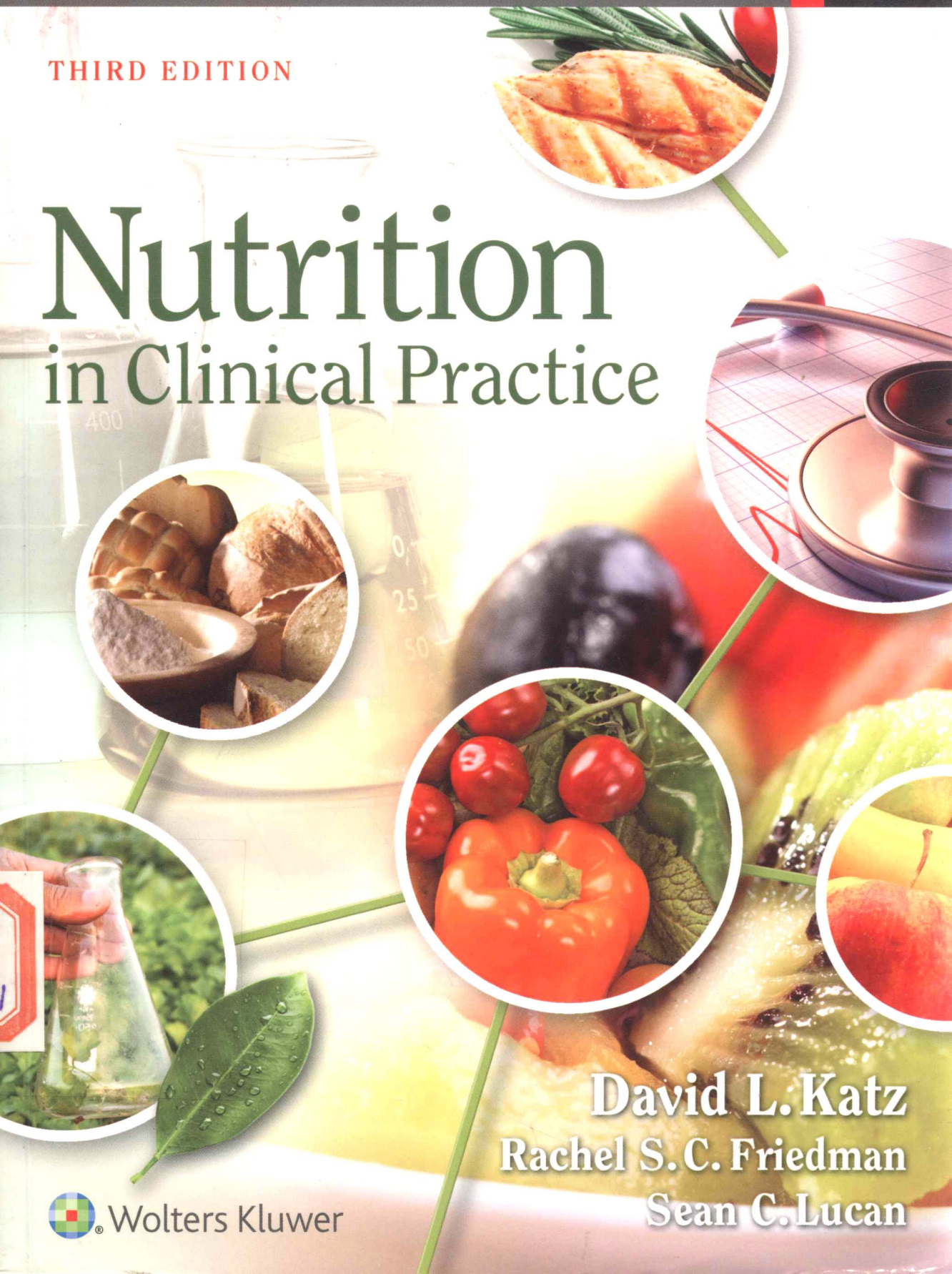


Includes interactive eBook with complete content

THIRD EDITION

# Nutrition in Clinical Practice



David L. Katz  
Rachel S.C. Friedman  
Sean C. Lucan



Wolters Kluwer

# Nutrition in Clinical Practice

***A Comprehensive, Evidence-Based  
Manual for the Practitioner***

THIRD EDITION

**David L. Katz, MD, MPH, FACPM, FACP**

Director, Prevention Research Center  
Yale University School of Public Health  
Griffin Hospital  
Clinical Instructor in Medicine  
Yale University School of Medicine  
Director, Integrative Medicine Center  
Griffin Hospital  
President, American College of Lifestyle Medicine  
Derby, Connecticut



**With**

**Rachel S.C. Friedman, MD, MHS**

Department of Family Medicine  
The Permanente Medical Group  
Santa Rosa, California  
Assistant Clinical Professor  
Department of Community and Family Medicine  
University of California  
San Francisco, California

**and**

**Sean C. Lucan, MD, MPH, MS**

Department of Family and Social Medicine  
Albert Einstein College of Medicine  
Montefiore Medical Center  
Bronx, New York



**Wolters Kluwer**

Philadelphia • Baltimore • New York • London  
Buenos Aires • Hong Kong • Sydney • Tokyo

Executive Editor: Rebecca Gaertner  
Senior Product Development Editor: Kristina Oberle  
Production Project Manager: Alicia Jackson  
Senior Manufacturing Manager: Beth Welsh  
Marketing Manager: Stephanie Manzo  
Design Coordinator: Stephen Druding  
Production Services: S4Carlisle Publishing Services (P) Ltd.

Copyright © 2015 by Wolters Kluwer

Two Commerce Square  
2001 Market Street  
Philadelphia, PA 19103 USA  
LWW.com

2nd edition, © 2008 by LIPPINCOTT WILLIAMS & WILKINS, a Wolters Kluwer Business  
1st edition © 2001 by LIPPINCOTT WILLIAMS & WILKINS

All rights reserved. This book is protected by copyright. No part of this book may be reproduced or transmitted in any form or by any means, including as photocopies or scanned-in or other electronic copies, or utilized by any information storage and retrieval system without written permission from the copyright owner, except for brief quotations embodied in critical articles and reviews. Materials appearing in this book prepared by individuals as part of their official duties as U.S. government employees are not covered by the above-mentioned copyright. To request permission, please contact Wolters Kluwer at Two Commerce Square, 2001 Market Street, Philadelphia, PA 19103, via email at [permissions@lww.com](mailto:permissions@lww.com), or via our website at [lww.com](http://lww.com) (products and services).

9 8 7 6 5 4 3 2 1

Printed in China

Library of Congress Cataloging-in-Publication Data

Katz, David L., 1963-author.  
Nutrition in clinical practice : a comprehensive, evidence-based manual for the practitioner /  
David L. Katz ; with Rachel S.C. Friedman, Sean C. Lucan. — Third edition.  
p. ; cm.  
Includes bibliographical references and index.  
ISBN 978-1-4511-8664-2 (paperback : alk. paper)  
I. Friedman, Rachel S. C., author. II. Lucan, Sean C., author. III. Title.  
[DNLM: 1. Nutritional Physiological Phenomena. 2. Evidence-Based  
Medicine. QU 145]  
RM216  
615.8'54—dc23

2014015290

Care has been taken to confirm the accuracy of the information presented and to describe generally accepted practices. However, the authors, editors, and publisher are not responsible for errors or omissions or for any consequences from application of the information in this book and make no warranty, expressed or implied, with respect to the currency, completeness, or accuracy of the contents of the publication. Application of this information in a particular situation remains the professional responsibility of the practitioner; the clinical treatments described and recommended may not be considered absolute and universal recommendations.

The authors, editors, and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are in accordance with the current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new or infrequently employed drug.

Some drugs and medical devices presented in this publication have Food and Drug Administration (FDA) clearance for limited use in restricted research settings. It is the responsibility of the health care provider to ascertain the FDA status of each drug or device planned for use in his or her clinical practice.

LWW.com

# Get Your Free Enhanced eBook.



Your book purchase includes a complimentary download of the enhanced eBook for iOS, Android, PC & Mac. This eBook features:

- Complete content with enhanced navigation
- A powerful search tool that pulls results from content in the book, your notes, and even the web
- Cross-linked pages, references, and more for easy navigation
- Highlighting tool for easier reference of key content throughout the text
- Ability to take and share notes with friends and colleagues
- Quick reference tabbing to save your favorite content for future use

## Download Your eBook Now:

- 1 Go to <http://solution.lww.com/access>
- 2 Enter the Access Code to the right, and click Redeem Code.
- 3 Enter your information, click "Submit," and follow the on-screen instructions to start reading your eBook.

**Scratch Off Below**



**Katz**

Scratch off the sticker with care.

**NOTE:** Book cannot be returned once the panel is scratched off.



**Wolters Kluwer**

**inking**

Questions, Concerns? We are happy to help. Please contact us at 1-800-468-1128 or [techsupp@lww.com](mailto:techsupp@lww.com)

# Nutrition in Clinical Practice

DCP20/01



*To our patients, and yours.  
They are the reason.*

# ABOUT THE AUTHORS

**David L. Katz, MD, MPH, FACPM, FACP**, is the founding (1998) director of Yale University's Yale-Griffin Prevention Research Center. He received his BA from Dartmouth College (1984; magna cum laude); his MD from the Albert Einstein College of Medicine (1988); and his MPH from the Yale University School of Public Health (1993). He is a two-time diplomate of the American Board of Internal Medicine, a board-certified specialist in preventive medicine/public health, and a clinical instructor in medicine at the Yale School of Medicine.

Dr. Katz is the editor-in-chief of the journal *Childhood Obesity*, president of the American College of Lifestyle Medicine, founder and president of the nonprofit Turn the Tide Foundation, and medical director for the Integrative Medicine Center at Griffin Hospital in Derby, Connecticut. He is the principal inventor of the NuVal nutritional guidance system, currently in more than 2,000 US supermarkets in more than 30 states, coast to coast. He holds five US patents on other inventions, with several patents currently pending.

Dr. Katz has published nearly 200 scientific articles and textbook chapters, innumerable blogs and columns, nearly 1,000 newspaper articles, and authored or coauthored 15 books to date, including multiple editions of textbooks in both nutrition and preventive medicine.

Dr. Katz has been extensively involved in medical education. He was a founding director of one of the nation's first combined residency training programs in internal medicine and preventive medicine (Griffin Hospital, Derby, Connecticut); and served as director of medical studies in public health at the Yale University School of Medicine for a span of 8 years. He has led classes and given lectures for Yale students in medicine, public health, nursing, the physician assistants program, and undergraduates as well as medical residents and faculty.

Dr. Katz is the recipient of many awards for his contributions to public health and medical education. He has been named one of America's top physicians in preventive medicine three times by the Consumer's Research Council of America

and serves as a judge of best diets for the annual ranking published by *US News & World Report*. In 2009, he was a widely supported nominee for the position U.S. Surgeon General. He was named one of the 25 most influential people in the lives of children by *Children's Health Magazine*. In 2012, he was cited by Greatist.com as one of the 100 most influential people in health and fitness (no. 19: <http://greatist.com/health/most-influential-health-fitness-people/>), and recognized again in 2013, moving up to no. 13 (<http://greatist.com/health/most-influential-health-fitness-people/>). He has been honored for career accomplishments by numerous organizations including the Association of Yale Alumni in Public Health; the Academy of Nutrition and Dietetics; and the American College of Preventive Medicine. In 2013, he was awarded an honorary doctorate by the University of Bridgeport in Connecticut for his contributions to public health and patient care.

Dr. Katz has an extensive media portfolio, having worked for ABC News/Good Morning America as an on-air contributor, a writer for the *New York Times* syndicate, and a columnist to *O, the Oprah Magazine*. Currently, he is a blogger/medical review board member for the *Huffington Post*, a health contributor to *US News & World Report*, one of the original 150 "thought leader" Influencer bloggers for LinkedIn, a blogger and columnist for *TIME* magazine, and a contributing health writer on childhood obesity for About.com.

Dr. Katz speaks routinely at conferences and meetings throughout the United States, and around the world, and has delivered addresses in at least seven countries. He is a recognized thought leader in nutrition, chronic disease prevention/health promotion, weight management, and integrative medicine. Widely recognized as a gifted public speaker, he has been acclaimed by peers as the "poet laureate of health promotion."

Dr. Katz and his wife Catherine live in Connecticut; they have five children.

**Rachel Summer Claire Friedman, MD, MHS**, is a practicing family physician in Santa Rosa, California, at Kaiser Permanente Medical Center,

where she cares for a socioeconomically diverse population ranging from newborns to nonagenarians, with a strong focus on holistic approaches and preventive care, utilizing creativity and innovation to provide optimal support for patients in pursuing healthy lifestyles and optimal health. She received a BA in History of Medicine from Harvard University (2001; magna cum laude, Phi Beta Kappa) and MD and MHS degrees from Yale School of Medicine (2008). While in medical school, she worked with Dr. Katz to edit the 2nd edition of this textbook and update his innovative *Nutrition Detectives* curriculum. She personally taught the curriculum to more than 600 schoolchildren in Connecticut from 2005 to 2008. She completed her family medicine residency training at the Santa Rosa Family Medicine Residency, a UCSF affiliate, where she also completed fellowship training in integrative/holistic medicine. Believing in the power of music and whimsy to support health and disease management, she coauthored a full-length educational play, *Diabetes: The Musical* (HYPERLINK "<http://www.diabetesthemusical.com>" [www.diabetesthemusical.com](http://www.diabetesthemusical.com)), which has been featured at several local and national medical conferences. She has cocreated a food system leadership curriculum, training physicians how to counsel patients toward sustainable healthy food choices, and she has conducted a randomized clinical trial assessing the effects on fruit and vegetable consumption when at-risk low-income pregnant women are prescribed farmers market vouchers by their personal physicians. She has been recognized as a leader in the field of family medicine as a Pisacano Leadership Foundation Scholar, and her work connecting community clinics to local food banks and farmers markets and conducting supermarket visits with her patients has been published by local and national family medicine organizations as well as NPR. She is a contributor and editorial board member of the award-winning peer-reviewed

medical publication *Sonoma Medicine*. She lives in Sonoma County with her son and her husband, who is head winemaker for their small family winery Orpheus Wines.

**Sean C. Lucan, MD, MPH, MS**, is a practicing family physician in Bronx, New York, caring for predominantly low-income, minority patients at a federally qualified health center. Much of his clinical time is spent counseling patients on nutrition and managing diet-related diseases. Sean received his MD and MPH degrees from Yale. He subsequently earned an MS in health policy research from the University of Pennsylvania. His current research focuses on how different aspects of local food environments may influence what people eat, and what the implications are for obesity and chronic diseases, particularly in vulnerable communities. Sean has published more than 40 papers in the scientific literature, given more than 50 presentations at national and international science meetings, and has given invited talks around the country on his work. He has received several national awards, including the 2006 AAFP/BMS Award for Excellence in Graduate Medical Education, the 2008 Resident Scholar Award from the AAFP Commission on Sciences, and the 2010 STFM Distinguished Research Paper Award. His research on food environments and nutrition disparities has been recognized with four consecutive contracts from the NIH Loan Repayment Program in Health Disparities. He has been a Pisacano Leadership Foundation Scholar, a Robert Wood Johnson Foundation Clinical Scholar, an Einstein Men's Division Scholar, and is currently a fellow (honorary distinction) in The Obesity Society. He is on the editorial board at *American Journal of Health Promotion*, reviews for 14 other journals on nutrition, public health, and family medicine, and has coauthored a textbook on epidemiology, biostatistics, preventive medicine, and public health.



# CONTRIBUTING AUTHORS

**Ather Ali, ND, MPH, MHS**

Associate Research Scientist, Department  
of Pediatrics  
Integrative Medicine Specialist,  
Yale Stress Center

Director, Integrative Medicine at Yale  
Yale University School of Medicine  
New Haven, Connecticut

**Michelle M. Chen**

Senior Medical Student  
Yale University School of Medicine  
New Haven, Connecticut

**Kimberly N. Doughty, MPH**

Doctoral Candidate in Nutrition  
University of Massachusetts Amherst  
Research Associate  
Yale-Griffin Prevention Research Center  
New Haven, Connecticut

**Asiri S. Ediriwickrema**

Senior Medical Student  
Yale University School of Medicine  
New Haven, Connecticut

**Kofi D. Essel, MD**

Senior Pediatric Resident—Community  
Health Track  
Children's National Medical Center  
Washington, District of Columbia

**Jonathan Fu, MD, MHS**

Department of Emergency Medicine  
University of California San Francisco  
Medical Center  
San Francisco, California

**Richard Joseph, BS**

MD/MBA Candidate  
Stanford University School of Medicine  
Stanford, California

**Stacey Kallem, MD**

Resident Physician  
Children's Hospital of Philadelphia  
Philadelphia, Pennsylvania

**Dhruv Khullar**

Senior Medical Student  
Yale School of Medicine  
New Haven, Connecticut

**Jessica J. Kim, MD**

Department of Family Practice and Surgery  
Contra Costa Regional Medical Center  
Martinez, California

**Ashley Maltz, MD, MPH**

Assistant Professor, Clinician Educator Track  
University of New Mexico School of Medicine  
Department of General Internal Medicine  
Albuquerque, New Mexico

**Stephanie M. Meller**

Senior Medical Student  
Yale University School of Medicine  
New Haven, Connecticut

**David Merrick, MD**

Resident Physician in Internal Medicine  
University of Pennsylvania  
Philadelphia, Pennsylvania

**Lindsay Moyer, MS, RD**

Washington, DC

**Maria F. Nardell**

Senior Medical Student  
Yale University School of Medicine  
New Haven, Connecticut

**Valentina Vinante, MD, MPH**

Resident in Obstetrics and Gynaecology  
Frauenklinik Fontana Chur, Switzerland

**Ming-Chin Yeh, PhD, MEd, MS**

Associate Professor  
Nutrition Program  
CUNY School of Public Health  
Hunter College, City University of New York  
New York, New York

# PREFACE

**T**here are two prior editions of *Nutrition in Clinical Practice*, and thus two prior prefaces. That argues for brevity this time around, and I gladly concede.

That there is an opportunity for a third addition is testimony to the success of the first two. I find that gratifying, of course, but it is credit we share. This endeavor was always about practice more than theory; reading and application, more than writing. I am grateful so many colleagues recognize the relevance of nutrition to their practices and patients. It is upon that shared conviction that the rationale for this effort rests.

That there is need for a new edition is likely self-evident. The medical literature is not only vast, but growing at an ever accelerating pace. The nearly 10,000 citations in this third edition testify to how salient nutrition research is in that formidable flow of information. This new edition updates both content and citations, while reaffirming those fundamentals of nutrition that have stood the test of time. Those, too, are salient.

At the outset, we had thought to add many new chapters, but found that much of the new content situated itself comfortably into existing chapters. When it wasn't broken, we decided not to fix it. Many chapters thus have new sections, and all have been comprehensively revised; but the basic structure of the book and sequence of chapters is much as it was. My hope is that familiarity in this case will breed only accessibility and user-friendliness.

We did add a section on current, and controversial, topics in clinical nutrition. This section cannot, of course, be comprehensive; nor can it promise to be entirely current at the time of publication, let alone some number of months or years after that. The preoccupation with nutrition and diet in popular culture shifts rapidly, if redundantly, over time. This section is, more than anything, an acknowledgment of that preoccupation; of its relevance to clinical practice

and counseling; and of the important opportunity to approach such topics with the same dispassionate review of evidence germane to all other subjects in this diverse space. Those principles should remain reliably current.

Perhaps most importantly, the third edition is the beneficiary of a wonderful hybrid vigor, courtesy of my diverse team of associate and assistant authors. Associate authors, Drs. Friedman and Lucan, bring to the project well cultivated knowledge of nutrition and a pragmatism born of regular clinical practice. The larger group of assistant authors encompasses medical students, dietitians, public health professionals, naturopathic physicians, and nutritional epidemiologists—all committed to the same goal of reconciling the robust evidence base underlying nutrition and health with the constraints of clinical practice, for the benefit of provider and patient alike.

The captain, we know, goes down with the ship; but he (historically) or she cannot generally sail it alone. A book like this is much the same. And so it is that I am indebted to the team without whom I would have found this update an oppressive venture at best, but must personally accept responsibility for any lapses in our seaworthiness. Should there prove to be any important omissions or inadvertent misrepresentations, I am accountable for them. I am hopeful there will be few, if any.

We have worked hard to bring you a distillation of the current evidence in nutrition, enriched by relevant theory, but devoted to practice. And so it is that we go once more into the breach, together, in an effort to translate what we know about nutrition and health into what we do. A succession of editions is all well and good, but the true measure of our collective success is the years this body of knowledge can add to the lives of our patients, and the life it can add to their years. May those metrics reward us all.

—David L. Katz

# PREFACE TO THE FIRST EDITION

**W**hile compiling this text, I have been as committed to what it excludes as to what it includes. Excellent, comprehensive textbooks, even encyclopedias, of nutrition have been written. I have made use of a good many of them in this effort. But as it may, in fact, be considered true that we “are” what we eat, such books cover a vast array of topics in agonizing details. Agonizing, that is, for the clinician seeking the answers to clinical questions but quite appropriate for the nutritional biochemist.

First among the principles to which this text is devoted is *clinical relevance*. If material seemed likely to be of use to the clinician interacting with a patient, even occasionally, it was included. If such an application seemed far-fetched, or if the material did not support an understanding that would enhance such an exchange, it was left out. The range of nutrition topics germane to clinical care is quite expansive. Thus, a fairly selective inclusion process resulted in leaving quite a lot still to be said.

The second principle governing the compilation of this text is *consistency of application*. Only in books do states of health and disease, and the underlying factors that promote them, stay neatly in their own columns and rows. In reality, these states coexist in single patients, often in complex abundance. Therefore, mutually exclusive, disease-specific nutrition recommendations are apt to be of limited clinical utility. Conversely, if dietary recommendations never change in accommodation to varying states of health and clinical objectives, a book of many chapters seems an excessive effort to portray this set of uniform guidelines. I have sought the middle ground between the subtle applications of nutritional management that pertain to the occasional disease or risk factor and the unifying features of diet that may be universally applied to promote health.

The third principle governing this effort is that to be of use, material intended for clinical application must be described in terms of the extent, consistency, and quality, of *the underlying evidence*. This may be considered a text of evidence-based medicine, with the literature reviewed for

each chapter considered to represent preliminary, suggestive, or definitive evidence of any association described.

I strove to be consistent in the application of such terms, but found myself sometimes using, for example, “conclusive” rather than “definitive.” Despite such variation, the character of the evidence base should generally be clear. Associations supported by animal or in vitro or observational evidence only were considered *preliminary*; associations supported by a combination of basic science studies as well as observational studies in humans, or by limited interventional studies in humans, were considered *suggestive*; and associations subtended by the results of either large-scale human intervention trials (particularly randomized, controlled trials), or the aggregation of consistent results from numerous less rigorous studies were considered *definitive*.

The fourth principle, related to the third, is that for a subject of scrutiny to be well understood, it must be *viewed in its entirety* (or some approximation thereof). There is a risk (although certainly, too, a benefit) when each of many experts elaborates one particular aspect of nutrition as it pertains to health. That risk was perhaps never better expressed than in the allegorical poem, *The Blind Men and the Elephant*, by John Godfrey Saxe. I in no way wish to suggest that the expert authors of detailed chapters in the standard nutrition texts suffer any semblance of blindness, but rather that something of the overall character of nutrition and health is missed when only a small part is examined in great detail. I have become convinced, for example, that nominal n-3 fatty acid deficiency is likely widespread in the United States and contributing to adverse health outcomes. This conclusion is reached less on the basis of definitive evidence in any one area and more on the basis of remarkably consistent and voluminous evidence in the aggregate, across the expanse of many subjects. Only one author, struggling through each of many chapters in turn, may infuse the characterization of each topic with understanding derived from the others. As I cannot dispute the potential disadvantages of solo authorship, I have sought

instead to capitalize fully on any potential advantages. I have therefore freely shared what insights I have gained in the sequential review of so many topics, endeavoring at all times to be clear about the sources of my opinion and the nature of the evidence.

The final principle to which this text is devoted is the notion that there should be a *theoretical model* in which the complex interplay of human behavior, food, and health outcomes is decipherable. In much the same way that unifying threads of evidence have led me to specific recommendations for nutrition management, I have come through this labor convinced of the utility of the *evolutionary biology model* of human dietary behavior. This argument is elaborated in Chapter 39. The behavior and physiology of all animals are largely governed by the environments to which they adapted; there is both reason and evidence to suggest that, with regard to nutrition, the same is true of us.

While there is some interpretation offered in this text, it is only that which a devotee and teacher of evidence-based principles of medicine could abide and not avoid. In the inescapable need to convey to you my interpretations, I have endeavored to cleave as close and consistently to fact as possible. In the time-honored medical tradition of blending the best of available science with just the requisite art, I submit this work to you as a platform for the clinical practice of nutrition.

Following the introduction, a concise but comprehensive overview of dietary influences on the organ system or pathology under discussion is provided. The overview is generally divided into the influence of the overall dietary pattern (*Diet*) and the influence of specific nutrient (*Nutrients/Nutriceuticals*). As indicated, other topics are included in the overview, such as pathophysiology, epidemiology, and other issues of clinical relevance and/or general interest. The overview section uses the scheme above to rate the available evidence for each practice. Unpublished and non-peer-reviewed literature has been accessed as required to facilitate preparation of this text, but the assessment of evidence is based only on the peer-reviewed literature; references are to be found at the end of each chapter. Following the overview, other *Topics of Interest* not related directly to dietary management are provided as indicated (e.g., surgical management of severe

obesity). Chapters conclude with *Clinical Highlights*, a summary of those nutritional interventions of greatest clinical utility and for which the evidence is decisive, convincing, or suggestive. Each chapter is cross-referenced with other chapters and with pertinent *Nutrient/Nutriceutical Reference Tables* and other *Nutrition Resource Materials* in Section III.

#### *Claims, Disclaimers, and Acknowledgments*

Solo authorship of a text on nutrition may seem an act of either brash imprudence or unpardonable hubris. At times, poring over references and painstakingly compiling chapters, I have been tempted to think it both. But, please accept my assurances that it is neither. There is very definitely method in the potential madness of this project.

I am a clinician with an active practice in primary care internal medicine. Every day in the office I am confronted by the abiding interest of my patients in their own nutritional practices and by the innumerable attendant questions. And to be of use to my patients, to offer guidance when guidance is needed, I must have the answers at hand. I can certainly refer to a dietitian for counseling in support of clinical goals, but hardly as a means of answering each question that comes along.

So the clinician in practice, encountering what I in my practice encounter every day, must be able to answer a range of questions about nutrition and health, nutrition and disease. If unable to do so, the clinician misses a crucial opportunity to influence favorably the role of dietary behavior in the mitigation of chronic disease. On the list of the leading causes of death in the United States, dietary practices rank number 2, just behind smoking.

My nutrition expertise, cultivated by training, research, and teaching over the past 15 years, is appropriate for this project. But I certainly cannot claim to have the consummate knowledge in each of the diverse content areas of this text that is owned by that field's luminaries. To those experts, far too numerous to mention here, I owe a monumental debt. I have endeavored to make their work accessible to an audience of clinicians, but, in doing so, I have traveled the many trails they so painstakingly blazed.

My legitimacy, or perhaps my excuse, then, is not so much my claim to expertise in everything from lipid metabolism to ergogenic aids, but

rather my dual devotion to nutrition and to clinical practice. The experts to whom I am indebted have made their contributions to the literature, yet the accessibility of that literature to the busy practitioner is suspect. This text is as much translation as original work, the translation of current nutrition knowledge into a form useful to the clinician. This text of nutrition is both by, and for, the practicing clinician. If any one practitioner is to access all of this information and apply it to clinical practice, it is only reasonable that one clinician has been able to write it.

And so that is why I have written this text and justified the interminable hours of effort to myself. To those whose work has guided me, I offer thanks. For any omissions, or worse still, misrepresentations, I accept full responsibility (who else could I blame?). Yet even this solo effort has depended, and greatly benefited, from the direct and indirect contributions of many individuals. I owe debts of gratitude; I have little hope to repay to those who made this book possible.

—David L. Katz



# ACKNOWLEDGMENTS

**F**irst, and perhaps foremost, I am grateful to the panoply of researchers whose work is cited throughout this text. The effort of writing this book seemed considerable, but is of course vanishingly trivial in comparison to compiling the evidence on which it is based. This text is principally a distillation of evidence, and inclines with the vast weight of it. The many who have contributed to that mass of information are my teachers, my mentors, and in some cases, my heroes. I am indebted to this community of scholarship.

I owe thanks to my literary agent, Rick Broadhead, who helped navigate all of us—ably, as ever—from aspiration to collaboration. I very much appreciate the timely, supportive, and always professional contributions of our editors at Wolters Kluwer Health–Lippincott Williams & Wilkins, in particular Sonya Seigafuse, Rebecca Gaertner, and Kristina Oberle. My thanks as well to others involved in the many ancillary efforts critical to completion of a book, from graphic art for the cover to careful proofing, production, and marketing.

I was delighted to work again with my friend and colleague, Dr. Rachel Friedman, and to add to the mix my friend and colleague, Dr. Sean Lucan. The project is the better for both of their contributions. I am grateful to Dr. Lucan particularly for helping out when the new demands of motherhood put Rachel in the bind of choosing

between our timeline, or maybe getting an occasional hour of sleep. We came through as a team, and I am grateful.

I am grateful as well to the other members of our expanded team, the assistant authors who helped us divvy up and update these many chapters. The basic obligations unified us, but the diversity of backgrounds and perspectives undoubtedly fortified us as well. My thanks, and congratulations, to the expanded team that worked harmoniously throughout the process and brought the product to its timely completion.

Thanks, as ever, to my administrative assistant, Helen Day, who gets me where I need to be when competing demands on my time—including those involved in writing a book—make me a bit dizzy.

Lastly, and most intimately, I acknowledge the debt I owe my family for the love and support that is inevitably the sustenance for such endeavors as this. That they remain both covetous of time with me and willing to forgo it unbegrudgingly when duty calls is a source of pride and appreciation, love and humility. I imagine my coauthors have similar debts, and similar sentiments. Writing books means many hours alone—but it is the larger something of which we are, alone, just a part that makes books and writing matter. So thank you, too.

# **Nutrition in Clinical Practice**

# CONTENTS

About the Authors   vii  
Contributing Authors   ix  
Preface   xi  
Preface to the First Edition   xiii  
Acknowledgments   xvii

<b>SECTION I</b>	<b>Clinically Relevant Nutrient Metabolism . . . . .</b>	<b>1</b>
1	Clinically Relevant Carbohydrate Metabolism . . . . .	3
2	Clinically Relevant Fat Metabolism . . . . .	14
3	Clinically Relevant Protein Metabolism. . . . .	25
4	Overview of Clinically Relevant Micronutrient Metabolism . . . . .	33
<b>SECTION II</b>	<b>Nutritional Management in Clinical Practice: Diet, in Sickness and in Health . . . . .</b>	<b>53</b>
5	Diet, Weight Regulation, and Obesity . . . . .	55
6	Diet, Diabetes Mellitus, and Insulin Resistance . . . . .	122
7	Diet, Atherosclerosis, and Ischemic Heart Disease. . . . .	151
8	Diet and Hypertension . . . . .	182
9	Diet and Hemostasis. . . . .	192
10	Diet and Cerebrovascular and Peripheral Vascular Disease . . . . .	204
11	Diet and Immunity. . . . .	215
12	Diet and Cancer . . . . .	227
13	Diet and Hematopoiesis: Nutritional Anemias . . . . .	250
14	Diet, Bone Metabolism, and Osteoporosis . . . . .	257
15	Diet and Respiratory Disease . . . . .	270
16	Diet and Renal Disease . . . . .	277
17	Diet and Hepatobiliary Disease . . . . .	289
18	Diet and Common Gastrointestinal Disorders . . . . .	296
19	Diet, Dyspepsia, and Peptic Ulcer Disease. . . . .	311
20	Diet and Rheumatologic Disease . . . . .	316
21	Diet and Neurologic Disorders . . . . .	327
22	Diet and Dermatoses . . . . .	336
23	Diet and Wound Healing . . . . .	342
24	Food Allergy and Intolerance . . . . .	347
25	Eating Disorders . . . . .	355
26	Malnutrition and Cachexia . . . . .	363
<b>SECTION III</b>	<b>Special Topics in Clinical Nutrition . . . . .</b>	<b>375</b>
27	Diet, Pregnancy, and Lactation . . . . .	377
28	Diet and the Menstrual Cycle . . . . .	389
29	Diet and Early Development: Pediatric Nutrition . . . . .	396

30	Diet and Adolescence . . . . .	408
31	Diet and Senescence . . . . .	416
32	Ergogenic Effects of Foods and Nutrients: Diet and Athletic Performance & Sports Nutrition . . . . .	428
33	Endocrine Effects of Diet: Phytoestrogens . . . . .	441
34	Diet, Sleep–Wake Cycles, and Mood . . . . .	449
35	Diet and Cognitive Function . . . . .	459
36	Diet and Vision . . . . .	468
37	Diet and Dentition . . . . .	475
38	Hunger, Appetite, Taste, and Satiety . . . . .	485
39	Health Effects of Chocolate . . . . .	503
40	Health Effects of Ethanol . . . . .	514
41	Health Effects of Coffee . . . . .	521
42	Macronutrient Food Substitutes . . . . .	528
43	Vegetarianism, Veganism, and Macrobiotic Diets . . . . .	537

#### **SECTION IV** Diet and Health Promotion: Establishing the Theme of Prudent Nutrition . . . . . 547

44	Culture, Evolutionary Biology, and the Determinants of Dietary Preference . . . . .	549
45	Dietary Recommendations for Health Promotion and Disease Prevention . . . . .	564

#### **SECTION V** Principles of Effective Dietary Counseling . . . . . 583

46	Models of Behavior Modification for Diet and Activity Patterns and Weight Management . . . . .	585
47	Dietary Counseling in Clinical Practice . . . . .	606

#### **SECTION VI** Controversies in Contemporary Clinical Nutrition . . . . . 619

48	The Calorie . . . . .	621
49	The Search for Scapegoats and Silver Bullets . . . . .	624
50	Obesity as Disease . . . . .	628

#### **SECTION VII** Appendices and Resource Materials . . . . . 631

APPENDIX A	Nutrition Formulas of Clinical Interest . . . . .	633
APPENDIX B	Growth and Body Weight Assessment Tables . . . . .	634
APPENDIX C	Dietary Intake Assessment in the US Population . . . . .	644
APPENDIX D	Dietary Intake Assessment Instruments . . . . .	644
APPENDIX E	Nutrient/Nutraceutical Reference Tables: Intake Range and Dietary Sources . . . . .	646
APPENDIX F	Resources for Nutrient Composition of Foods . . . . .	703
APPENDIX G	Diet–Drug Interactions . . . . .	703
APPENDIX H	Nutrient Remedies for Common Conditions: Patient Resources . . . . .	704