NUTRITION IN THE PREVENTION AND TREATMENT OF DISEASE

SECOND EDITION

Edited by

ANN M. COULSTON

CAROL J. BOUSHEY

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AMSTERDAM • BOSTON • HEIDELBERG • LONDON • NEW YORK • OXFORD
PARIS • SAN DIEGO • SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Academic Press is an imprint of Elsevier

Elsevier Academic Press
30 Corporate Drive, Suite 400, Burlington, MA 01803, USA
525 B Street, Suite 1900, San Diego, California 92101-4495, USA
84 Theobald's Road, London WC1X 8RR, UK

This book is printed on acid-free paper. ♾

Library of Congress Cataloging-in-Publication Data
Nutrition in the prevention and treatment of disease / edited by Ann M. Coulston, Carol J. Boushey. – 2nd ed.
p. ; cm.
Includes bibliographical references and index.
ISBN-13: 978-0-12-374118-9 (hardcover : alk. paper) 1. Dietetics. 2. Nutrition.
3. Diet in disease. 4. Diet therapy. I. Coulston, Ann M. II. Boushey, Carol. J.
[DNLM: 1. Diet Therapy–methods. 2. Nutrition Disorders–diet therapy.
3. Nutrition Disorders–epidemiology. 4. Nutrition Disorders–prevention & control.
5. Nutritional Support. WB 400 N97534 2008]
RM216.N875 2008
615.8′54–dc22

2007043040

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN 13: 978-012-374118-9

Printed in China
08 09 10 9 8 7 6 5 4 3 2 1

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We dedicate this book to our teachers and colleagues,
women and men who have dedicated their
professional lives to advance the field of nutrition science.

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Preface to the First Edition

The purpose of this text is to provide an update of current knowledge in clinical nutrition and an overview of the rationale and science base of its application to practice in the treatment and prevention of disease. The text addresses basic principles and concepts that are central to the major clinical nutrition-related activities, such as nutritional assessment and monitoring, current theoretical base and knowledge of efficacious interventions, interactions between genetic and nutritional factors, and the use and interpretation of population-based or clinical epidemiological evidence. The various roles of clinical nutrition and current knowledge of nutrition in the prevention and treatment of major disease-specific conditions are also reviewed, with an emphasis on past and current scientific evidence that supports these roles. New areas of interest and study are also discussed, with the perspective that the application of the scientific method is by definition an evolutionary process.

Treatment of the disease diabetes mellitus provides an excellent and current example of treatment evolution. In the early part of the 20th century, before the discovery of insulin by F. G. Banting and C. H. Best in 1921, the treatment of choice for individuals with diabetes mellitus was morphine for pain abatement along with a very restricted, starvation diet. When insulin injections became available, dietary protocols were developed. Initially, dietary treatment was based on food exchange lists that encouraged prescribed intakes of carbohydrate, protein, and fat. Recent research from the Diabetes Control and Complications Trial and a similar research trial in the United Kingdom has been the base for the current dietary management emphasizing blood glucose monitoring throughout the day and individualized adjustment of carbohydrate ingestion and insulin injection in individuals who require insulin therapy. Nutrition intervention plays a major role in the management of the patient with diabetes mellitus and in the treatment of the disease and the prevention or delay of complications.

Another essential role for nutrition intervention is in the prevention of cancer. Cancer represents a disease continuum, and at all stages, from primary prevention to treatment, nutrition is a key factor. As discussed in the section highlighting nutrition and major cancer types, an explosion of new knowledge has identified nutrition as a major factor in the etiology and progression of disease.

Nutrition is the process by which the human body utilizes food for the production of energy, for the maintenance of health, for growth, and for the normal functioning of every organ and tissue. Clinical nutrition is the study of nutrition and diet as related to the development and treatment of human disease. Nutrition is an interdisciplinary field of study, built on a foundation of biomedical and behavioral sciences. Clinical nutrition is the aspect of nutrition science that is related to the development, progression, or management of disease, as differentiated from the issues of normal requirements, cellular functions and activities, and various topics that must be addressed in meeting basic requirements to enable normal growth and development.

Areas of study that contribute to knowledge in clinical nutrition include the disease-relevant biochemistry, metabolism, and activities of nutrients and dietary factors within the tissues and cells; the bioavailability and utilization of nutrients from various food sources, as disease risk or diagnosis may influence these factors; the regulation and compartmentalization of nutrients in the body; the attitudes about food and the eating patterns and behaviors of the targeted individual or group; the technology of food science and specialized or modified food products; and the technology involved in providing adequate and appropriate nutrients or foods to individuals and various community-based or institutionalized groups. Other aspects of clinical nutrition include the development and evaluation of nutrition education efforts; the development of nutrition policies, guidelines, and practice standards that affect the goals and objectives of government and private health agencies, professional practice groups, and health-related organizations; and the design and implementation of individual, clinical, and community-based nutrition and diet interventions. Clinical nutrition interventions range in scope from efforts to maintain health during short-term illness, to optimization of health status in individuals at risk for or diagnosed with

chronic diseases, to major nutritional and diet modifications as specific or adjuvant treatments for disease. Clinical nutrition encompasses primary, secondary, and tertiary disease prevention, in addition to management of disease.

Dietary intake or nutritional status may be altered as a result of disease or by the treatment modalities that are utilized, such as surgical treatments, or medical management strategies, such as drugs. The altered needs must be met by dietary or nutritional interventions in order to prevent malnutrition and the associated consequences, which would contribute to overall morbidity and mortality. Also, nutrition intervention can be a critical component of disease prevention, an important aspect of disease management, or the primary treatment for disease. A complicating factor is that people generally eat food, rather than nutrients, so that the practical and psychosocial aspects of diet modification and food or food product availability must be considered in any nutrition intervention, whether individual or community based and irrespective of whether the goal is primary prevention or disease treatment.

As in any area of the biomedical sciences, the importance of science-based activities and practices cannot be understated. Clinical nutrition concepts and practices that can become popular with either the lay public or professionals are sometimes based on the type of scientific evidence that cannot truly support the rationales and practices, regardless of how standard and common they might be. Popular theories may be generated by observational epidemiological studies, case series, or anecdotal reports, all of which lack the capability of truly demonstrating a causative or efficacious role for the nutritional factor. Such studies are useful for generating hypotheses, but the apparent associations between diets and disease may be confounded by uncontrolled or unmeasured factors and other determinants of health and disease. Unproven diet therapies exist for the treatment of numerous conditions, and many aspects of common nutrition interventions are sorely in need of testing in an appropriate research design. As in any other aspect of disease prevention and treatment, the use of nutrition interventions or diet therapies should be based on a scientific rationale and sound data, not on anecdotal experience. The scientific basis for clinical nutrition needs to expand considerably in order to fully support claims for the efficacy of many of the common activities and interventions, and progress in this area is being made.

Our definitions of diseases need to further evolve to bring greater clarity and improve precision of treatment. As gene–diet interactions are scientifically delineated, laser-sharp therapies may be applied to specific individuals. For the public, however, generating and analyzing data that summarize dietary intake and its association with disease will be valuable tasks in both treating disease and developing disease prevention strategies. Well-designed focused screening will be an aid in disease detection, and well-founded medical nutrition therapies can minimize disease development and related complications. Providing scientifically sound, creative, and effective nutrition interventions can be challenging. In so doing, however, we will serve the public good.

It is our goal to update our knowledge and its application through updated editions of this text. In addition, we plan to provide online access to relevant new findings and their import to nutrition in the prevention and treatment of disease. It is our goal to raise the bar for both understanding and treatment.

Ann M. Coulston
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Preface to the Second Edition

Like with the first edition of this text, our purpose is to provide a compilation of current knowledge in clinical nutrition and an overview of the rationale and science base of its application to practice in the prevention and treatment of disease. The first section addresses basic principles and concepts that are central to clinical nutrition research methodology. Because nutrition information is gathered from a variety of study designs, research methodology, epidemiology, and intervention studies are reviewed, coupled with data analysis, intervention techniques, and application of behavioral principles to nutrition intervention. The use of biomarkers to monitor nutrition intervention is an example of a rapidly expanding field in research methodology. Throughout these chapters, new areas of study are discussed with the perspective that the application of the scientific method is by definition an evolutionary process. Specific examples, drawn from recently published reports, bring the principles to life.

The second section covers areas of study that contribute to knowledge in clinical nutrition, including disease-relevant biochemistry, metabolism, dietary factors within tissues and cells, and attitudes about food and the eating patterns and behaviors of targeted individuals or groups. This section presents a rich array of topics that cover areas of general interest with several new topics of nutrition relationships.

Clinical nutrition is the aspect of nutrition science that is related to the development, progression, or management of disease, as differentiated from the issues of normal requirements, cellular functions, and activities. Interventions range from efforts to maintain health during short-term illness, to optimization of health status in individuals at risk for or diagnosed with chronic diseases, to major nutritional and dietary modifications as specific or adjuvant treatments for disease. The first condition addressed is the ever-growing concern with overweight and obesity. As with many of the following disease groups, this grouping begins with a chapter on the genetics of human obesity and moves on to issues related to treatment, role of physical activity, nutrient-related considerations, childhood and adolescent issues, and environmental queues controlling energy intake.

Cardiovascular disease, also a condition closely related to nutrition, is summarized in three chapters that examine genetic considerations, lipid disorders, and hypertension. Closely related to obesity and cardiovascular disease is diabetes mellitus. It is interesting how many of the clinical nutrition areas interrelate—obesity is a risk factor for cardiovascular disease and diabetes, whereas diabetes is an independent risk factor for cardiovascular disease. Dietary intake or nutritional status may be altered as a result of disease or by the treatment modalities that are used, such as surgical treatments or medical management strategies, including prescription medications. The altered needs must be met by dietary or nutrition interventions in order to prevent malnutrition and the associated consequences that contribute to morbidity and mortality.

Nutrition intervention can be a critical component of disease prevention, an important aspect of disease management, or the primary treatment for disease. This is exemplified by the chapters dealing with cancer, beginning again with a discussion of the genetic components, followed by a discussion of malignancies that have connections to nutrition and specific nutrients. Gastrointestinal diseases, especially the newer knowledge about diet and microflora of the gastrointestinal tract, demonstrate the importance of food choices in disease prevention, treatment, and management. The bone health chapters cover three important topics linked by the nutrients calcium and vitamin D and tell an important story of the value of early nutrition on health in later years.

Generating and analyzing data that summarize dietary intake and its association with disease are valuable tasks in treating disease and developing disease prevention strategies. Well-founded medical nutrition therapies can minimize disease development and related complications. Providing scientifically sound, creative, and effective nutrition interventions is challenging and rewarding. We plan to update our knowledge and its application through future editions of this text.

Ann M. Coulston
Carol J. Boushey

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