

# NEONATOLOGY

Second  
Edition

Pathophysiology and  
Management of  
the Newborn

Edited by

GORDON B. AVERY, M.D., Ph.D.

# Contributors

**R. Peter Altman, M.D.**

Professor of Surgery  
Columbia Presbyterian College of Physicians and Surgeons; and  
Chief, Division of Pediatric Surgery  
Babies' Hospital  
Columbia Presbyterian Medical Center  
New York, New York

**Charles A. Alford, Jr., M.D.**

Meyer Professor of Pediatric Research  
Department of Pediatrics  
University of Alabama in Birmingham  
School of Medicine  
Birmingham, Alabama

**Kathryn D. Anderson, M.D.**

Associate Professor of Surgery and of Child Health and Development  
George Washington University School of Medicine; and  
Senior Attending Surgeon  
Children's Hospital National Medical Center  
Washington, DC

**Gordon B. Avery, M.D., Ph.D.**

Professor of Child Health and Development  
George Washington University School of Medicine; and  
Director, Division of Neonatology  
Children's Hospital National Medical Center  
Washington, DC

**Joseph A. Bellanti, M.D.**

Professor of Pediatrics and Microbiology and  
Director, International Center for Interdisciplinary  
Studies of Immunology  
Georgetown University School of Medicine  
Washington, DC

**A. Barry Belman, M.D.**

Professor of Urology and Child Health and Development  
George Washington University School of Medicine; and  
Chairman, Department of Urology  
Children's Hospital National Medical Center  
Washington, DC

**Diane V. Bernstein, R.N.**

Associate Clinical Unit Coordinator  
Children's Hospital National Medical Center  
Washington, DC

**Attilio L. Boner, M.D.**

Associate Professor of Pediatrics  
University of Verona  
Verona, Italy

**Alfred M. Bongiovanni, B.S., M.D.**

Professor of Pediatrics and of Pediatrics in Obstetrics  
University of Pennsylvania School of Medicine; and  
Director of Perinatal Endocrinology  
Pennsylvania Hospital  
Philadelphia, Pennsylvania

**T. Berry Brazelton, M.D.**

Chief, Child Development Unit  
Children's Hospital Medical Center; and  
Associate Professor of Pediatrics  
Harvard Medical School  
Boston, Massachusetts

**Judyth Todd Brown, R.N., B.S.N.**

Neonatal Nurse Clinician  
Children's Hospital National Medical Center  
Washington, DC

**Phillip L. Calcagno, M.D.**

Professor and Chairman, Department of Pediatrics  
Georgetown University School of Medicine  
Washington, DC

**Judith A. Cannon, R.N.**

Transport Coordinator  
Children's Hospital National Medical Center  
Washington, DC

**George Cassady, M.D.**

Professor of Pediatrics and  
Associate Professor of Obstetrics and Gynecology  
University of Alabama in Birmingham  
School of Medicine  
Birmingham, Alabama

**Richard M. Cowett, M.D.**

Assistant Professor of Pediatrics  
Brown University; and  
Neonatologist  
Women and Infants Hospital of Rhode Island  
Providence, Rhode Island

**Joseph Dancis, M.D.**

Professor and Chairman, Department of Pediatrics  
New York University School of Medicine  
New York, New York

**Michele M. Dombkiewicz, R.N.**

Associate Clinical Unit Coordinator  
Children's Hospital National Medical Center  
Washington, DC

**Mitzi L. Duxbury, F.A.A.N., B.S., M.A., Ph.D.**

Professor of Nursing  
University of Minnesota School of Nursing;  
Assistant Dean for Graduate Studies and  
Professor, Center for Health Services Division  
Minneapolis, Minnesota

**Gloria D. Eng, M.D.**

Professor of Child Health and Development  
George Washington University School of Medicine;  
Chairman, Department of Physical Medicine and  
Rehabilitation  
Children's Hospital National Medical Center  
Washington, DC; and  
Medical Director  
Center for the Handicapped  
Montgomery County, Maryland

**Audrey E. Evans, M.D.**

Director, Division of Oncology  
Children's Hospital; and  
Professor of Pediatrics  
The University of Pennsylvania School of Medicine  
Philadelphia, Pennsylvania

**Murray Feingold, M.D.**

Director, Center for Genetic Counseling and Birth  
Defect Evaluation  
Tufts University School of Medicine and  
Boston Floating Hospital for Infants and Children  
Boston, Massachusetts

**Pamela M. Fitzhardinge, M.D., F.R.C.P.(C)**

Professor of Pediatrics  
University of Toronto;  
Associate Director of Pediatrics and  
Director of the Neonatal Follow-up Program  
Hospital for Sick Children  
Toronto, Ontario, Canada

**Anne B. Fletcher, M.D.**

Director of the Nursery and  
Associate Professor of Child Health and Development  
George Washington University School of Medicine  
Washington, DC

**Roger K. Freeman, M.D.**

Medical Director, Women's Hospital  
Memorial Hospital Medical Center  
Long Beach; and  
Professor-in-Residence, Department of Obstetrics and  
Gynecology  
University of California School of Medicine  
Irvine, California

**David S. Friendly, M.D.**

Associate Professor of Ophthalmology and of Child  
Health and Development  
George Washington University School of Medicine; and  
Chairman, Department of Ophthalmology  
Children's Hospital National Medical Center  
Washington, DC

**Donald C. Fyler, M.D.**

Associate Professor of Pediatrics  
Harvard Medical School; and  
Associate Chief, Department of Cardiology  
Children's Hospital Medical Center  
Boston, Massachusetts

**George P. Glacola, M.D.**

Associate Professor of Pediatrics;  
Head, Division of Neonatology  
University of Oklahoma  
Tulsa Medical College; and  
Director, Eastern Oklahoma Perinatal Center  
Tulsa, Oklahoma

**Harry H. Gordon, M.D.**

Director Emeritus, Rose F. Kennedy Center for  
Research in Mental Retardation and Human  
Development; and  
NARC-Grover F. Powers Professor Emeritus of  
Pediatrics  
Albert Einstein College of Medicine  
Yeshiva University  
New York, New York

**Paul P. Griffin, M.D.**

Professor and Chairman, Department of Orthopedics  
and Rehabilitation  
Vanderbilt University School of Medicine  
Nashville, Tennessee

**Joan E. Hodgman, M.D.**

Professor of Pediatrics  
University of Southern California School of Medicine;  
and  
Director of the Newborn Division  
Los Angeles County-University of Southern California  
Medical Center  
Los Angeles, California

**W. Alan Hodson, M.D.**

Professor and Head, Division of Neonatal Biology  
Department of Pediatrics  
University of Washington School of Medicine  
Seattle, Washington

**Edward H. Hon, M.D.**

Doré Professor of Obstetrics and Gynecology  
Los Angeles County–University of Southern California  
Medical Center  
Los Angeles, California

**Mary Elizabeth L. House, R.N., B.S.N.**

Neonatal Outreach Coordinator  
Children's Hospital National Medical Center  
Washington, DC

**Y. Edward Hsia, B.M., M.R.C.P., D.C.H.**

Professor of Genetics and Pediatrics  
University of Hawaii School of Medicine  
Honolulu, Hawaii

**Pedro A. José, M.D., Ph.D.**

Associate Professor and Chief, Pediatric Nephrology  
Georgetown University School of Medicine  
Washington, DC

**Richard Koenigsberger, M.D.**

Associate Professor of Neurology and Pediatrics and  
Director, Division of Pediatric Neurology  
College of Medicine and Dentistry of New Jersey  
Newark, New Jersey

**Kee S. Koh, M.D.**

Assistant Clinical Professor  
Los Angeles County–University of Southern California  
Medical Center  
Los Angeles, California

**Ernest N. Kraybill, M.D.**

Associate Professor of Pediatrics and  
Chief, Division of Neonatology  
University of North Carolina School of Medicine  
Chapel Hill, North Carolina

**Peter Lang, M.D.**

Instructor in Pediatrics  
Harvard Medical School; and  
Associate in Cardiology  
Children's Hospital Medical Center  
Boston, Massachusetts

**Lula O. Lubchenco, M.D.**

Professor Emerita, Department of Pediatrics  
University of Colorado School of Medicine  
University of Colorado Health Sciences Center  
Denver, Colorado

**M. Jeffrey Maisels, M.B., B.Ch.**

Professor of Pediatrics and of Obstetrics and  
Gynecology  
The Pennsylvania State University College of Medicine;  
and  
Chief, Division of Newborn Medicine  
The Milton S. Hershey Medical Center  
Hershey, Pennsylvania

**Andrew M. Marglith, M.D.**

Professor and Associate Chairman, Department of  
Pediatrics  
Uniformed Services University School of Medicine; and  
Attending Physician  
National Naval Medical Center  
Bethesda, Maryland and  
Walter Reed Army Medical Center  
Washington, DC

**George H. McCracken, Jr., M.D.**

Professor of Pediatrics  
University of Texas Health Sciences Center  
Southwestern Medical School; and  
Attending Physician  
Children's Medical Center and  
Parkland Memorial Hospital  
Dallas, Texas

**Thomas H. Milhorat, M.D.**

Professor of Surgical Neurology and of Child Health  
and Development  
George Washington University School of Medicine; and  
Chairman of Neurosurgery  
Children's Hospital National Medical Center  
Washington, DC

**Thomas Moshang, Jr., M.D.**

Associate Professor of Pediatrics  
Hahnemann Medical College  
Philadelphia, Pennsylvania

**John Stephen Naulty, M.D.**

Instructor in Anesthesia  
Harvard Medical School; and  
Senior Associate in Anesthesia  
Brigham and Women's Hospitals  
Boston, Massachusetts

**Nicholas M. Nelson, M.D.**

Professor and Chairman, Department of Pediatrics  
The Pennsylvania State University College of Medicine  
Milton S. Hershey Medical Center  
Hershey, Pennsylvania

**David J. Nochimson, M.D.**

Associate Professor of Obstetrics and Gynecology and  
Director, Maternal–Fetal Medicine  
University of Connecticut School of Medicine  
Farmington, Connecticut

**William Oh, M.D.**

Professor of Pediatrics and Obstetrics  
Brown University Program in Medicine; and  
Pediatrician-in-Chief  
Women and Infants Hospital of Rhode Island  
Providence, Rhode Island

**Frank A. Oski, M.D.**

Professor and Chairman, Department of Pediatrics  
State University of New York  
Upstate Medical Center  
Syracuse, New York

**Zoe L. Papadopoulos, M.D.**

Assistant Professor and Chief, Pediatric Dialysis and  
Transplantation  
Georgetown University School of Medicine  
Washington, DC

**Karen E. Pape, M.D., F.R.C.P.(C)**

Assistant Professor of Pediatrics  
University of Toronto; and  
Assistant Director of the Neonatal Follow-Up Program  
Hospital for Sick Children  
Toronto, Ontario, Canada

**Roderic H. Phibbs, M.D.**

Professor of Pediatrics and  
Associate, Cardiovascular Research Institute  
University of California in San Francisco  
San Francisco, California



**Edward J. Quilligan, M.D.**

Professor and Director, Division of Maternal-Fetal Medicine

Department of Obstetrics and Gynecology  
University of California School of Medicine  
Irvine, California

**Judson G. Randolph, M.D.**

Professor of Surgery  
George Washington University School of Medicine; and  
Surgeon-in-Chief  
Children's Hospital National Medical Center  
Washington, DC

**David W. Reynolds, M.D.**

Assistant Professor of Pediatrics  
University of Alabama in Birmingham  
School of Medicine  
Birmingham, Alabama

**Jeffrey G. Rosenstock, M.D.**

Assistant Professor of Pediatrics  
University of Pennsylvania School of Medicine; and  
Director, Oncology Ambulatory Services  
Children's Hospital  
Philadelphia, Pennsylvania

**Arnold J. Sameroff, Ph.D.**

Professor of Psychology and  
Associate Director of the Institute for the Study of  
Developmental Disabilities  
University of Illinois at Chicago Circle  
Chicago, Illinois

**Jon W. Scopes, M.B., Ph.D., F.R.C.P.**

Professor of Pediatrics  
St. Thomas's Hospital Medical School  
University of London  
London, England

**Sergio Stagno, M.D.**

Associate Professor of Pediatrics  
University of Alabama in Birmingham  
School of Medicine  
Birmingham, Alabama

**Mildred T. Stahlman, M.D.**

Professor of Pediatrics  
Division of Neonatology  
Vanderbilt University School of Medicine  
Nashville, Tennessee

**Jean J. Steinchen, M.D.**

Assistant Professor of Pediatrics and of Obstetrics and  
Gynecology  
University of Cincinnati College of Medicine and  
Children's Hospital Research Foundation  
Cincinnati, Ohio

**Leo Stern, M.D.**

Professor and Chairman, Department of Pediatrics  
Brown University; and  
Pediatrician-in-Chief  
Rhode Island Hospital  
Providence, Rhode Island

**Paul R. Swyer, M.A., M.B. (Cantab), F.R.C.P.(C),  
F.R.C.P.(Lond), D.C.H.**

Director, Division of Perinatal Medicine and  
Senior Scientist, Research Institute  
The Hospital for Sick Children; and  
Professor, Department of Pediatrics  
University of Toronto  
Toronto, Ontario, Canada

**Leticia U. Tina, M.D.**

Associate Professor and Chief, Renal Clinic  
Georgetown University School of Medicine  
Washington, DC

**William E. Truog, III, M.D.**

Department of Pediatrics  
Division of Neonatal Biology  
University of Washington School of Medicine  
Seattle, Washington

**Reginald C. Tsang, M.B.B.S.**

Professor of Pediatrics and of Obstetrics and  
Gynecology, and  
Director, Diabetes in Pregnancy Program  
University of Cincinnati College of Medicine and  
Children's Hospital Research Foundation  
Cincinnati, Ohio

**Robert Usher, M.D.**

Director of Neonatology  
Royal Victoria Hospital  
Montreal, Quebec, Canada

**Joseph J. Volpe, M.D.**

Professor of Pediatrics, Neurology, and Biological  
Chemistry  
Washington University School of Medicine; and  
Pediatric Neurologist and Neonatologist  
St. Louis Children's Hospital  
St. Louis, Missouri

**Ruth D. Welse, R.N., M.A.**

Assistant Professor of Nursing  
University of Minnesota School of Nursing  
Minneapolis, Minnesota

**Barry Wolf, M.D., Ph.D.**

Assistant Professor of Human Genetics and Pediatrics  
Medical College of Virginia  
Richmond, Virginia

**Sumner J. Yaffe, M.D.**

Professor of Pediatrics and Pharmacology  
University of Pennsylvania School of Medicine; and  
Director, Division of Clinical Pharmacology  
Children's Hospital  
Philadelphia, Pennsylvania

# Preface

Neonatology, an "infant" field at the time the first edition of this book was published, has grown and developed considerably in the ensuing interval. An explosion of publications about the newborn has occupied perhaps a third of the space in pediatric journals and has left the clinician scrambling to keep up with modifications of care. The number of neonatologists has surged, as almost 200 training programs in the United States have graduated fellows who have moved into full-time positions in secondary and tertiary centers. Concern has begun to arise as to when the discipline will be saturated and graduates will no longer readily find jobs, although this time has not yet arrived. However, it has become obvious that the number of pediatric and neonatology trainees will not be sufficient to meet the need for around-the-clock bedside neonatal care supervision. Full-time physician groups, working in shifts, and neonatal nurse practitioners are among the arrangements with which institutions are experimenting to meet this need. It seems clear, however, that even small and frail infants will henceforth command the same diligent and intensive care as is afforded older children who are critically ill.

This book, in its second edition, has required extensive revision to take into account the

developments of the past 5 years. Its general format and goals are nevertheless the same: to serve both as a guide to therapy and an aid to understanding the pathophysiology of diseases affecting the newborn. Six new chapters have been added. The first, on obstetric anesthesiology, reflects the increasing concern of neonatologists for the critical delivery room transition period. The second, on the behavioral characteristics of the newborn, is in keeping with a new awareness of the sensitivity of the newborn as a responsive individual. Indeed, it has recently been the lay public that has pressured the profession to provide more adequately for the humanistic aspects of childbirth. A third new chapter is written by a group of nurses and describes nursing care organization and practices in the intensive care nursery. Another new chapter details present knowledge of the outcome of follow-up of high-risk newborns, with concern for both major handicaps and for subtle perceptual and learning difficulties. The remaining two new chapters are devoted to mineral metabolism and to neonatal urology.

The neonatologist ideal for today's situation is a multitasking superman or superwoman who never sleeps. Both the scientific and intensely personal aspects of neonatal inten-

sive care must be responded to on a case-by-case basis. But in addition, the neonatologist must coordinate a complex interdisciplinary team including nursing, social work, laboratory, respiratory therapy, pharmacy, and consulting medical and surgical specialties. Budgeting involves not only negotiations with hospital administration, but with state and federal agencies, third party payers, and fund raising through public and private grant mechanisms. Making all of these responsive to the unique needs of newborns is akin to administration of a small hospital within a hospital. With regionalization of care, these negotiation and coordination roles are further multiplied. An active interface is vital with both obstetrics and obstetric anesthesiology. Teaching, outcome feedback, and statistics-keeping must reach out to numerous referring hospitals. A transport mechanism must be created and continuously supervised and monitored. Public legislation must be followed and active participation given in the seemingly endless committees responsible for regional planning. Yet, at the same time, new techniques must be evaluated by controlled clinical trials, pathophysiology elucidated through laboratory research, publications scrutinized for new developments, and new equipment evaluated and budgeted.

Needless to say, few individuals can fill all these roles, and specialization within neonatology is beginning to occur both in areas of specific medical expertise and in administrative responsibility. However, our traditional

training is biased strongly toward medical care of individual patients and is weak in many of the other areas vital to success of a program. In the future, it would be prudent for increased emphasis to be placed on administration, personnel policies, public health and epidemiology, statistics, teaching techniques, and the special skills of counseling and negotiation. Although there are aspects of these activities in other pediatric specialties, neonatology is, and will be for the foreseeable future, a uniquely team-oriented discipline. It is permanently embedded in the matrix of total reproductive care, from personal hygiene and sex education, to general health and perinatal care, to high-risk obstetric clinics and delivery management, through neonatal intensive care, to follow-up and rehabilitative care of high-risk infants.

Looking to the future, certain areas of development seem likely. First, the regional perinatal care systems currently being planned and assembled will become more uniform and efficient. Persons with particular training and skills in health care systems management will be responsible for their coordination. Within individual perinatal systems, risk identification and preventive measures, including maternal transfer, will assume increasing importance. Our preoccupation will be more and more with the quality of survivors. To this end, new techniques of monitoring and management will allow care of the brain with sophistication and precision similar to that now possible with care of the lung. There are some interesting years ahead.

**Gordon B. Avery, M.D., Ph.D.**

# Preface to the First Edition

Neonatology means knowledge of the human newborn. The term was coined by Alexander Schaffer, whose book on the subject, *Diseases of the Newborn*, was first published in 1960. This book, together with Clement Smith's *Physiology of the Newborn Infant*, formed cornerstones of the developing field. In the past 15 years, neonatology has grown from the preoccupation of a handful of pioneers to a major subspecialty of pediatrics. Knowledge in this area has so expanded that it now seems important to collect this material into a multiauthor reference work.

Although the perinatal mortality rate has declined over the past 50 years, the best presently attainable survival rates have not been achieved throughout the world, and indeed the United States lags behind 15 other countries, despite its vast resources. New knowledge and improvement in the coordination of services for mother and child are needed to drive down perinatal mortality further. And finally, far greater emphasis must be placed on morbidity, so that surviving infants can lead full and productive lives. One hopes that in the future the yardstick of success will be the quality of life and not the mere fact of life itself.

In this past decade, neonatology, as a rec-

ognized subspecialty of pediatrics, has come into being around the intensive care-premature nursery. Needless to say, the problems of prematurity are far from solved. But neonatology is ripe for a broadening-out from its prematurity-hyaline membrane disease beginnings. The newborn is heir to so many problems and his physiology is so unique and rapidly changing that all conditions of the newborn should come within the concern of the new and expanding discipline of neonatology. It has long since become standard practice to admit to premature nurseries other high-risk infants such as those of diabetic or toxemic mothers. Here the criterion is the need for intensive care. However, the neonatologist's specialized knowledge should give him a significant role in the care of other infants in the first 2 to 3 months of life, whether or not they require intensive care, and whether or not they are readmitted for problems unrelated to prematurity and birth itself. Detailed knowledge of newborn physiology can assist in the management of congenital anomalies, surgical conditions of the neonate, failure to thrive, nutritional problems, genetic, neurologic and biochemical diseases, and a host of conditions involving delayed maturation. Thus one can conceive of a subspecialty sharply limited in



age to early infancy, but broad in its study of the interaction of normal physiology and disease processes.

Neonatology must also grow in its relationship to obstetrics and fetal biology. In the best centers, an active partnership has developed between obstetrics and pediatrics around the management of high-risk pregnancies and newborns. Sometimes training has been cooperative, but in only a few instances have basic scientists concerned with fetal biology been brought into this effort. Important beginnings have been made in studying the fetomaternal unit, such as the endocrine studies of Egon Diczfalussy, the cardiopulmonary studies of Geoffrey Dawes, and the immunologic studies of Arthur Silverstein. But fundamental processes such as the controls of fetal growth and the onset of labor are not understood at this time. Centers or institutes bringing together workers of diverse points of view are needed to wrestle with the profound problems of fetal biology. At the clinical level, the interdependence of obstetrics and neonatology is obvious. As an ultimate development, these two specialties may one day be joined as a new entity, perinatology, at least at the level of training

and certification. In the meantime, far greater mutual understanding and daily interaction are needed for the optimal care of mothers and their infants.

This book is organized around problems as they occur, as well as by organ systems. It hopes to achieve a balance between presentation of the basic science on which rational management must rest, and the advice concerning patient care which experts in each subarea are qualified to give. Individual chapter authors have approached their subjects in varying ways, and no attempt has been made to achieve a completely uniform format. In some instances, there is overlap of subject material, but the somewhat different viewpoints presented, and the desire to spare the reader hopscotching through the book after cross references, have persuaded me to leave small overlaps undisturbed.

It is appreciated that no volume such as this can have more than a finite useful lifetime. Yet while its currency lasts, I hope it will serve as a practical guide to therapy and an aid in the understanding of pathophysiology for those active in the care of newborns.

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**Gordon B. Avery, M.D., PH.D.**

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