

PEDIATRIC SURGERY

Edited by

KENNETH J. WELCH, M.D.

JUDSON G. RANDOLPH, M.D.

MARK M. RAVITCH, M.D.

JAMES A. O'NEILL, JR., M.D.

MARC I. ROWE, M.D.

FOURTH EDITION

Volume 1

PEDIATRIC SURGERY

Edited by

KENNETH J. WELCH, M.D.

Clinical Professor of Surgery, Harvard Medical School,
Senior Associate in Surgery, The Children's Hospital,
Boston, Massachusetts

JUDSON G. RANDOLPH, M.D.

Professor of Surgery and Child Health, George Washington University,
Surgeon-in-Chief, Children's Hospital National Medical Center,
Washington, D.C.

MARK M. RAVITCH, M.D.

Professor of Surgery, University of Pittsburgh,
Surgeon-in-Chief, Montefiore Hospital, Pittsburgh, Pennsylvania

JAMES A. O'NEILL, JR., M.D.

Professor of Pediatric Surgery, University of Pennsylvania School of Medicine,
Surgeon-in-Chief, The Children's Hospital of Philadelphia,
Philadelphia, Pennsylvania

MARC I. ROWE, M.D.

Professor of Pediatric Surgery, University of Pittsburgh School of Medicine,
Chief of Surgical Services, Children's Hospital of Pittsburgh,
Pittsburgh, Pennsylvania

FOURTH EDITION

Volume 1



YEAR BOOK MEDICAL PUBLISHERS, INC.
CHICAGO • LONDON

Copyright © 1986 by Year Book Medical Publishers, Inc. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Printed in the United States of America.

0 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging in Publication Data

Main entry under title:

Pediatric surgery:

Includes bibliographies and index.

1. Children—Surgery. I. Welch, Kenneth J.

[DNLM: 1. Surgery—in infancy & childhood. WO 925 P371]

RD137.P42 1986 617'.98 85-13775

ISBN 0-8151-9210-X

Notice

Every effort has been made by the editors, the authors, and the publisher of this work to ensure that the procedures and treatment protocols presented herein were in accord with established practice at the time of publication. It should be noted, however, that procedures and treatment are subject to change and modification. In every case the reader is advised to check the latest publications on a given topic and to review recent drug product information to assure that changes have not been made, particularly in the recommended dosage of a drug or in contraindications for its administration.

Sponsoring Editor: Daniel J. Doody

Manager, Copyediting Services: Frances M. Perveiler

Copyeditor: Deborah Thorp

Production Project Managers: Carol Ennis Coghlan, R. Allen Reedtz

Proofroom Supervisor: Shirley E. Taylor

Preface to the First Edition

Pediatric surgery today is one of the most vigorously growing fields in surgery. The establishment of chairs, divisions, and departments of pediatric surgery in university centers attests to an increasing awareness of the special problems in this field. Several societies have been founded to promote knowledge in this area, and special sections exist in others. Two journals are devoted entirely to pediatric surgery, a third has a special department and others publish special issues concerned with its problems.

In June of 1959, an editorial board was formed to enroll the services of recognized authorities in writing a complete textbook of pediatric surgery that would reflect the best thoughts of men from representative institutions, covering a wide geographic area in the United States, Canada and England. As in any branch of surgery, during a period of rapid development and experimentation, much of the material is new, and much of it is as yet unpublished elsewhere in any form.

Our colleagues in many countries are contributing importantly to the growth of pediatric surgical knowledge. They will find repeated references to their published material. We regret that we could not enlist the services of many worthwhile contributors from Australia, Scandinavia and Continental Europe.

This project was conceived to meet the need for a comprehensive work on pediatric surgery presented from as broad a point of view as possible. There was agreement that all aspects of pediatric surgery would be covered, although, in order to limit the work to a reasonable size, it was necessary to restrict the space allotted to such specialty fields as ophthalmology, otolaryngology, orthopedics, and neurosurgery. The heaviest concentration is in the traditional fields of general, thoracic, and urologic surgery.

Particular emphasis has been laid on appropriate treatment of the physiologic, anatomic and embryologic aspects of specific surgical problems. Because we feel that the current state of knowledge is best understood in the light of its development, we have prefaced many subjects with an historical résumé.

Contributors have been urged to express their own feelings clearly on controversial points, to draw particularly on their own experience and, in addition, to evaluate and comment upon the work of others. To this end, we have encouraged extensive bibliographic lists, with annotations in the text. Particular attention has been paid to the illustrations and the publishers have been generous concerning the number included.

Our contributors have been cooperative, prompt, and patient with our editorial suggestions, and we are grateful to them. Some duplication of coverage will necessarily occur in a multiauthor textbook, and we think this not undesirable. Differences of opinion are expressed in some areas, and such differences will be found to exist. In details of treatment, and in other matters, in a variety of aspects of pediatric surgery, the editors do not hold uniform opinions—nor do the contributors. It was felt im-

portant only that an individual contribution present a valid and supportable point of view and a satisfactory method of treatment.

It is hoped that the various sections are developed in a manner systematic enough to make them useful to the student or house officer interested in the field of pediatric surgery, that the presentations are broad enough and sufficiently free from surgical minutiae to be useful to the pediatrician and yet detailed enough to convey to the informed general surgeon each author's assessment of current knowledge in his field and his own recommendations.

We have felt strongly that the value of this presentation would be increased in direct proportion to the briefness of time between the preparation of the manuscript and publication. In a multiauthor work, a good deal of time is necessarily expended in the transmission of manuscripts from authors to editors, in circulation among editors, and resubmission to authors for consideration of joint editorial suggestions. Six months were spent by the editorial board in organizing the form of the work, the division of subject matter, the matter of presentation, the division of editorial responsibilities and the assignment of subjects to the editors and contributors. The actual writing, editing, and publication have been accomplished in less than two years.

The editorial board has functioned in a coordinated effort. While the editors were individually responsible for given Parts, each contributed Sections to Parts for which others were editorially responsible. Every chapter has been reviewed by several members of the board. The distribution of a model chapter, prepared by Doctor Mustard, greatly simplified the problem of achieving uniformity. Doctor Welch served as chairman of the board and was editorially responsible for PART I: *General*, PART II: *Head and Neck*, and PART V: *Genitourinary System*. Doctors Mustard and Ravitch were responsible for PART III: *The Thorax*, Doctor Mustard for PART VI: *Integument and Musculoskeletal System*, and Doctor Ravitch for PART VII: *Nervous System*. Doctors Benson and Snyder prepared PART IV: *Abdomen*. The selection of contributors was a joint editorial effort. Mrs. Muriel McL. Miller was responsible for the uniform pen and ink illustration concept.

We wish to acknowledge our gratitude to our secretaries, Mrs. Ralph Conjour, Miss June Gerkens, Mrs. Grace Crabbe, Mrs. Josephine Dyer, and Miss Linda Morse, for their tolerance and patience, and their willingness to type and retype manuscripts at a rapid pace and make early publication a reality.

We are grateful also to the staff of Year Book Medical Publishers for their enthusiasm and cooperation. The many meetings of the editorial board have been made possible through their generous support.

THE EDITORS



The Editors (*from left to right*): James A. O'Neill, Jr., Kenneth J. Welch, Judson G. Randolph, Marc I. Rowe, and Mark M. Ravitch.

Preface to the Fourth Edition

This edition sees publication a quarter century after the appearance of the first.

With changes in organization and content and the roster of contributors, this edition is in many respects a new book. There are 33 new chapters representing either the presentation of new subjects (or phases of new subjects), or elevation of the status of a brief treatment offered previously. Discussions of the major malignant neoplasms of childhood have been collected in Part III rather than appearing in the various organ- or system-related sections of the book. Transplantation was considered to deserve its own section (Part IV) and an allocation of space that recognized the increasing importance of this exciting area.

Among the 33 new chapters and the subjects accorded expanded treatment are those on teratology, prenatal diagnosis, respiratory support, the immunocompromised child, newer imaging technologies, retinoblastoma, superior vena cava syndrome, esophageal rupture and perforation, gastrostomy, necrotizing enterocolitis, primary peritonitis, ileostomy and colostomy, non-Hodgkin's lymphoma, and six chapters on transplantation.

The increasing scope and complexity of what might be called general pediatric surgery led to the reluctant appreciation that not as much space could be devoted to the special fields as in previous editions. Most notably this has led to a sharp contraction and reorientation of the section that was devoted to cardiac surgery. That section, superbly organized and largely written by Dr. Mustard in the first two editions and brilliantly carried on by Dr. Aberdeen in the third, was in its own right a textbook of pediatric cardiac surgery. The sections on orthopedics and neurosurgery have also been reoriented.

Dr. Aberdeen has retired from the editorial board, as has Dr. Clifford Benson, one of the original editors, and a stalwart editor and contributor to the first three editions. We were delighted that he consented to contribute, once more, the chapter on pyloric stenosis. Drs. O'Neill and Rowe fill the places in the edi-

torial board left by the retirement from it of Drs. Aberdeen and Benson.

The roster of 149 contributors includes 83 new names, recognizing the emergence of new authorities, new possessors of special knowledge. The contributors have been patient and cooperative in responding to the requirements of the book and we are grateful to them.

In the matter of editorial assignment to the various parts, Dr. Rowe took responsibility for PART I—*General*, PART IV—*Transplantation*, and PART IX—*Special Areas of Pediatric Surgery*; Dr. O'Neill, PART II—*Trauma*, and with Dr. Ravitch, PART VII—*The Abdomen*; Dr. Randolph, PART III—*Principal Malignant Tumors*, and with Dr. Ravitch, PART VI—*The Thorax*; Dr. Ravitch, PARTS VI and VII as noted, and PART X—*Skin, Soft Tissues, and Blood Vessels*; and Dr. Welch, PART V—*Head and Neck*, and PART VIII—*The Genitourinary System*.

Dr. Welch served as chairman of the board and Dr. Ravitch functioned as the "final common pathway" for all manuscripts and galleys. Our secretaries—Ruth Jacobson, Suzanne Danais, Katie Moran, Elizabeth Smith, and Norma Hackwelder—have been patient, tolerant, hardworking, and resourceful in typing and retyping manuscripts, tracking and routing contributions with persistence and good humor.

The informal portrait of the editors was taken in the final editorial work session, during a lunch break at which we discussed our hopes for the Fourth Edition and our desire that it prove helpful to pediatric surgeons and surgical residents the world over.

Once more Year Book Medical Publishers has been unstintingly cooperative and efficient and strongly endorsed and supported our efforts to make this essentially new book as complete, authoritative, and handsomely produced as the three preceding editions.

THE EDITORS

Contributors

- ABERDEEN, EOIN, M.D.: Associate Professor, Department of Critical Care and Emergency Medicine, State University of New York, Emergency Room Physician, Upstate Medical Center, Syracuse, New York
- ADKINS, JOHN C., M.D.: Clinical Assistant Professor of Pediatric Surgery, University of Pittsburgh, Attending Surgeon, Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania
- ALTMAN, R. PETER, M.D.: Professor of Surgery and Pediatrics, Columbia University, College of Physicians and Surgeons, Director, Division of Pediatric Surgery, Babies Hospital, Columbia-Presbyterian Medical Center, New York, New York
- AMOURY, RAYMOND A., M.D.: Katherine Berry Richardson Professor of Pediatric Surgery, University of Missouri-Kansas City School of Medicine, Surgeon-in-Chief, The Children's Mercy Hospital, Kansas City, Missouri
- ANDERSON, KATHRYN D., M.D.: Professor of Surgery and Child Health Development, George Washington University, Senior Attending Surgeon, Children's Hospital National Medical Center, Washington, D.C.
- ARENSMAN, ROBERT M., M.D.: Assistant Clinical Professor of Surgery, Louisiana State University Medical College, Chief, Division of Pediatric Surgery, Ochsner Medical Institutions, New Orleans, Louisiana
- ASCHER, NANCY L., M.D., Ph.D.: Assistant Professor, Department of Surgery, University of Minnesota, Clinical Director, Liver Transplant Program, University of Minnesota Hospitals, Minneapolis, Minnesota
- ASHCRAFT, KEITH W., M.D.: Clinical Professor, University of Missouri-Kansas City School of Medicine, Chief of Urology, Children's Mercy Hospital, Kansas City, Missouri
- BARTLETT, ROBERT H., M.D.: Professor of Surgery, University of Michigan, Head, Section of General Surgery, Director, Surgical Intensive Care Unit, University of Michigan Medical Center, Ann Arbor, Michigan
- BARTONE, FRANCIS F., M.D.: Professor of Surgery, Head, Section of Urology, Professor of Pediatrics, University of Nebraska, Omaha, Nebraska
- BELMAN, A. BARRY, M.D., M.S.: Professor of Urology and Child Health and Development, George Washington University School of Medicine and Health Sciences, Chairman, Department of Urology, Children's Hospital National Medical Center, Washington, D.C.
- BENSON, CLIFFORD D., M.D., F.A.C.S., F.A.A.P.: Professor of Clinical Surgery, Wayne State University School of Medicine, Emeritus Surgeon-in-Chief, Children's Hospital of Michigan, Consulting Surgeon, Bon Secours Hospital, Grosse Pointe, Michigan
- BETTS, EUGENE K., M.D.: Assistant Professor of Anesthesia, The University of Pennsylvania, Senior Anesthesiologist and Director, Anesthesia Operating Room Service, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- BISHOP, HARRY C., M.D.: Professor of Pediatric Surgery, University of Pennsylvania School of Medicine, Senior Surgeon, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- BOIX-OCHOA, J., M.D.: Professor of Pediatric Surgery, Autonomous University, Chief, Department of Pediatric Surgery, Children's Hospital, Barcelona, Spain
- BOLES, E. THOMAS, JR., M.D.: Professor and Director, Division of Surgery, Ohio State University College of Medicine, Chief, Department of Pediatric Surgery, Children's Hospital, Columbus, Ohio
- BOLEY, SCOTT J., M.D.: Professor of Surgery and Pediatrics, Chief, Pediatric Surgical Services, Albert Einstein College of Medicine, Chief of Pediatric Surgery, Montefiore Medical Center, New York, New York
- BRUCE, DEREK A., M.B., Ch.B.: Associate Professor, Neurosurgery and Pediatrics, University of Pennsylvania School of Medicine, Associate Neurosurgeon, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- BUNTAIN, WILLIAM L., M.D.: Professor of Surgery, Director, Division of Pediatric Surgery, University of Tennessee Memorial Hospital, Knoxville, Tennessee
- CALDAMONE, ANTHONY A., M.D., M.M.S.: Assistant Professor of Surgery (Urology), Case Western Reserve University School of Medicine, Head, Pediatric Urology, Rainbow Babies and Children's Hospital, Cleveland, Ohio
- CAMPBELL, JOHN R., M.D.: Professor of Surgery and Pediatrics, Chief of Pediatric Surgery, Acting Chairman, Department of Surgery, Oregon Health Sciences University School of Medicine and University Hospitals, Portland, Oregon
- CATLIN, FRANCIS I., M.D.: Professor of Otorhinolaryngology and Communicative Sciences, Baylor College of Medicine, Chief of Otolaryngology Services, St. Luke's Episcopal Texas Children's Hospitals, Houston, Texas
- CHEW, EMILY Y., M.D.: Lecturer, University of Toronto, Staff Ophthalmologist, Toronto General Hospital and the Hospital for Sick Children, Toronto, Ontario
- COLODNY, ARNOLD H., M.D.: Associate Professor of Surgery, Harvard Medical School, Senior Surgeon, Associate Director, Division of Urology, Children's Hospital, Boston, Massachusetts
- CORAN, ARNOLD G., A.B., M.D.: Professor of Surgery, Head of the Section of Pediatric Surgery, University of Michigan Medical School, Surgeon-in-Chief, Mott Children's Hospital, Ann Arbor, Michigan, Chief of the Division of Pediatric Surgery, Henry Ford Hospital, Detroit, Michigan
- CRAWFORD, JOHN D., M.D.: Professor of Pediatrics, Harvard Medical School, Chief, Pediatric Endocrinology-Metabolic Unit, Massachusetts General Hospital, Boston, Massachusetts
- CRAWFORD, JOHN S., M.D., C.M., D.O.M.S. (Eng.), F.R.C.S.(C.): Emeritus Professor of Ophthalmology, University of Toronto, Former Ophthalmologist-in-Chief, Hospital for Sick Children, Toronto, Ontario
- CROMIE, WILLIAM J., M.D.: Associate Professor of Surgery and Pediatrics, Head, Section of Pediatric and Reconstructive Urology, Albany Medical College of Union University, Albany, New York
- D'ANGIO, GIULIO J., M.D.: Professor of Radiology, Professor of Radiation Therapy, Professor of Pediatric Oncology, University of Pennsylvania, Director, The Children's Cancer Research Center, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- DAVIDSON, RICHARD S., M.D.: The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- DEAN, RICHARD H., M.D.: Professor of Surgery, Head, Division of Vascular Surgery, Vanderbilt University School of Medicine, Nashville, Tennessee
- de LORIMIER, ALFRED A., M.D.: Professor of Surgery, School of

- Medicine, University of California at San Francisco, Chief of Pediatric Surgery, University of California, San Francisco, Children's Hospital, San Francisco, California
- de VRIES, PIETER A., M.D.: Professor of Surgery, Chief, Section of Pediatric Surgery, University of Kansas Medical Center, Kansas City, Kansas
- DONAHOE, PATRICIA K., M.D.: Associate Professor of Surgery, Harvard Medical School, Chief of Pediatric Surgery, Director of Pediatric Surgical Research Laboratory, Massachusetts General Hospital, Boston, Massachusetts
- DOWNES, JOHN J., M.D.: Professor of Anesthesia and Pediatrics, University of Pennsylvania, Anesthesiologist-in-Chief and Director, Department of Anesthesia and Critical Care, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- DUCKETT, JOHN W., M.D.: Professor of Urology, University of Pennsylvania School of Medicine, Director, Division of Urology, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- EATON, RICHARD G., M.D.: Associate Professor of Surgery, Columbia College of Physicians and Surgeons, Co-Chief, Hand Surgery Service, The Roosevelt Hospital, New York, New York
- EDGERTON, MILTON T., M.D.: Chairman, Department of Plastic and Maxillofacial Surgery, University of Virginia Medical Center, Charlottesville, Virginia
- EDHOLM, CURTIS D., M.D.: Associate Professor of Surgery (Orthopedic), Michigan State University College of Human Medicine, Project Director, Area Child Amputee Center, Mary Free Bed Hospital and Rehabilitation Center, Grand Rapids, Michigan
- EICHELBERGER, MARTIN R., M.D.: Associate Professor of Surgery and Child Health, George Washington University, Director, Emergency Trauma Services, Children's Hospital National Medical Center, Washington, D.C.
- EIN, SIGMUND H., M.D., C.M., F.R.C.S.(C.), F.A.C.S., F.A.A.P.: Assistant Professor, Department of Surgery, Faculty of Medicine, University of Toronto, Staff Surgeon, The Hospital for Sick Children, Consultant Staff, Division of Pediatrics, Women's College Hospital, Toronto, Ontario
- EPSTEIN, MELVIN H., M.D.: Professor and Chairman, Department of Neurosurgery, Brown University, Providence, Rhode Island
- FILLER, ROBERT M., M.D., F.A.A.P., F.R.C.S.(C.): Professor of Surgery and Pediatrics, University of Toronto, Surgeon-in-Chief, The Hospital for Sick Children, Toronto, Ontario
- FILSTON, HOWARD C., M.D.: Professor of Pediatric Surgery and Pediatrics, Duke University School of Medicine, Chief of Pediatric Surgery Service, Duke University Medical Center, Durham, North Carolina
- FIRLIT, CASIMIR F., M.D., Ph.D.: Professor of Urology, Northwestern University Medical School, Chairman, Division of Urology, Head, Renal Transplantation, Children's Memorial Hospital, Chicago, Illinois
- FONKALSRUD, ERIC W., M.D.: Professor and Chief of Pediatric Surgery, Vice Chairman, Department of Surgery, UCLA School of Medicine, Los Angeles, California
- GANS, STEPHEN L., M.D., F.A.C.S., F.A.A.P.: Clinical Professor of Surgery, UCLA School of Medicine, Attending Surgeon, Cedars-Sinai Medical Center, Los Angeles, California
- GRIFFIN, PAUL P., M.D.: Professor of Orthopaedic Surgery, Harvard Medical School, Orthopaedic Surgeon-in-Chief, The Children's Hospital, Boston, Massachusetts
- GRIFFITH, BARTLEY P., M.D.: Assistant Professor of Surgery, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania
- GROFF, DILLER B. III, M.D., F.A.C.S., F.A.A.P.: Professor of Pediatric Surgery, University of Louisville School of Medicine, Surgeon-in-Chief, Kosair Children's Hospital, Louisville, Kentucky
- GROSFELD, JAY L., M.D.: Lafayette F. Page Professor and Chairman, Department of Surgery, Indiana University School of Medicine, Surgeon-in-Chief, James Whitcomb Riley Hospital for Children, Indianapolis, Indiana
- GUZZETTA, PHILIP C., M.D.: Assistant Professor, Department of Child Health and Development, George Washington University, Attending Surgeon, Children's Hospital National Medical Center, Washington, D.C.
- HALLER, J. ALEX, JR., M.D.: Robert Garrett Professor of Pediatric Surgery, Professor of Emergency Medicine, Professor of Pediatrics, The Johns Hopkins University School of Medicine, Children's Surgeon-in-Charge, The Johns Hopkins Hospital, Baltimore, Maryland
- HARDY, BRIAN E., M.B., Ch.B.: Associate Professor of Surgery, University of Southern California, Chief, Division of Urology, Children's Hospital of Los Angeles, Los Angeles, California
- HARRISON, MICHAEL R., M.D.: Associate Professor of Surgery, University of California at San Francisco, Attending Pediatric Surgeon, USCF Children's Medical Center, San Francisco, California
- HAYS, DANIEL M., M.D.: Professor of Surgery and Pediatrics, University of Southern California School of Medicine, Attending Surgeon, Children's Hospital of Los Angeles, Los Angeles, California
- HELLER, RICHARD M., M.D.: Professor of Radiology and Radiological Sciences, Associate Professor of Pediatrics, Vanderbilt University School of Medicine, Nashville, Tennessee
- HENDREN, W. HARDY, M.D., F.A.C.S.: Professor of Surgery, Harvard Medical School, Chief of Surgery, Children's Hospital Medical Center, Boston, Massachusetts
- HERSH, STEPHEN P., M.D.: Co-Director, Medical Illness Counseling Center, Chevy Chase, Maryland
- HILL, J. LAURANCE, M.D.: Professor of Surgery, University of Maryland, Baltimore, Maryland
- HOLCOMB, GEORGE W., JR., M.D.: Clinical Professor of Pediatric Surgery, Vanderbilt University School of Medicine, Staff Pediatric Surgeon, Vanderbilt Children's Hospital, Nashville, Tennessee
- HOLDER, THOMAS M., M.D.: Clinical Professor of Surgery, University of Missouri-Kansas City School of Medicine, Chief, Thoracic and Cardiovascular Surgery, Children's Mercy Hospital, Kansas City, Missouri
- HOWELL, CHARLES G., M.D.: Associate Professor of Pediatric Surgery and Pediatrics, Medical College of Georgia, Augusta, Georgia
- IWATSUKI, SHUNZABURO, M.D.: Associate Professor of Surgery, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania
- JAFFE, NORMAN, M.D.: Professor of Pediatrics, University of Texas, Chief, Division of Pediatrics, M. D. Anderson Hospital and Tumor Institute, Houston, Texas
- JEFFS, ROBERT D., M.D.: Professor of Pediatric Urology, The Johns Hopkins University School of Medicine, Professor and Director, Division of Pediatric Urology, The Johns Hopkins Hospital, Baltimore, Maryland
- JEWETT, THEODORE C., JR., M.D.: Professor of Surgery and Pediatrics, State University of New York at Buffalo, Associate Chairman, Department of Pediatric Surgery, The Children's Hospital of Buffalo, Buffalo, New York
- JOHNSON, DALE G., M.D.: Professor of Surgery, Professor of Pediatrics, University of Utah College of Medicine, Chief of Surgery, Primary Children's Medical Center, Salt Lake City, Utah
- JONES, PETER G., M.S. (Melb.), F.R.C.S., F.R.A.C.S., F.A.C.S., F.A.A.P. (Hon.): Fellow, Trinity College, Clinical Instructor, University of Melbourne, Surgeon, Royal Children's Hospital, Melbourne, Victoria, Australia
- KABAN, LEONARD B., D.M.D., M.D., F.A.C.S.: Associate Professor, Oral and Maxillofacial Surgery, Harvard School of Dental Medicine, Associate in Surgery, Children's Hospital, Surgeon, Brigham and Women's Hospital, Boston, Massachusetts
- KASS, EVAN J., M.D., F.A.A.P., F.A.C.S.: Chief, Pediatric Urology, William Beaumont Hospital, Royal Oak, Michigan
- KEYV, SHERWIN V., M.D.: Associate Professor at Pediatrics, Harvard Medical School, Director of Transfusion Service, The Children's Hospital Medical Center, Boston, Massachusetts
- KEYSER, JOHN J., M.D., F.A.C.S.: Clinical Instructor in Surgery, Columbia College of Physicians and Surgeons, Attending, Plastic, Reconstructive and Hand Surgery, St. Luke's Roosevelt Hospital Center, New York, New York, Chairman, Section of Plastic Surgery, Morristown Memorial Hospital, Morristown, New Jersey

- KING, DENIS R., M.D.: Associate Professor of Surgery, Ohio State University College of Medicine, Children's Hospital, Columbus, Ohio
- KING, LOWELL R., M.D.: Professor, Division of Urology, Department of Surgery, Department of Pediatrics, Duke University Medical Center, Durham, North Carolina
- KOSLOSKE, ANN M., M.D.: Clinical Professor of Surgery and Pediatrics, University of New Mexico School of Medicine, Director of Pediatric Surgery, University of New Mexico Hospital, Albuquerque, New Mexico
- KOTTMEIER, PETER K., M.D.: Professor of Surgery, State University of New York, Chief of Pediatric Surgery, Downstate Medical Center, Brooklyn, New York
- LACKMAN, RICHARD D., M.D.: Assistant Clinical Professor and Chief, Musculoskeletal Tumor Service, Thomas Jefferson University, Philadelphia, Pennsylvania
- LaROSSA, DONATO, M.D.: Associate Professor of Surgery, University of Pennsylvania School of Medicine, Director, Microsurgery Laboratory, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
- LEAPE, LUCIAN L., M.D.: Professor of Surgery, Tufts University School of Medicine, Chief, Pediatric Surgery, New England Medical Center, Boston, Massachusetts
- LILLY, JOHN R., M.D.: Professor of Surgery, Department of Surgery, Chief of Pediatric Surgery, University of Colorado School of Medicine, Denver, Colorado
- LINDSAY, WILLIAM K., M.D., B.Sc. (Med.), F.R.C.S. (C.), F.A.C.S.: Professor, Department of Surgery, Chairman, Interhospital Coordinating Committee for Plastic Surgery, Head, Division of Plastic Surgery, University of Toronto School of Medicine, The Hospital for Sick Children, Toronto, Ontario
- LLOYD, DAVID A., M.D.: Associate Professor of Surgery, University of Pittsburgh School of Medicine, Pediatric Surgeon, Department of Surgery, Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania
- LONG, DONLIN M., M.D., Ph.D.: Professor and Chairman, Department of Neurosurgery, The Johns Hopkins University School of Medicine, Baltimore, Maryland
- MARTIN, LESTER W., M.D.: Professor of Surgery and Pediatrics, University of Cincinnati College of Medicine, Director of Pediatric Surgery, Children's Hospital Medical Center, Cincinnati, Ohio
- MASTERSON, JOHN S.T., B.Sc., M.D., F.R.C.S.(C.): Clinical Instructor, University of British Columbia, Active Staff, Children's Hospital of British Columbia, Vancouver, British Columbia
- MAUER, S. MICHAEL, M.D.: Professor of Pediatrics, Division of Nephrology, Department of Surgery, University of Minnesota, Minneapolis, Minnesota
- MORGAN, RAYMOND F., M.D., D.M.D., F.A.C.S.: Associate Professor of Surgery, University of Virginia Medical Center, Charlottesville, Virginia
- MULLIKEN, JOHN B., M.D., F.A.C.S.: Associate Professor in Surgery, Harvard Medical School, Surgeon, The Children's Hospital, Boston, Massachusetts
- MURRAY, JOSEPH E., M.D.: Professor of Surgery, Harvard Medical School, Chief of Plastic Surgery, Children's Hospital and Brigham and Women's Hospital, Boston, Massachusetts
- MYERS, NATHAN A., A.M., F.R.C.S., F.R.A.C.S.: Professorial Associate, University of Melbourne, Senior Surgeon, Royal Children's Hospital, Melbourne, Australia
- NADLER, HENRY L., M.D.: Dean, School of Medicine, Professor of Pediatrics, Professor of Obstetrics, Wayne State University, Director, Genetic, Metabolic, and Developmental Disorders Clinic, Children's Hospital of Michigan, Detroit, Michigan
- NAJARIAN, JOHN S., M.D.: Regents' Professor and Chairman, Department of Surgery, University of Minnesota Hospital, Minneapolis, Minnesota
- O'NEILL, JAMES A., JR., M.D., F.A.C.S., F.A.A.P.: Professor of Pediatric Surgery, University of Pennsylvania School of Medicine, Surgeon-in-Chief, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- OTHERSEN, H. BIEMANN, JR., M.D.: Professor of Surgery and Pediatrics, Medical University of South Carolina, Chief, Pediatric Surgery, Medical University Hospital, Charleston, South Carolina
- PAE, WALTER E., JR., M.D.: Assistant Professor of Surgery, The Pennsylvania State University, Staff Surgeon, The Milton S. Hershey Medical Center, Hershey, Pennsylvania
- PASHBY, ROBERT C., M.D.: Assistant Professor, Department of Ophthalmology, University of Toronto, Active Staff, The Hospital for Sick Children, Toronto, Ontario
- PENA, ALBERTO, M.D.: Surgeon-in-Chief, National Institute of Pediatrics, Pre and Post Graduate Professor of Pediatric Surgery, Military Medical School and Faculty of Medicine of the University of Mexico, Mexico City, Mexico
- PETTITT, BARBARA J., M.D.: Assistant Professor of Surgery and Pediatrics, Emory University School of Medicine, Attending Surgeon, Henrietta Eggleston Hospital for Children, Grady Memorial Hospital, Atlanta, Georgia
- PHILIPPART, ARVIN I., M.D.: Associate Professor of Surgery, Wayne State University School of Medicine, Chief of Pediatric General Surgery, Chairman of Surgical Services, Children's Hospital of Michigan, Detroit, Michigan
- PRINGLE, KEVIN C., M.B., Ch.B., F.R.A.C.S.: Associate Professor, University of Iowa College of Medicine, Associate Professor of Surgery (Pediatrics), Department of Surgery, University of Iowa Hospitals and Clinics, Iowa City, Iowa
- RANDOLPH, JUDSON G., M.D.: Professor of Surgery and Child Health, George Washington University, Surgeon-in-Chief, Children's Hospital National Medical Center, Washington, D.C.
- RAPHAELY, RUSSELL C., M.D.: Associate Professor of Anesthesiology and Pediatrics, University of Pennsylvania School of Medicine, Director, Pediatric Intensive Care Complex, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- RAVITCH, MARK M., M.D.: Professor of Surgery, University of Pittsburgh, Surgeon-in-Chief, Montefiore Hospital, Pittsburgh, Pennsylvania
- REEMTSMA, KEITH, M.D., D.M.Sci.: Valentine Mott Professor of Surgery, Chairman, Department of Surgery, Columbia University College of Physicians and Surgeons, Director, Surgical Service, Presbyterian Hospital, New York, New York
- RETIK, ALAN B., M.D.: Professor of Surgery (Urology), Harvard Medical School, Chief, Division of Urology, The Children's Hospital, Boston, Massachusetts
- RODGERS, BRADLEY M., M.D.: Professor of Surgery and Pediatrics, University of Virginia Medical Center, Chief, Children's Surgery, University of Virginia Hospital, Charlottesville, Virginia
- ROSEN, FRED S., M.D.: The James L. Gamble Professor of Pediatrics, Harvard Medical School, Chief, Division of Immunology and Renal Division, The Children's Hospital, Boston, Massachusetts
- ROSENBAUM, KENNETH N., M.D.: Associate Professor of Child Health and Development, George Washington University, Director, Clinical Genetics and Genetics Laboratory, Children's Hospital Medical Center, Washington, D.C.
- ROWE, MARC I., M.D.: Professor of Pediatric Surgery, University of Pittsburgh School of Medicine, Chief of Surgical Services, Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania
- RUSH, BENJAMIN F., Jr., M.D., F.A.C.S.: Professor and Chairman, Department of Surgery, University of Medicine and Dentistry of New Jersey, New Jersey Medical School, Surgeon-in-Chief, University Hospital, Newark, New Jersey
- SANTOS, GEORGE W., M.D.: Professor of Oncology and Medicine, The Johns Hopkins University School of Medicine, Active Staff in Medicine and Oncology, The Johns Hopkins Hospital, Baltimore, Maryland
- SANTULLI, THOMAS V., M.D.: Professor Emeritus of Surgery, Special Lecturer in Surgery, Columbia University, Consultant in Surgery, Columbia-Presbyterian Medical Center, New York, New York
- SCHNAUFER, LOUISE, M.D.: Associate Professor, Pediatric Surgery, University of Pennsylvania School of Medicine, Associate Surgeon, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- SCHULLINGER, JOHN N., M.D., F.A.C.S., F.A.A.P.: Associate Clin-

- ical Professor of Surgery, Columbia University College of Physicians and Surgeons, Associate Attending Surgeon, Columbia-Presbyterian Medical Center (Babies Hospital), New York, New York
- SCHUSTER, SAMUEL R., M.D.: Associate Professor of Surgery, Harvard Medical School, Senior Associate Surgeon, Children's Hospital of Boston, Boston, Massachusetts
- SEASHORE, JOHN H., M.D.: Professor of Surgery and Pediatrics, Yale University School of Medicine, Attending Physician, Yale-New Haven Hospital, New Haven, Connecticut
- SHAW, ANTHONY, M.D.: Clinical Professor of Surgery, UCLA School of Medicine, Director, Pediatric Surgery, City of Hope National Medical Center, Attending Surgeon, UCLA Medical Center, Los Angeles, California
- SHAW, BYERS W., JR. M.D.: Associate Professor of Surgery, Chief, Transplantation Section, Department of Surgery, University of Nebraska, Omaha, Nebraska
- SIEBER, WILLIAM K., M.D.: Clinical Professor of Surgery, University of Pittsburgh, Senior Staff, Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania
- SMITH, BRUCE M., M.D.: Assistant Clinical Professor of Surgery, Vanderbilt University Medical Center, Chief, Vascular Surgical Service, Nashville Veterans Administration Medical Center, Nashville, Tennessee
- SMITH, E. IDE, M.D.: Professor of Surgery, University of Oklahoma College of Medicine, Chief, Pediatric Surgery Service, Oklahoma Children's Memorial Hospital, Oklahoma City, Oklahoma
- SNYDER, HOWARD McC. III, M.D.: Assistant Professor of Surgery/Urology, University of Pennsylvania School of Medicine, Associate Director, Division of Pediatric Urology, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- SOPER, ROBERT T., M.D.: Professor of Surgery, University of Iowa College of Medicine, Director of Pediatric Surgery Service, University of Iowa Hospitals and Clinics, Iowa City, Iowa
- STARZL, THOMAS E., M.D., Ph.D.: Associate Professor of Surgery, University of Pittsburgh School of Medicine, Staff Surgeon, University-Presbyterian Hospital, Pittsburgh, Pennsylvania
- STEPHENS, F. DOUGLAS, M.S. (Melb.), F.R.A.C.S.: Professor Emeritus of Surgery and Urology, Northwestern University Medical School, Pediatric Urologist, Children's Memorial Hospital, Chicago, Illinois
- STONE, H. HARLAN, M.D.: Professor of Surgery and Chief, Division of General Surgery, University of Maryland School of Medicine, Chief of General Surgery, University of Maryland Hospital, Baltimore, Maryland
- TELANDER, ROBERT L., M.D.: Head, Section of Pediatric Surgery, Professor of Surgery, Mayo Medical School, Consultant and Surgeon in Pediatric Surgery, St. Marys Hospital, Rochester, Minnesota
- TEMPLETON, JOHN M., JR., M.D.: Assistant Professor of Pediatric Surgery, University of Pennsylvania School of Medicine, Associate Surgeon, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- TERNBERG, JESSIE L., M.D., Ph.D.: Professor of Surgery and Pediatrics, Chief, Division of Pediatric Surgery, Washington University School of Medicine, Hospital Director, Division of Pediatric Surgery, Children's Hospital of the Washington University Medical Center, St. Louis, Missouri
- THOMPSON, NORMAN W., M.D.: Henry King Ransom Professor of Surgery, University of Michigan School of Medicine, Chief, Division of Endocrine Surgery, University of Michigan Medical Center, Ann Arbor, Michigan
- TOULOUKIAN, ROBERT J., M.D.: Professor of Surgery and Pediatrics, Yale University School of Medicine, Chief, Pediatric Surgery, Attending Surgeon, Yale-New Haven Hospital, New Haven, Connecticut
- TUNELL, WILLIAM P., M.D.: Professor of Surgery, University of Oklahoma College of Medicine, Attending Surgeon, Oklahoma Children's Memorial Hospital, Oklahoma City, Oklahoma
- UDVARHELYI, GEORGE B., M.D., F.A.C.S.: Professor Emeritus of Neurosurgery, Associate Professor Emeritus of Radiology (Neuroradiology), The Johns Hopkins University School of Medicine, Emeritus Staff Neurosurgeon, The Johns Hopkins Hospital, Baltimore, Maryland
- VOTTELER, THEODORE P., M.D.: Clinical Associate Professor of Surgery, University of Texas Health Science Center, Director of Surgical Services, Children's Medical Center, Dallas Texas
- WALDHAUSEN, JOHN A., M.D.: John W. Oswald Professor of Surgery, Chairman, Department of Surgery, The Pennsylvania State University, Chief of Surgery, The Milton S. Hershey Medical Center, Hershey, Pennsylvania
- WATTS, HUGH G., M.D.: Professor of Orthopedic Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania
- WEBER, COLLIN J., M.D., D.M.Sci.: Assistant Professor of Surgery, Director of Endocrine Transplant, Department of Surgery, Columbia College of Physicians and Surgeons, Assistant Attending Surgeon, The Presbyterian Hospital, New York, New York
- WEBER, THOMAS R., M.D.: Associate Professor of Surgery, St. Louis University School of Medicine, Director, Department of Pediatric Surgery, Cardinal Glennon Children's Hospital, St. Louis, Missouri
- WEINTRAUB, WILLIAM H., M.D.: Vice Chairman and Professor of Surgery, Temple University School of Medicine, Director, Department of Surgery, St. Christopher's Hospital for Children, Philadelphia, Pennsylvania
- WEITZMAN, JORDAN J., M.D., F.A.C.S.: Associate Clinical Professor of Surgery, University of Southern California, Chairman, Section of Pediatric Surgery, Cedars-Sinai Medical Center, Los Angeles, California
- WELCH, KENNETH J., M.D., F.A.C.S.: Clinical Professor of Surgery, Harvard Medical School, Senior Associate in Surgery, The Children's Hospital, Boston, Massachusetts
- WHITAKER, LINTON A., M.D.: Professor of Surgery (Plastic), University of Pennsylvania School of Medicine, Chief of Plastic Surgery, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- WHITAKER, ROBERT H., M.Chir., F.R.C.S.: Associate Lecturer, Cambridge University, Consultant Paediatric Urologist, Addenbrooke's Hospital, Cambridge, England
- WIENER, EUGENE S., M.D.: Clinical Assistant Professor of Pediatric Surgery, University of Pittsburgh, Attending Staff, Children's Hospital, Pittsburgh, Pennsylvania
- WINFIELD, JEFFREY A., M.D., Ph.D.: Assistant Professor of Neurosurgery/Pediatrics, State University of New York, Upstate Medical Center, Syracuse, New York
- WOOLLEY, MORTON M., M.D.: Professor of Surgery, University of Southern California School of Medicine, Surgeon-in-Chief and Head, Department of Surgery, Children's Hospital of Los Angeles, Los Angeles, California
- ZIEGLER, MORITZ M., M.D.: Associate Professor of Pediatric Surgery, University of Pennsylvania School of Medicine, Associate Surgeon, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania
- ZUKER, RONALD M., M.D., F.R.C.S.(C.), F.A.C.S.: Assistant Professor of Surgery, University of Toronto, Consultant in Plastic Surgery, The Hospital for Sick Children, Director of the Burn Unit, Toronto General Hospital, Toronto, Ontario

Color Plates

VOLUME 1

Plate I (following page 402)

Hodgkin's Lymphoma
Toxic Nodular Goiter
Massive Cervical Cystic Hygroma
Mixed Intracapsular Hemangioma/Lymphangioma
Mixed Vascular Malformation
Thyroglossal Cyst

Plate II (following page 558)

Congenital Cystic Disease—Left Lower Lobe
Congenital Cystic Disease—Right Lower Lobe
Poland Syndrome
Pectus Carinatum, Atypical
Pectus Excavatum, Extreme Form
Ectopia Cordis

VOLUME 2

Plates III and IV (following page 730)

Omphalocele
Gastroschisis
Patent Omphalomesenteric Duct
Necrotizing Enterocolitis

Non-Hodgkin's Lymphoma of Small Bowel
Intussusception
Chylous Cyst of the Mesentery
Multiple Jejunal Atresias
Hirschsprung's Disease
Hirschsprung's Disease
Intestinal Duplication
Granulomatous Ileitis

Plate V (following page 1126)

Newborn Boy With Abdominal Muscular Deficiency
Syndrome
Splenogonadal Fusion
Hydronephrosis (Ureteropelvic Obstruction)
Unilateral Multicystic Dysplastic Kidney With Proximal
Ureteral Atresia
Exstrophy of the Urinary Bladder
Hydrocolpos in Newborn

Plate VI (following page 1178)

Port-Wine Stain
Complicated Syndactylism
Wringer Injury
Hemangioma
Congenital Lymphedema
Giant, Hairy Pigmented Nevi

Contents

VOLUME 1

PART I. GENERAL

1 / Genetics and Dysmorphology <i>by Kenneth N. Rosenbaum</i>	3
Frequency and Impact of Genetic Disorders	3
Dysmorphology—Definitions	3
Principles of Genetics	3
Assessment of the Child With Malformations	5
Selected Genetic Disorders and Syndromes Featuring Surgically Treatable Malformations	6
Chromosomal Aberrations	7
Counseling in Cases of Isolated Surgically Treatable Malformations	8
2 / Teratology <i>by Henry L. Nadler</i>	11
General Principles	11
Categories of Teratogens	11
Summary	13
3 / Prenatal Diagnosis <i>by Michael R. Harrison</i>	14
Amniocentesis and Genetic Counseling	14
Fetoscopy and Fetal Sampling	15
Prenatal Diagnosis and Perinatal Management	16
4 / Fluid and Electrolyte Management <i>by Marc I. Rowe</i>	22
Fetal and Neonatal Physiology	23
Arriving at the Tentative Program—The Rough Draft	27
5 / Management of the Critically Ill Patient <i>by Marc I. Rowe, Barbara J. Pettitt</i>	31
Monitoring	31
Shock	39
6 / Anesthesia <i>by Eugene K. Betts, John J. Downes</i>	50
The Risks of Anesthesia	50
Principles of Pediatric Anesthesia	51
Results	65
7A / Respiratory Support—Ventilators <i>by Russell C. Raphaely</i>	68
Oxygenation Failure	68
Ventilation Failure	68
Respiratory Support Options	68
Techniques	68
Elevation of Transpulmonary Distending Pressure	68
Inspiratory Pressure Elevation (Mechanical Ventilation)	69
High-Frequency Ventilation	70
Management of Acute Respiratory Failure	70
Complications of Respiratory Support	72
Chronic Respiratory Failure	72
7B / Respiratory Support—Extracorporeal Membrane Oxygenation in Newborn Respiratory <i>Failure</i> <i>by Robert H. Bartlett</i>	74
Technique	75
Results	75
8 / Surgical Infections <i>by Ann M. Kosloske, H. Harlan Stone</i>	78
Components of Infection	78
Host Deficiency States	80
Specific Types of Surgical Infection	80
Sepsis in the Newborn	84
Antibiotics	86

9 / The Immunocompromised Child by Fred S. Rosen	89
B-Cell Deficiencies	89
T-Cell Immunodeficiencies	91
Complement Defects	94
Phagocytic Defects	95
10 / Nutrition of the Surgical Patient by Arnold G. Coran	96
Nutritional Requirements	96
Metabolic Response of the Full-Term Infant to Operation and Stress	97
Nutritional Assessment	98
Enteral Feeding	98
Total Parenteral Nutrition	100
Short-Gut Syndrome	107
Home Parenteral Nutrition	107
11 / Surgical Implications of Hematologic Disorders by Sherwin V. Key	109
Nonhemolytic Anemias	109
Hemolytic Anemias	109
Platelets	111
Nonthrombocytopenic Purpura	112
Coagulation	112
Transfusion Therapy	115
12 / New Imaging Technologies by Richard M. Heller	117
The New Modalities	117
13 / Psychological Implications of Operations in Children by Stephen P. Hersh	125
Biopsychosocial Principles	125
Psychosocial Principles	125
Principles of Treatment	126
Elective Operation	126
Emergency Operation	127
Operation and the Exceptional Child	127
Disturbed and Disturbing Behaviors	127
Use of Medications	128
Glossary of Selected Terms	128

PART II. TRAUMA

14 / Infants and Children as Accident Victims by James A. O'Neill, Jr.	133
15 / Emergency Management of the Injured Child by James A. O'Neill, Jr.	135
Initial Assessment and Management of Life Support	135
Continuing Care of the Stable Patient	137
Priorities in Emergency Treatment	138
16 / Child Abuse by James A. O'Neill, Jr.	138
Incidence and Epidemiology	139
Diagnosis	139
Lesions Associated With Physical Abuse	139
General and Legal Considerations	142
17 / Thoracic Injuries by J. Alex Haller, Jr.	143
Primary Evaluation and Therapy	143
Specific Initial Resuscitative Measures	143
Treatment Approach	144
Potentially Lethal Chest Injuries	148
Less Dangerous Chest Injuries	153
18 / Abdominal Trauma by Martin R. Eichelberger, Judson G. Randolph	154
Evaluation of Intra-abdominal Injury	155
Exploratory Laparotomy	160
19 / Genitourinary Injuries by Howard McC. Snyder III, Anthony A. Caldamone	174
Renal Trauma	174
Ureteral Injuries	178
Bladder Injuries	179
Urethral Injuries	180
Injuries to the External Genitalia	182
20 / Soft Tissue Injuries by Donato LaRossa, Linton A. Whitaker	185
Wound Management	185
Management of Specific Injuries	186
Injuries With Partial or Complete Soft Tissue Loss	188

21 / Musculoskeletal Trauma by Richard S. Davidson, Hugh G. Watts	189
Differences in the Musculoskeletal System Between Children and Adults	189
Initial Assessment: Physical Examination	191
Management	193
Complications and Pitfalls	195
22 / Management of Acute Hand Injuries by Richard G. Eaton, John J. Keyser	197
Evaluation of the Injured Hand	197
Treatment	197
Tendon Injury	199
Nerve Injury	201
Skeletal Injuries	201
23 / Snake and Insect Bites by William L. Buntain	203
Snakebites	203
Insect (<i>Hymenoptera</i>) Stings	207
Spider (Arthropod) Bites	208
24 / Central Nervous System Injuries by Derek A. Bruce	209
Diffuse Injuries	209
Focal Injuries	210
Birth Trauma	212
Emergency Medical Management	213
Medications	214
Spinal Cord Injury	215
25 / Vascular Injuries by James A. O'Neill, Jr.	216
Causes of Injury	216
Diagnosis	217
Preoperative Management	218
Technical Considerations	218
Results and Complications	219
26 / Burns by James A. O'Neill, Jr.	220
Care of Minor Burns	221
Care of Major Burns	221
Treatment	222
Complications Associated With Burn Injury	228
Results	228
27 / Birth Trauma by Peter K. Kottmeier	230
Infants at Risk	230
Nerves	231
Fractures	232
Respiratory Distress	233
Abdominal Distention	234

PART III. PRINCIPAL MALIGNANT TUMORS

28 / Cancer Chemotherapy by Norman Jaffe	241
Indications for Chemotherapy	241
Classification of Chemotherapeutic Agents	241
Vinca Alkaloids	246
Miscellaneous Agents	247
Combination Chemotherapy and Protocol Treatment	248
29 / Radiation Therapy for Solid Tumors by Giulio J. D'Angio	249
General Principles	249
Treatment Modalities	249
Radiation Modifiers	250
Radiation Therapy of Specific Conditions	250
Wilms Tumor	250
Neuroblastoma	252
Soft Tissue Sarcomas	253
Other Soft Tissue Tumors	254
Gonadal Tumors	254
Bone Tumors	255
30 / Hodgkin's and Non-Hodgkin's Lymphoma by Jessie L. Ternberg	256
Hodgkin's Disease	256
Non-Hodgkin's Lymphoma	261
31 / Teratoma by Morton M. Woolley	265
Experimental Embryology	266
Human Embryology	266

Endocrinopathy and Serum Tumor Markers	266
Clinical Aspects of Teratomas	267
Sacroccygeal Teratomas	267
Genetic Presacral Teratomas With Associated Sacral, Anal, and Urinary Anomalies	269
Abdominal Teratomas	270
Gastric Teratomas	270
Retroperitoneal Teratomas	270
Thoracic Teratomas	271
Intrapericardial Teratomas	272
Myocardial Teratomas	272
Cervical Teratomas	272
Epignathi	275
Intracranial Teratomas	275
32 / Rhabdomyosarcoma by Daniel M. Hays	276
Incidence and Sites	276
Etiology and Epidemiology	277
Pathology	277
Development of Combined Therapy Programs	278
Clinical Management	278
Characteristics of Tumors in Specific Sites	279
Summary	282
33 / Neuroblastoma by Jay L. Grosfeld	283
Clinical Presentation	284
Diagnosis	285
Immunologic Aspects	287
Staging	287
Therapy	288
Role of Second and Delayed Primary Operations	290
Prognosis	290
Future Directions	291
34 / Wilms Tumor (Nephroblastoma) by H. Biemann Othersen, Jr.	293
Pathogenesis and Epidemiology	293
Pathology	294
Diagnosis	294
Operative Technique	295
Postoperative Care	296
Metastatic Disease	297
Second Neoplasms	297
Bilateral Tumors	297
Mesoblastic Nephroma	298
Results and Conclusions From the National Wilms Tumor Study	298
Future Directions	300
35 / Tumors of the Liver by Judson G. Randolph, Philip C. Guzzetta	302
Diagnosis of the Child With a Suspected Hepatic Mass	302
Benign Tumors of the Liver	302
Malignant Tumors of the Liver	305
Technique of Liver Resection	308
36 / Bone Tumors by Hugh G. Watts, Richard Lackman	311
Malignant Tumors	311
Benign Tumors	316
37 / Tumors of the Brain and Spinal Cord by George B. Udvarhelyi, Jeffrey A. Winfield	318
Brain Tumors	318
Spinal Cord Tumors	338

PART IV. TRANSPLANTATION

38 / Principles of Whole Organ Transplantation by Thomas E. Starzl, Byers W. Shaw, Jr., Shunzaburo Iwatsuki	347
Immunosuppression	347
Tissue Typing	350
Organ Procurement and Preservation	351
39 / Kidney Transplantation by John S. Najarian, Nancy L. Ascher, S. Michael Mauer	360
Selection and Evaluation of Patients for Renal Transplantation	360
Diseases Leading to Kidney Transplantation	361
Evaluation of the Potential Recipient	361
Relative Indication for Hemodialysis, Peritoneal Dialysis, or Transplantation	362
Preparation of the Patient for Transplantation	362
Donor Selection	363

Pretransplant Transfusions	364
Anesthesia in the Anephric Patient	364
Intraoperative Management and Surgical Technique	364
Routine Postoperative Care	364
Immunosuppressive Therapy	365
Complications in the Postoperative Period	366
Late Post-Transplant Problems	367
Recurrence of the Original Disease in the Transplanted Kidney	368
Psychological Considerations	369
Rehabilitation	370
Cancer	370
Results	372
40 / Liver Transplantation by Thomas E. Starzl, Shunzaburo Iwatsuki, Byers W. Shaw, Jr.	373
The Laboratory Origins	373
The Pace of Clinical Trials	374
Indications for Liver Transplantation	374
Surgical Technique	377
Immunosuppression and Survival	378
The Place of Liver Transplantation in Pediatric Hepatology	381
41 / Heart and Heart-Lung Transplantation by Bartley P. Griffith	383
Cardiac Transplantation	383
Compatibility of Donor-Recipient	384
Donor Criteria and Procurement	384
Operative Technique for Cardiac Transplantation	385
Immune Suppression	385
Surveillance for Rejection	386
Results of Cardiac Transplantation	386
Selection of Candidates for Heart-Lung Transplantation	386
Criteria for Heart-Lung Donor	387
Procurement of Heart-Lung Bloc	387
Operative Technique for Heart-Lung Transplantation	387
Results of Heart-Lung Transplantation	390
42 / Transplantation of Bone Marrow by George W. Santos	392
Selection of Marrow Donors	392
Preparative Regimens	393
Supportive Care	393
Current Clinical Results	393
Complications of Marrow Transplants	393
Conclusions	394
43 / Transplantation of Pancreas, Parathyroids, Intestine, and Other Organs by Keith Reemtsma, Collin J. Weber	395
Pancreas and Islet Transplantation	395
Parathyroid Transplantation	397
Adrenal Autotransplantation	398
Other Endocrine Tissues	398

PART V. HEAD AND NECK

44 / Ophthalmologic Disorders—Eyes and Lids by John S. Crawford, Robert C. Pashby	403
Injuries	403
Surgery of the Eyelids	405
Preoperative Examination	408
Operative Procedures	408
Surgical Treatment of Congenital Cataracts and Dislocated Lens	410
Operation for Obstructed Tear Ducts	416
Ophthalmologic Disorders—Retinoblastoma and Other Retinal Diseases by Emily Y. Chew	417
Diagnosis	418
Genetics of Retinoblastoma	419
Locus of Retinoblastoma Mutation	419
Retinomas	419
Second Nonocular Tumors	419
Pathology	419
Mortality	420
Investigations	420
Treatment	420
Extraocular Retinoblastoma	422
Follow-up	422
Differential Diagnosis	422

45 / Craniofacial Abnormalities by Leonard B. Kaban, John B. Mulliken, Joseph E. Murray	423
Congenital Deformities: Anatomy and Clinical Findings	423
Correction of Congenital Craniofacial Anomalies	431
The Future of Craniofacial Surgery	438
46 / The Nose By Ronald M. Zuker	439
Embryology	439
Anatomy	440
Congenital Anomalies of the Nose	441
Tumors of the Nose	444
Nasal Trauma	447
47 / Cleft Lip and Cleft Palate by William K. Lindsay	450
Cleft Lip	
Normal Lip Development	451
Cleft Lip Development	451
Epidemiology	451
Risk for Future Siblings	451
Historical Aspects	451
Neonatal Management	452
Age at Operation	452
Choice of Anesthesia	452
Neonatal Maxillary Orthopedics	453
The Unilateral Cleft Lip Repair	453
The Bilateral Cleft Lip Repair	453
Changes With Time in Bilateral Cleft Lip	456
Later Management of Patients With Unilateral Cleft Lip	457
Later Management of Patients With Bilateral Cleft Lip	458
The Role of Alveolar Bone Grafting	460
Cleft Palate	
Embryology and Development	460
Classification	461
Applied Anatomy	461
Epidemiology	463
Treatment	464
48 / Otolaryngologic Disorders by Francis I. Catlin	470
Surgery of the Tonsils and Adenoids	470
Operative Treatment of Hearing Impairment	476
Choanal Atresia	482
The Infant Larynx	484
49 / The Salivary Glands by Kenneth J. Welch	487
Benign Neoplasms	487
Malignant Neoplasms	491
Mucoepidermoid Carcinoma	491
Undifferentiated Sarcoma	491
Adenocarcinoma	493
Acinic Cell Carcinoma	493
Embryonal Rhabdomyosarcoma	493
Miscellaneous	493
Discussion	494
Treatment	494
Ranula	495
Sialadenitis	496
Miscellaneous Lesions	499
Sialography	499
Techniques of Parotidectomy	499
50 / The Oropharynx and Jaws by Kenneth J. Welch	502
Congenital Anomalies of the Lip	502
Injuries	503
Hemangioma	505
Vascular Malformations	505
Lesions of the Jaw	506
Infections	510
Lesions of the Tongue and Oral Cavity	511
Lesions of the Nasopharynx	513
Cervicopharyngeal Teratomas of the Newborn	513
51 / Glands of the Neck—Lymphadenitis by Peter G. Jones	517
Acute Coccal Adenitis	517
Mycobacterial Cervical Adenitis	517
Cat-Scratch Disease	519
Glands of the Neck—Neoplasia of Cervical Nodes by Theodore C. Jewett, Jr.	520