

第四版

透析治療手冊

Handbook of Dialysis Therapy

原・著 Allen R. Nissenson
Richard N. Fine

總審閱 陳鴻鈞 教授

翻・譯 陳忠祺・林勤堯・謝君儀
黃子旗・張瑞廷・蔡任弼
吳欣旭・陳煥升・翁志仁
阮國彰 醫師



ELSEVIER TAIWAN LLC

第四版

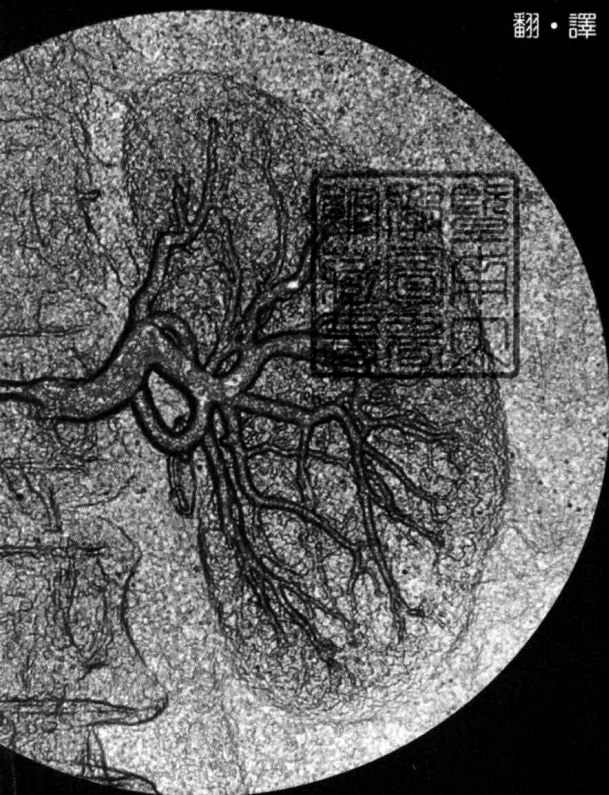
透析治療手冊

Handbook of Dialysis Therapy

原・著 Allen R. Nissenson
Richard N. Fine

總審閱 陳鴻鈞 教授

翻・譯 陳忠祺・林勤堯・謝君儀
黃子旗・張瑞廷・蔡任弼
吳欣旭・陳煥升・翁志仁
阮國彰 醫師



ELSEVIER TAIWAN LLC

透析治療手冊 (第四版) / Allen R. Nissenson、
Richard N. Fine 原著；陳忠祺等編譯。

-- 初版. -- 臺北市：台灣愛思唯爾，2011. 7
面； 公分

含索引

譯自：Handbook of Dialysis Therapy, 4/e

ISBN 978-986-6538-99-5

1.血液透析 2.透析治療

415.8162

100010891

透析治療手冊 (第四版)

原 著：Allen R. Nissenson、Richard N. Fine

編 譯：陳忠祺、林勤堯、謝君儀、黃子旗、張瑞廷
蔡任弼、吳欣旭、陳煥升、翁志仁、阮國彰

發 行 所：台灣愛思唯爾有限公司

發 行 人：王怡華

總 編 輯：徐雅萍

文字編輯：薛詠芬

排 版：王秀菁

封面設計：鄭碧華

地 址：台北市中山北路二段96號嘉新大樓後棟4樓N-412室

電 話：(02) 2522-5900

傳 真：(02) 2522-1885

網 址：www.elsevier.tw

總 經 銷：台灣愛思唯爾有限公司

劃撥帳號：50033265

戶 名：台灣愛思唯爾有限公司

出版日期：西元2011年7月 初版一刷

本書任何部分之文字及圖片，如未獲得本公司之書面同意，
不得用任何方式抄襲、節錄或翻印。

This edition of *Handbook of Dialysis Therapy*, 4/e by **Allen R. Nissenson**, **Richard N. Fine** is published by arrangement with Elsevier Inc.

Copyright ©2008 by ELSEVIER Inc. All rights reserved.
ISBN 13: 978-1-4160-4197-9

Authorized translation from English language edition published by the Proprietor.
Copyright ©2011 by Elsevier Taiwan LLC. All rights reserved.
ISBN: 978-986-6538-99-5

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 the prior written permission of the publisher.

本書任何部分之文字及圖片，如未獲得本公司之書面同意，不得用任何方式抄襲、節錄或翻印。

Elsevier Taiwan LLC

Rm. N-412, 4F, Chia Hsin Building II,
No. 96, Zhong Shan N. Road, Sec. 2, Taipei
10449 Taiwan
Tel: 886-2-2522-5900
Fax: 886-2-2522-1885

First Published 2011
Printed in Taiwan

將此書獻給 Hinda Rosenthal 以茲紀念，其熱忱、智慧、幽默和睿智的建議，對於我個人本身及專業方面一直是非常重要的驅動力。

Allen R. Nissenson 博士

我想將此版透析治療一書獻給我所敬愛的朋友暨同事 John E. Lewy 博士。很不巧地，他在 72 歲生日那天離開人世，這對整個小兒腎臟病學領域來說是個莫大的損失。John 是小兒腎臟病學中的先驅者，而我也將永遠懷念這位朋友及他的智慧。

Richard N. Fine 博士

感謝

Sergio R. Acchiardo, M.D.

Professor and Chief, Division of
Nephrology, The University of
Tennessee Health Science Center,
Memphis, Tennessee

**Rajiv Agarwal, MBBS, MD, DNB,
FAHA, FASN**

Professor of Medicine, Division of
Nephrology, Indiana University;
Staff Physician, Department of
Medicine, VA Medical Center,
Indianapolis, Indiana

Amira Al-Uzri, MD, MCR

Associate Professor of Pediatrics,
Oregon Health & Science
University, Portland, Oregon

Connie Anderson, BSN, MBA

Director of Clinical Services,
Northwest Kidney Centers, Seattle,
Washington

Vincent T. Armenti, MD, PhD

Professor of Surgery, Temple
University School of Medicine;
Interim Surgical Director, Kidney
Transplantation, Temple University
Hospital, Philadelphia, Pennsylvania

Stephen R. Ash, MD, FACP

Clinical Associate Professor, Indiana
University Medical Center,
Indianapolis; Director of Dialysis,
Department of Nephrology, Arnett-

Clarian Health System, Lafayette;
Chairman and Director of Research
and Development, HemoCleanse,
Inc. and Ash Access Technologies,
Inc., Lafayette, Indiana

Morrell Michael Avram, MD

Division of Nephrology, Long Island
College Hospital, Brooklyn, New
York

Antonio Bellasi, MD

Division of Nephrology, University
of Milan and San Paolo Hospital,
Milan, Italy

Mark R. Benfield, MD

Professor of Pediatrics, University of
Alabama at Birmingham; Professor
and Division Director of Pediatric
Nephrology, Children's Hospital,
Birmingham, Alabama

William M. Bennett, MD

Division of Nephrology, Legacy Good
Samaritan Hospital, Portland,
Oregon

Jeffrey S. Berns, MD

Associate Professor of Medicine, Renal,
Electrolyte, and Hypertension
Division, University of
Pennsylvania School
of Medicine; Penn Presbyterian
Medical Center, Philadelphia,
Pennsylvania

Anatole Besarab, MD

Clinical Professor of Medicine,
Wayne State University School
of Medicine; Director of Clinical
Research, Division of Nephrology
and Hypertension, Henry Ford
Hospital, Detroit, Michigan

Christopher R. Blagg, MD, FRCP

Professor Emeritus of Medicine,
University of Washington;
Executive Director Emeritus,
Northwest Kidney Centers, Seattle,
Washington

Geoffrey A. Block, MD

Director of Clinical Research, Denver
Nephrologists, PC, Denver,
Colorado

Paola Boccardo, BiolSciD

Negri Bergamo Laboratories, Mario
Negri Institute for Pharmacological
Research, Bergamo, Italy

W. Kline Bolton, MD

Professor of Medicine and Chief of
Nephrology, University of Virginia
School of Medicine, Charlottesville,
Virginia

Mary L. Brandt, MD

Professor and Vice Chair, Michael E.
DeBakey Department of Surgery,
Baylor College of Medicine;
Department of Pediatric Surgery,
Texas Children's Hospital, Houston,
Texas

Eileen D. Brewer, MD

Professor and Head, Renal Section,
Department of Pediatrics, Baylor

College of Medicine; Chief, Renal
Service, Texas Children's Hospital,
Houston, Texas

Patrick D. Brophy, MD

Assistant Professor of Pediatrics
(Pediatric Nephrology), University
of Michigan; Department of
Pediatrics and Communicable
Diseases, CS Mott Children's
Hospital, Ann Arbor, Michigan

Warren S. Brown, PhD

Professor of Psychology and Director
of the Travis Research Institute,
Graduate School of Psychology,
Fuller Theological Seminary,
Pasadena, California

Suphamai Bunnapradist, MD

Division of Nephrology, Maggiore
Hospital, IRCCS, Milan, Italy

John M. Burkart, MD

Professor of Internal Medicine,
Division of Nephrology
and Director, Dialysis Units, Wake
Forest University
Medical Center, Winston-Salem,
North Carolina

Vito M. Campese, MD

Department of Medicine, The New
York University School of
Medicine; North Shore University
Hospital, Manhasset, New York

Ralph J. Caruana, MD

Professor of Medicine, Division of
Nephrology, Hypertension and
Transplantation, Medical College of
Georgia, Augusta, Georgia

Darrell L. Cass, MD

Assistant Professor, Michael E.

DeBakey Department of Surgery
and Department of Pediatrics,
Baylor College of Medicine; Co-
Director, Texas Children's Fetal
Center, Texas Children's Hospital,
Houston, Texas

Vimal Chadha, MD

Assistant Professor of Pediatrics

and Chief, Pediatric Nephrology,
Virginia Commonwealth University
Medical Center, Richmond, Virginia

Christopher T. Chan, MD, FRCPC

Assistant Professor of Medicine,

University of Toronto; Medical
Director, Home Hemodialysis,
Toronto General Hospital, Toronto,
Ontario, Canada

Chaim Charytan, MD

Clinical Professor of Medicine, Cornell

University College of Medicine,
New York; Chief, Renal Division,
New York Hospital Medical Center
of Queens, Flushing, New York

William R. Clark, M.D.

Clinical Assistant Professor of

Medicine, Nephrology Division,
Indiana University School of
Medicine, Indianapolis, Indiana;
Vice President, Medical Strategy
and Therapy Development, Gambro,
Inc., Lakewood, Colorado

Allan J. Collins, MD, FACP

Chronic Disease Research Group,
Minneapolis, Minnesota

Carl H. Cramer II, MD

Lecturer, Department of Pediatric and

Adolescent Medicine, Division of
Pediatric Nephrology, Mayo Clinic,
Rochester

Terri L. Crawford-Bonadio, RN, CNN

Director of Professional Education,

Fresenius Medical Care North
America, Lexington, Massachusetts

**Declan de Freitas, MB, BAO, BCh,
LRCP&SI, MRCPI**

Registrar in Renal Medicine,

Manchester Institute of ephrology
and Transplantation, The Royal
Infirmary, Manchester, United
Kingdom

José A. Diaz-Buxo, MD, FACP

Clinical Professor of Medicine,

University of North Carolina,
Chapel Hill, North Carolina; Senior
Vice President, Home Therapies
Development, Fresenius Medical
Care North America, Lexington,
Massachusetts

**Lesley C. Dinwiddie, MSN, RN FNP,
CNN**

Senior Vice President, Institute for

Clinical Excellence, Education, and
Research, Wheaton, Illinois

Eileen N. Ellis, MD

Professor of Pediatrics, University of

Arkansas for Medical Sciences;
Director, Pediatric Nephrology,
Arkansas Children's Hospital, Little
Rock, Arkansas

Janet A. Englund, MD

Associate Professor of Pediatrics,
University of Washington;
Associate Professor of Pediatrics,
Section of Infectious Diseases,
Children's Hospital and Regional
Medical Center; Clinical Associate,
Department of Infection Diseases,
Fred Hutchinson Cancer Research
Center, Seattle, Washington

Fabrizio Fabrizi, MD

Staff Nephrologist, Maggiore Hospital,
IRCCS, Milan, Italy

Donald A. Feinfeld, MD, FASN

Professor of Clinical Medicine, Albert
Einstein College of Medicine,
Bronx; Nephrology Fellowship
Program Director, Beth Israel
Medical Center, New York, New
York

Charles Jerome Foulks, MD

Professor of Medicine and Director,
Division of Nephrology-
Hypertension, Texas A&M
University Health Science Center
and College of Medicine, Scott &
White Clinic and Hospital, Temple,
Texas

Denis Fouque, MD, PhD

Professor of Nephrology, JE 2411-
University Claude Bernard, Hôpital
E. Herriot, Lyon, France

Miriam Galbusera, BiolSciD

Negri Bergamo Laboratories, Mario
Negri Institute for Pharmacological
Research, Bergamo, Italy

Dayong Gao, PhD

Professor of Mechanical Engineering,
University of Washington,
Seattle, Washington; Professor of
Mechanical Engineering, University
of Kentucky, Lexington, Kentucky

F. John Gennari, MD

Robert F. and Genevieve B. Patrick
Professor of Medicine, University
of Vermont College of Medicine;
Attending Physician, Department
of Medicine, Fletcher Allen Health
Care, Burlington, Vermont

Jeffrey Giullian, MD

Clinical Fellow, Division of
Nephrology, Vanderbilt University,
Nashville, Tennessee

Stuart L. Goldstein, MD

Associate Professor of Pediatrics,
Baylor College of Medicine;
Medical Director, Renal Dialysis
Unit and Pheresis Service, Texas
Children's Hospital, Houston, Texas

Esther A. Gonzalez, MD

Associate Professor of Internal
Medicine, Division of Nephrology,
Saint Louis University, St. Louis,
Missouri

William G. Goodman, MD

Professor of Nephrology, University of
California, Los Angeles, California

Frank A. Gotch, MD

Associate Clinical Professor of
Medicine, Division of Nephrology,
University of San Francisco, San
Francisco, California

Leila Haghighat

Research Assistant, Division of
Nephrology, Stroger Hospital of
Cook County, Chicago, Illinois

Nikolas B. Harbord, MD

Nephrology Fellow, Beth Israel
Medical Center, New York, New
York

Elizabeth Harvey, MD, FRCPC

Associate Professor of Pediatrics,
University of Toronto; Division
of Nephrology, Hospital for Sick
Children, Toronto, Ontario, Canada

Nicholas Andrew Hoenich, PhD

Lecturer in Clinical Science, School of
Clinical Medical Sciences,
Newcastle University; Clinical
Scientist, Renal Unit, The
Newcastle upon Tyne Hospitals
NHS Trust, Newcastle upon Tyne,
United Kingdom

Christer Holmberg, MD

Professor of Pediatrics, University
of Helsinki; Head of Pediatric
Nephrology and Transplantation,
Hospital for Children and
Adolescents, Helsinki, Finland

Clifford J. Holmes, PhD

Vice President, Scientific Affairs,
Renal Division, Baxter Healthcare,
McGaw Park, Illinois

Robert Hootkins, MD, PhD, FASN

Section Chief, Department of
Nephrology and Hypertension,
Austin Diagnostic Clinic, Austin,
Texas

Daljit K. Hothi, MBBS, MRCPCH

Department of Pediatric Nephrology,
Hospital for Sick Children,
Toronto, Ontario, Canada

Susan Hou, MD

Professor of Medicine, Division of
Nephrology, Loyola University
Stritch School of Medicine,
Chicago, Illinois

**Alastair J. Hutchison, MBChB,
FRCP, MD**

Honorary Lecturer in Medicine,
Manchester University Medical
School; Clinical Director and
Consultant in Renal Medicine,
Renal Unit, Manchester Institute of
Nephrology and Transplantation,
Manchester, United Kingdom

Zhongping Huang, PhD

Assistant Professor of Mechanical
Engineering, Widener University,
Chester, Pennsylvania

Todd S. Ing, MD

Professor Emeritus of Medicine, Loyola
University Chicago, Stritch School
of Medicine, Maywood; Staff
Physician, Department of Medicine,
Veterans Affairs Hospital, Hines,
Illinois

Curtis A. Johnson, PharmD

Professor Emeritus of Pharmacy and
Medicine, University of Wisconsin-
Madison, Madison, Wisconsin

Kamyar Kalantar-Zadeh, MD, MPH, PhD

Associate Professor of Medicine and Pediatrics, Division of Nephrology and Hypertension, University of California, Los Angeles, David Geffen School of Medicine, Los Angeles; Director of Dialysis Expansion Program and Epidemiology, Division of Nephrology and Hypertension, Harbor-UCLA Medical Center, Torrance, California

André A. Kaplan, MD, FACP, FASN

Professor of Medicine, Division of Nephrology, University of Connecticut Health Center; Medical Director, University of Connecticut Dialysis Center; Chief, Blood Purification, John Dempsey Hospital, Farmington, Connecticut

Toros Kapoian, MD, FACP

Associate Professor of Medicine, Division of Nephrology and Hypertension, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School; Medical Director, Kidney Center of New Jersey; Robert Wood Johnson University Hospital; Medical Director, Dialysis Clinic, Inc., North Brunswick, New Jersey

Elaine M. Kaptein, MD, FACP

Professor of Medicine, Division of Nephrology, University of Southern California; Division of Nephrology, LAC+USC Medical Center, Los Angeles, California

Pranay Kathuria, MD

Associate Professor of Medicine and Chief, Section of Nephrology, University of Oklahoma College of Medicine, Tulsa, Oklahoma

Jeffrey L. Kaufman, MD, FACS

Associate Professor of Surgery, Tufts University School of Medicine, Boston; Vascular Surgeon, Baystate Medical Center, Springfield, Massachusetts

William F. Keane, MD

Vice-President, External Medical and Scientific Affairs, Merck & Company, Inc., North Wales, Pennsylvania

Ramesh Khanna, MD

Professor of Medicine and Director, Division of Nephrology, University of Missouri-Columbia, Columbia, Missouri

Neenoo Khosla, MD

Assistant Professor of Nephrology, Northwestern University Feinberg School of Medicine, Chicago, Illinois

Paul L. Kimmel, MD, FACP, FASN

Professor of Medicine and Director, Division of Renal Diseases and Hypertension, George Washington University School of Medicine, Washington, DC

Carl M. Kjellstrand, MD, PhD, FACP, FRCP(C)

Clinical Professor of Medicine, Loyola University, Chicago; Vice President, Medical Affairs, Aksys Ltd., Lincolnshire, Illinois

Laura Kooienga, MD

Assistant Professor, Division of
Renal Diseases and Hypertension,
University of Colorado Health
Science Center, Denver, Colorado

Peter Kotanko, MD

Krankenhäuser der Barmherzigen
Brüder, Abteilung Innere Medizin,
Graz, Austria

**Eugene C. Kovalik, MD, CM,
FRCPCCS, FACP**

Associate Professor of Medicine,
Division of Nephrology, Duke
University Medical Center, Durham,
North Carolina

Matthias Kraemer, MD

Scientific and Medical Affairs,
Fresenius Biotech GmbH,
Bad Homburg, Germany

Anthony Langone, MD

Assistant Professor of Medicine,
Division of Nephrology, Vanderbilt
University; Medical Director,
Kidney Transplantation,
Veterans Affairs Hospital,
Nashville, Tennessee

Peter F. Lawrence, MD

Professor of Surgery, Chief of Vascular
Surgery, and Director of the Gonda
Vascular Center, David Geffen
School of Medicine, University of
California, Los Angeles; University
of California, Los Angeles, Center
for Health Sciences, Los Angeles,
California

Jeffrey J. Letteri, BS

Gambro, Inc., Lakewood, Colorado

Chi-Bon Leung, MB, FRCP

Senior Medical Officer, Department
of Medicine and Therapeutics,
Prince of Wales Hospital, Chinese
University of Hong Kong, Shatin,
Hong Kong

Adeera Levin, MD, FRCPC

Professor of Medicine, Division of
Nephrology, University of British
Columbia; Division of Nephrology,
St. Paul's Hospital; Director,
BC Provincial Renal Agency,
Vancouver, British Columbia,
Canada

Nathan W. Levin, MD

Professor of Clinical Medicine, Albert
Einstein College of Medicine;
Attending Physician, Beth Israel
Medical Center; Medical and
Research Director, Renal Research
Institute, New York, New York

John Kenneth Leypoldt, PhD

Research Professor of Medicine
and Adjunct Professor of
Bioengineering, Department of
Medicine, University of Utah;
Research Service, VA Salt Lake
City Health Care System,
Salt Lake City, Utah

**Philip Kam-Tao Li, MD, FRCP,
FACP**

Professor and Chief of Nephrology,
Department of Medicine and
Therapeutics, Prince of Wales
Hospital, Chinese University of
Hong Kong, Shatin, Hong Kong

**Robert McGregor Lindsay, MD,
FRCPC, FRCP(Edin), FACP,
FRCP(Glasg)**

Professor of Medicine, Division of
Nephrology, The University of
Western Ontario and London Health
Sciences Centre, London, Ontario,
Canada

Francisco Llach, MD

Professor and Director of Clinical
Nephrology, Georgetown University
Medical Center, Washington, D.C.

Margaret MacDougall, MD, PhD

Clinical Associate Professor of
Medicine, SUNY Upstate Medical
University, Syracuse, New York

Lionel U. Mailloux, MD, FACP

Associate Professor of Medicine,
New York University School
of Medicine; Senior Attending
Physician, Department of Medicine,
North Shore University Hospital,
Manhasset; Attending Physician,
Division of Nephrology, St. Francis
Hospital and Heart Center, Roslyn,
New York

Kevin J. Martin, MB, BCh, FACP

Professor of Internal Medicine and
Director, Division of Nephrology,
Saint Louis University, St. Louis,
Missouri

Paul Martin, MD

Professor of Medicine and Associate
Director, Division of Liver
Diseases, Mount Sinai School of
Medicine, New York, New York

Ziad A. Massy, MD, PhD

Professor of Pharmacology and
Director, INSERM ERT 12,
University of Picardie; Professor
of Clinical Pharmacology and
Nephrology, Amiens University
Hospital, Amiens, France

**Philip A. McFarlane, MD, PhD,
FRCP(C)**

Professor, Division of Nephrology,
University of Toronto; Medical
Director, Home Dialysis, St.
Michael's Hospital, Toronto,
Ontario, Canada

Rajnish Mehrotra, MD, FACP, FASN

Associate Professor of Medicine,
David Geffen School of Medicine,
University of California, Los
Angeles; Director, Peritoneal
Dialysis, Department of Medicine,
Harbor-UCLA Medical Center;
Department of Medicine, Los
Angeles Biomedical Research
Institute at Harbor-UCLA Medical
Center, Torrance, California

Mark M. Mitsnefes, MD, MS

Associate Professor of Pediatrics,
University of Cincinnati;
Pediatric Nephrology, Division
of Nephrology and Hypertension,
Cincinnati Children's Hospital
Medical Center, Cincinnati, Ohio

Neal Mittman, MD

Division of Nephrology, Long Island
College Hospital, Brooklyn, New
York

Michael J. Moritz, MD

Chief, Section of Transplantation,
Lehigh Valley Hospital, Allentown,
Pennsylvania

Laura L. Mulloy, DO

Professor of Medicine and Section
Chief of Nephrology, Hypertension
and Transplantation Medicine,
Medical College of Georgia,
Augusta, Georgia

Sean W. Murphy, MD

Associate Professor of Medicine,
Divisions of Nephrology and
Clinical Epidemiology, The
Health Sciences Centre, Memorial
University of Newfoundland, St.
John's, Newfoundland, Canada

Dana Negoi, MD

Assistant Professor of Clinical
Medicine and Medical Director,
Medicine Specialty Clinic,
University of Missouri, Columbia,
Missouri

Alicia M. Neu, MD

Associate Professor of Pediatrics, The
Johns Hopkins University School of
Medicine; Medical Director,
Pediatric Dialysis and Kidney
Transplantation, Department of
Pediatric Nephrology, The Johns
Hopkins Hospital, Baltimore,
Maryland

Bijan Nikakhtar, MD

Division of Nephrology, Georgetown
University Medical Center,
Washington, D.C.

Allen R. Nissenson, MD, FACP

Professor of Medicine, Associate Dean,
Director, Dialysis Program, and
Attending Physician, Department of
Medicine, University of California,
Los Angeles, Medical Center, Los
Angeles, California

Pouneh Nouri, MD

Division of Nephrology, Georgetown
University Medical Center,
Washington, D.C.

Jed G. Nuchtern, MD

Associate Professor, Michael E.
DeBakey Department of Surgery
and Department of Pediatrics,
Baylor College of Medicine,
Houston, Texas

Matthew J. Oliver, MD

Division of Nephrology, Medical
College of Georgia, Augusta,
Georgia

Ali J. Olyaei, PharmD, BCPS

Associate Professor of Medicine,
Division of Nephrology and
Director, Clinical Trials, Oregon
Health and Science University,
Portland, Oregon

Madeleine V. Pahl, MD, FACP

Associate Professor of Medicine,
Division of Nephrology, University
of California, Irvine; Director
of Renal Clinic, Division of
Nephrology, University of
California, Irvine, Medical Center,
Orange, California

Patricia Painter, PhD

Associate Professor of Medicine,
Division of Renal Medicine,
University of Minnesota,
Minneapolis, Minnesota

Biff F. Palmer, MD

Professor of Internal Medicine and
Director, Renal Fellowship Training
Program, Division of Nephrology,
University of Texas Southwestern
Medical Center, Dallas, Texas

Patrick S. Parfrey, MD, FRCPC

University Research Professor,
Department of Medicine, Memorial
University; Staff Nephrologist,
Eastern Health, St. John's,
Newfoundland, Canada

Ashley A. Perilloux, MS, RD

Pediatric Renal Dietitian, University
of California, Los Angeles/DaVita
Pediatric Dialysis, Los Angeles,
California

Phuong-Chi T. Pham, MD

Associate Clinical Professor of
Medicine, Division of Nephrology,
David Geffen School of Medicine,
University of California, Los
Angeles; Division of Nephrology,
Olive View-UCLA Medical Center,
Sylmar, California

Phuong-Thu T. Pham, MD

Assistant Clinical Professor of
Medicine, Kidney and
Pancreas Transplantation, David
Geffen School of Medicine,
University of California, Los
Angeles, California

Andreas Pierratos, MD, FRCPC

Associate Professor of Medicine,
University of Toronto;
Head, Home Hemodialysis,
Department of Medicine,
Humber River Regional Hospital,
Toronto, Ontario, Canada

Joanne D. Pittard, MS, RN

Professor of Allied Health, Community
Services Education, Glendale
Community College, Santa Monica,
California

Patrick H. Pun, MD

Fellow in Nephrology, Duke University
Medical Center, Durham, North
Carolina

Erik Qvist, MD, PhD

Professor, University of Helsinki;
Pediatric Nephrology and
Transplantation, Hospital for
Children and Adolescents, Helsinki,
Finland

Dominic S.C. Raj, MD, DM

Associate Professor of Medicine,
Division of Nephrology, University
of New Mexico Health Sciences
Center, Albuquerque, New Mexico

Giuseppe Remuzzi, MD, FRCP

Director, Division of Nephrology and
Dialysis, Azienda Ospedaliera
Ospedali Riuniti di Bergamo;
Research Coordinator, Negri
Bergamo Laboratories,
Mario Negri Institute for
Pharmacological Research,
Bergamo, Italy

**Claudio Rigatto, MD, FRCPC,
MACP, MSc**

Assistant Professor of Medicine,
University of Manitoba; Staff
Nephrologist, Manitoba Renal
Program, Winnipeg, Manitoba,
Canada

Michael V. Rocco, MD, MSCE, FACP

Professor of Internal Medicine
(Nephrology), Wake Forest
University School of Medicine;
Division of Nephrology, North
Carolina Baptist Hospital, Winston-
Salem, North Carolina

Rudolph A. Rodriguez, MD

Associate Professor of Medicine,
Division of Nephrology, University
of Washington; Section Head,
Primary and Specialty Medicine
Service Line, VA/Puget Sound
Medical Center, Seattle, Washington

Claudio Ronco, MD

Director, Department of Nephrology,
Dialysis, and Transplantation, St.
Bortolo Hospital, Vicenza, Italy

Kai Rönholm, MD, PhD

Professor, University of Helsinki;
Pediatric Nephrology and
Transplantation, Hospital for
Children and Adolescents, Helsinki,
Finland

Mitchell H. Rosner, MD

Assistant Professor of Medicine
and Associate Chief for Faculty
Development, Division of
Nephrology, University of Virginia
Health System, Charlottesville,
Virginia

John H. Sadler, MD

Associate Professor Emeritus of
Medicine, Division of Nephrology,
University of Maryland; President
and Chief Medical Officer,
Independent Dialysis Foundation,
Baltimore, Maryland

Isidro B. Salusky, MD

Professor of Pediatrics, Associate Dean
of Clinical Research, Director,
Pediatric Dialysis Program,
Director, General Clinical Research
Center, David Geffen School of
Medicine, University of California,
Los Angeles, California

Ramin Sam, MD

Assistant Professor of Medicine,
University of Illinois at Chicago
Medical Center; Physician, Stroger
Hospital of Cook County, Chicago,
Illinois

Cheryl P. Sanchez, MD

Associate Professor of Pediatrics,
University of Wisconsin School
of Medicine and Public Health;
Department of Pediatrics, University
of Wisconsin Children's Hospital,
Madison, Wisconsin

Scott G. Satko, MD

Assistant Professor of Medicine and
Director, Nephrology Fellowship
Program, Division of Nephrology,
Wake Forest University School of
Medicine, Winston-Salem, North
Carolina

Franz Schaefer, MD

Professor of Pediatrics, University of Heidelberg; Chief, Division of Pediatric Nephrology, Hospital for Pediatric and Adolescent Medicine, Heidelberg, Germany

Rebecca J. Schmidt, DO, FACP, FASN

Professor of Medicine and Chief, Section of Nephrology, West Virginia University School of Medicine; West Virginia University Hospitals, Morgantown, West Virginia

Cornelis H. Schröder, MD, PhD

Professor of Pediatric Nephrology, University Medical Center, Wilhelmina Children's Hospital, Utrecht, The Netherlands

Gerald Schulman, MD, FAAN

Professor of Medicine, Director of Hemodialysis, Co-Director of Clinical Trials Center in Nephrology, Vanderbilt University Medical Center, Nashville, Tennessee

Steve J. Schwab, MD

Department of Medicine, Division of Nephrology, Medical College of Georgia, Augusta, Georgia

Michael H. Schwenk, PharmD

Division of Nephrology and Hypertension, The New York Hospital of Queens, Flushing, New York

Warren B. Shapiro, MD

Associate Professor of Clinical Medicine, State University of New York Health Sciences Center at Brooklyn; Co-Chief, Division of Nephrology and Hypertension, Brookdale University Hospital and Medical Center, Brooklyn, New York

Richard A. Sherman, MD

Professor of Medicine, Division of Nephrology, University of Medicine and Dentistry of New Jersey—Robert Wood Johnson School of Medicine, New Brunswick, New Jersey

Jodi M. Smith, MD, MPH

Assistant Professor of Pediatrics, University of Washington; Division of Nephrology, Children's Hospital and Regional Medical Center, Seattle, Washington

Michael J.G. Somers, MD

Assistant Professor of Pediatrics, Harvard Medical School; Director of Clinical Services, Division of Nephrology, Children's Hospital Boston, Boston, Massachusetts

Evelyn Spanner, MSc, RD

Renal Program, London Health Sciences Centre, London, Ontario, Canada

Bruce S. Spinowitz, MD, FACP

Associate Clinical Professor of Medicine and Associate Chairman, Department of Medicine, New York Hospital of Queens, Flushing, New York