hepatic and Biliary Disorders; Alcoholic Liver Disease; Fibrosis and Cirrhosis; Vascular Disorders of the Liver; Gallbladder and Bile Duct Disorders*

**STEWART SHANKEL, MD**

Clinical Professor of Medicine and Director of Clinical Instruction, University of California, Riverside  
*Urinary Tract Infections*

**WILLIAM R. SHAPIRO, MD**

Professor of Clinical Neurology, University of Arizona College of Medicine, Tucson; Chief, Neuro-oncology, Barrow Neurological Institute

*Intracranial and Spinal Tumors*

**MICHAEL J. SHEA, MD**

Professor of Internal Medicine, Section Head, Cardiovascular Medicine Outpatient Services and Clinical Evaluation, University of Michigan Health Systems

*Cardiovascular Tests and Procedures*

**DAVID D. SHERRY, MD**

Professor of Pediatrics, University of Pennsylvania; Director, Clinical Rheumatology, The Children's Hospital of Philadelphia

*Rheumatic Fever; Bone and Connective Tissue Disorders in Children*

**STEPHEN D. SILBERSTEIN, MD**

Professor of Neurology, Headache Center, Thomas Jefferson University

*Headache*

**DAPHNE SIMEON, MD**

Associate Professor, Department of Psychiatry, Mount Sinai School of Medicine

*Dissociative Disorders*

**ADAM J. SINGER, MD**

Professor and Vice Chairman for Research, Department of Emergency Medicine, Stony Brook University and Medical Center

*Lacerations*

**ASHISH C. SINHA, MD, PhD**

Assistant Professor, Anesthesiology and Critical Care, University of Pennsylvania School of Medicine

*Obesity and the Metabolic Syndrome (Bariatric Surgery portion)*

**RICHARD V. SMITH, MD**

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*Tumors of the Head and Neck*

**NORMAN SOHN, MD**

Clinical Assistant Professor of Surgery, New York University School of Medicine; Attending Surgeon, Lenox Hill Hospital

*Anorectal Disorders*

**DAVID E. SOPER, MD**

Professor and Vice Chairman for Clinical Affairs, Department of Obstetrics and Gynecology, Medical University of South Carolina

*Vaginitis and Pelvic Inflammatory Disease*

**DAVID R. STEINBERG, MD**

Associate Professor, Department of Orthopaedic Surgery and Director, Hand & Upper Extremity Fellowship, Department of Orthopaedic Surgery, University of Pennsylvania

*Hand Disorders*

**MARVIN E. STEINBERG, MD**

Professor (Emeritus) of Orthopaedic Surgery, University of Pennsylvania School of Medicine

*Osteonecrosis*

**KINGMAN P. STROHL, MD**

Professor of Medicine and Oncology, Department of Medicine, Division of Pulmonary, Critical Care and Sleep Medicine, Case Medical Center; Director, Center for Sleep Disorders Research, Case Western Reserve University

*Sleep Apnea*

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Professor of Psychiatry, University of Pennsylvania School of Medicine

*Eating Disorders*

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*Fungi*

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*Learning and Developmental Disorders; Behavioral Concerns and Problems in Children*

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*Approach to the Pregnant Woman and Prenatal Care*

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*Genitourinary Cancer*

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*Approach to the Cardiac Patient; Valvular  
Disorders*

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of Medicine  
*Polyglandular Deficiency Syndromes*

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*Adverse Drug Reactions*

**MARY TERRITO, MD**

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Hematopoietic Stem Cell Transplantation,  
University of California, Los Angeles  
*Neutropenia and Lymphocytopenia*

**DAVID R. THOMAS, MD**

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Medicine, Saint Louis University Health  
Sciences Center  
*Nutritional Support*

**ELIZABETH CHABNER THOMPSON,  
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Private Practice, New York Group for Plastic  
Surgery  
*Overview of Cancer; Principles of Cancer  
Therapy*

**STIG THUNELL, MD, PhD**

Professor, Karolinska Institute; Senior  
Consultant, Porphyria Center Sweden,  
Karolinska University Hospital Huddinge,  
Stockholm  
*Porphyrias*

**SHELLY D. TIMMONS, MD, PhD**

Assistant Professor and Chief of Neurotrauma  
Division, Department of Neurosurgery,  
University of Tennessee; Private Practice,  
Semmes-Murphey Neurologic & Spine Institute  
*Traumatic Brain Injury*

**COURTNEY M. TOWNSEND, Jr., MD**

Professor and John Woods Harris Distinguished  
Chairman, Department of Surgery, The  
University of Texas Medical Branch at  
Galveston  
*Carcinoid Tumors*

**AMAL TRIVEDI, MD, MPH**

Assistant Professor of Community Health,  
The Warren Alpert Medical School of  
Brown University; Investigator, REAP On  
Outcomes and Quality in Chronic Disease  
and Rehabilitation, Providence VA Medical  
Center  
*Funding Health Care for the Elderly; Financial  
Issues in Health Care*

**ANNE S. TSAO, MD**

Assistant Professor, Department of Thoracic/  
Head & Neck Oncology, Division of Cancer  
Medicine, The University of Texas MD  
Anderson Cancer Center  
*Tumors of the Lungs*

**DEBARA L. TUCCI, MD**

Associate Professor of Surgery, Division of  
Otolaryngology–Head and Neck Surgery, Duke  
University Medical Center  
*Approach to the Patient With Ear Problems*

**ALLAN R. TUNKEL, MD, PhD**

Chair, Department of Medicine, Monmouth  
Medical Center; Professor of Medicine,  
Drexel University College of Medicine  
*Biology of Infectious Disease*

**RONALD B. TURNER, MD**

Professor of Pediatrics, University of Virginia  
School of Medicine  
*Respiratory Viruses*

**ALEXANDER G.G. TURPIE, MD**

Professor of Medicine, McMaster University  
and Hamilton Health Sciences General Hospital  
*Peripheral Venous and Lymphatic Disorders*

**JAMES T. UBERTALLI, DMD**

Assistant Clinical Professor, Tufts University  
School of Dental Medicine; Private Practice,  
Hingham, MA  
*Common Dental Disorders*

**VICTOR G. VOGEL, MD, MHS**

National Vice President for Research, American  
Cancer Society  
*Breast Disorders*

**AARON E. WALFISH, MD**

Clinical Assistant Attending, Division of Digestive Diseases, Beth Israel Medical Center; Clinical Instructor, Mount Sinai Medical Center

*Inflammatory Bowel Disease*

**JAMES WAYNE WARNICA, MD**

Professor of Medicine, Department of Cardiac Science, University of Calgary; Director, Cardiac Intensive Care Unit, Foothills Medical Center

*Coronary Artery Disease*

**MAX HARRY WEIL, MD, PhD, ScD (Hon)**

Distinguished Professor and Founding President, Weil Institute of Critical Care Medicine; Research Professor of Surgery, Keck School of Medicine, The University of Southern California, Los Angeles

*Cardiac Arrest; Shock and Fluid Resuscitation; Sepsis and Septic Shock*

**GEOFFREY A. WEINBERG, MD**

Professor of Pediatrics, University of Rochester School of Medicine and Dentistry; Director, Pediatric HIV Program, Golisano Children's Hospital at Strong, University of Rochester Medical Center

*Miscellaneous Infections in Infants and Children; Human Immunodeficiency Virus Infection in Infants and Children*

**LAURA WEISSMAN, MD**

Assistant Professor in Medicine and Instructor in Pediatrics, Harvard Medical School

*Incontinence in Children*

**GREGORY L. WELLS, MD**

Resident in Dermatology, Dartmouth Medical School and Dartmouth-Hitchcock Medical Center

*Cancers of the Skin*

**JOHN B. WEST, MD, PhD, DSc**

Professor of Medicine and Physiology, University of California, San Diego

*Altitude Sickness*

**KENDRICK ALAN WHITNEY, DPM**

Assistant Professor, Department of Medicine and Orthopedics, Temple University School of Podiatric Medicine

*Foot and Ankle Disorders*

**FRANK H. WIANS, Jr., PhD**

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*Normal Laboratory Values*

**JAMES E. WILBERGER, MD**

Professor and Chairman, Department of Neurosurgery, Allegheny General Hospital, Pittsburgh; Vice Dean, Drexel University College of Medicine

*Spinal Trauma*

**MARGARET-MARY G. WILSON, MD**

Medical Director, Health Services, United Healthcare, Maryland Heights

*Nutrition: General Considerations; Syndromes of Uncertain Origin*

**G. TERENCE WILSON, PhD**

Oscar K. Buros Professor of Psychology, Graduate School of Applied and Professional Psychology, Rutgers University

*Eating Disorders*

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*Chronic Obstructive Pulmonary Disease*

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*Obesity and the Metabolic Syndrome*

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Betty and Bob Kelso Distinguished Chair in Burns and Trauma, Vice Chair for Research, and Professor, Department of Surgery, The University of Texas Health Science Center at San Antonio; Chief, Clinical Research, United States Army Institute of Surgical Research

*Burns*

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*External Ear Disorders*

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*Transplantation*