

# *Basic Nutrition and Diet Therapy*

*Ninth Edition*



*Williams*



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*To my son, JIM, with love —  
his expert work and personal support  
have helped me shape this book —  
he is a true “Renaissance man” — and friend*

**S.R.W.**

## P R E F A C E

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For many years, through eight highly successful editions, this compact “little” book has provided a sound learning resource and a handy manual in basic nutrition for support personnel in health care. It has filled a practical need among various allied health workers and students for a realistic and easily comprehended reference. It has always maintained a person-centered approach to nutritional study and client/patient care. This new ninth edition continues this important central focus.

The field of nutrition is a dynamic *human* endeavor. It has been expanding and changing since publication of earlier editions. We want to capture the excitement of this current, constantly developing nutrition knowledge and its application to human needs in this new edition with its modern format and style.

Three main factors continue to expand and change this modern face of nutrition. First, the science of nutrition is growing more and more rapidly with basic research. New knowledge, as is true in all fields, always challenges some traditional ideas and develops new ones. This is especially true in applying current nutritional science to the modern movement in health promotion and disease prevention in health care for younger populations and to a preventive early risk-reduction approach to management of chronic disease in our aging population. Second, the rapidly increasing multiethnic diversity in the changing nature of the general population in the United States both enriches our food patterns and presents varying health care needs. Third, the overall general public is more aware and concerned about health promotion and the role of nutrition, largely through increasing attention of the media. General interest in nutrition has grown. Our clients and patients are raising more questions and seeking intelligent answers. They want sound information to deal with common misinformation and fads, as well as with legitimate controversy. They want to be more personally involved in their own health care. Nothing, perhaps, is more human a part of that care than food.

This new edition reflects these far-reaching changes. Its guiding principle continues to be my own commitment, along with that of my publisher, to the integrity of each previous edition. *Our expanded goal here is to produce a new book for today's needs, completely updated and rewritten, with new design and format and sound content to meet the expectations and changing needs of students, faculty, and practitioners in basic health care.*

## OBJECTIVES OF THE BOOK

This text is designed primarily for students and health workers in beginning assistance level programs for practical or licensed vocational nurses (LPNs and LVNs), as well as for diet technicians or diet aides. As in previous editions, it assumes a limited background in nutrition-related basic sciences, so basic concepts are carefully explained when introduced. But with the changing public health awareness, it also assumes an expanded general base in nutrition and health. Thus, building on this interest, its general purpose is to introduce some basic principles of scientific nutrition and present their applications in *person-centered* care in health and disease. In addition, my personal concerns are ever present: (1) that this introduction to the science and practice I love will continue to lead students and readers to enjoy learning about human nutrition in the lives of people and stimulate further reading in personal interest areas; (2) that these caretakers will be alert to nutrition news and to questions raised by their increasingly diverse clients and patients; and (3) that contact and communication with professional nutrition resource persons will help build a strong team approach to clinical nutrition problems in all patient care.

## MAJOR CHANGES IN THIS EDITION

In a real sense, this new edition of this classic basic text continues to be a new book for our new times and needs. To accommodate the demands of a rapidly developing science and society, yet retain a clearly understood writing style, I have rewritten a large portion of the text and made major changes to increase its usefulness.

**1. New Chapter Materials.** All chapters include new materials to help meet current practice needs: Chapter 1 provides a strengthened current focus on new directions in health care—health promotion, risk reduction for disease prevention, and new community health care delivery systems with emphasis on team care and the active role of clients in educated self-care. New research updates all of the basic nutrient-energy chapters in the remainder of Part I. In Part II, the separate life cycle Chapters 10, 11, and 12 reflect new material on human growth and development needs at each age. For example, the new Academy of Sciences guidelines for a more liberal positive weight gain to support the metabolic demands of pregnancy and lactation are presented and discussed. Positive growth support for infancy, childhood, and adolescence, as well as health-maintenance needs of adults throughout the aging process, focuses on the building of a healthy lifestyle to reduce disease risks. New community nutrition material in Chapter 13 highlights food-borne disease through bacterial contamination, environmental contaminants such as lead, and food labeling reform for the 1990s, and in Chapter 14 a reorganized and greatly expanded section on America's multiethnic cultural food patterns includes new descriptions of Moslem, Native American Navajo, African Americans, Cajun, and Southeast Asian patterns. Chapter 16 contains new material on athletics to clarify current practices of glycogen loading for endurance events, the proliferation of sports drinks, and the illegal use of steroids by athletes and body builders. Additional changes in each clinical nutrition chapter are described below.

**2. New Book Format and Design.** The chapter format enhances the book's appeal and encourages its use. Basic chapter concepts and overview, illustrations, tables, boxes, definitions, headings, and subheadings make it easier and more interesting to read.

**3. New Learning Aids.** Educational aids have been developed to assist both student and instructor in the teaching-learning process. These aids are described later in detail.

**4. New Illustrations.** A number of new illustrations, including artwork, graphs, charts, and photographs, help both students and practitioners better understand the concepts and clinical practices presented.

**5. Enhanced Readability and Student Interest.** This ninth edition is written in a style that not only continues its simple unfolding of the material, but also creates new interest and helps students understand basic concepts better by expanding explanations to "flesh out" the topics discussed.

## ADDITIONAL CHANGES NEW TO THIS EDITION

I have developed and reorganized the text material to reflect both current nutrition knowledge and changes in health care practices.

### Part One: Principles of Nutrition

**Introductory chapter.** Chapter 1 expands its focus on our changing health-care system and the expanded role of nutrition in health promotion as well as disease prevention.

**Nutrients and energy.** Each chapter on the various macronutrients that supply energy, as well as each of those describing the large number of micronutrients that supply special metabolic needs, has been updated to include current nutritional science material and its application to human health and health problems. For example, new material addresses such current nutrition concerns as complex carbohydrates, fats and cholesterol, fiber, vitamins and minerals, and the issue of nutrient supplements.

### Part Two: Community Nutrition and the Life Cycle

**Expanded age group needs.** Three expanded separate chapters provide needed new material on: (1) early fetal growth and development during pregnancy with liberal guidelines for weight gain to support metabolic demands of both pregnancy and breast-feeding of the newborn; (2) continued rapid growth of infancy, erratic growth patterns through childhood, followed by the rapid growth surge and changing male and female bodies of maturing adolescents; and (3) the leveling off of physical growth in adulthood, but continued psychosocial development throughout life with its gradual decline in the extended aging process. There is new material, for example, on the eating disorders of adolescence, adolescent pregnancy, and on the aging process, as well as practical ways of meeting nutritional needs in each period of growth and development.

**Weight management and physical fitness.** These two updated chapters meet current needs for positive health approaches to maintaining ideal weight and developing habits of regular exercise, with expanded discussion of athletic practices both useful and harmful.

**Community nutrition and changing American food patterns.** Chapters 13 and 14 have been rewritten to include much practical material for working with families in the community. There is new background, as indicated above, on the relation of health to the community food supply, the significance of cultural food patterns in our increasingly multi-ethnic society, the many community factors that influence food habits, and the effects of our changing American food patterns.

### Part Three: Clinical Nutrition

**Introductory chapter.** The chapter introducing clinical nutrition in various health problems focuses on the *process* of modern health care, here relating nutritional aspects of care to total medical-nursing nutrition team care of individual patients. This person-centered care *process* follows interrelated stages of assessment, intervention, and evaluation in many forms.

**Clinical disease chapters.** The remaining chapters on major health problems have all been reorganized and updated to provide current diet therapy procedures for each condition. For example, new material is provided on the underlying disease process of atherosclerosis and essential hypertension as a major risk factor is reflected in the chapter on heart disease, on nephrotic syndrome and kidney dialysis in renal disease, on tube feedings and total parenteral nutrition (TPN) in the chapters on surgery and cancer, on care of the patient with burns in the surgery chapter, and on nutrition and immunity in the cancer chapter.

### LEARNING AIDS THROUGHOUT THE TEXT

As indicated, this new edition is especially significant in its use of many learning aids throughout the text.

**Chapter openers.** To immediately draw students into the topic for study, each chapter opens with a short list of the basic concepts involved, and a brief chapter overview leading into the topic to “set the stage.”

**Chapter headings.** Throughout each chapter, the major headings and subheadings in special type indicate the organization of the chapter material. This makes for easy reading and understanding of the key ideas. Main concepts and terms are also brought out with bold type and italics.

**Boxed material.** Additional boxed information has been expanded and numbered for easy reference. New Clinical Applications boxes go a step further on a given topic or present a case study for analysis. This enhances the understanding of concepts through further explanation or application.

**Definitions of terms.** Key terms important to the student’s understanding and application of the material in patient care are presented in two ways. First, they are identified in the body of the text, often with interesting derivation and description of the words. Second, they are listed in a summary glossary at the back of the book for quick reference.

**Illustrations.** The expanded use of new illustrations throughout the text creates interest and helps the student better understand important concepts and applications.

**Chapter summaries.** Brief summary paragraphs review chapter highlights



and help students see the “big picture.” Then the student can return to any part of the material for repeated study and clarification of details as needed.

**Review questions.** To help the student understand key parts of the chapter or to apply it to patient care problems, questions are given after each chapter for review and analysis of the material presented.

**Self-test questions.** In addition, self-test items in both true-false and multiple choice forms are provided at the end of each chapter for students to check their basic knowledge at that point.

**Suggestions for further study.** Also, at the end of each chapter a variety of activities are suggested for better understanding and application of the text material. These suggestions include many projects, surveys, situational problems, and analysis of information gathered.

**Case studies.** In clinical care chapters, case studies have been highlighted in separate Boxes to focus the student’s attention to related patient care problems. Each case is accompanied by questions for case analysis. Students can use these examples for similar patient care needs in their own clinical assignments.

**Diet guides.** In clinical chapters, various diet therapy guides provide practical help in patient care and education.

**Cited references.** Expanded use of background references throughout the text provide more resources for students who may want to “dig further” into a particular topic of interest.

**Further annotated readings.** To encourage further reading of useful materials for expanding knowledge of key concepts or applying the material in practical ways for patient care and education, a brief list of annotated resources is provided at the end of each chapter.

**Appendixes.** The Appendixes include a table of food values and several materials, such as food sources of cholesterol, dietary fiber, sodium and potassium, as well as the food exchange lists for meal-planning, for use as reference tools and guides in learning and practice. The newly revised standard Recommended Dietary Allowances (RDA) tables have been placed inside the book covers for easy quick reference.

## A PERSONAL APPROACH

In the past, users of this basic text have responded very positively to the person-centered approach I have tried to develop. In this new edition I have sought to strengthen this approach in several ways.

**Personal writing style.** In this new edition, I have continued to use a personal writing style to reflect the very personal nature of human nutrition and health care, and to speak more directly to the reader. I wish to share my own self and feelings, born of many years of experience in clinical work and teaching. I want to create interest and involvement in our rapidly advancing knowledge of nutrition, the exciting process of learning, and in sound humanistic practice. In this manner, I want to express my concern for students and their learning, and for clients or patients and their needs.

**Practical application.** In most human endeavors, theory is useful only in its human application. So it is with nutritional care. Thus all of the chapters here

supply expanded practical applications of current scientific knowledge in very realistic human terms. My goal is always to bring together science and human needs to make them “come alive” for students and in turn for their clients and patients. Often there are no single “pat” answers to many health care problems, and individual situations require individual solutions. But a basic understanding of the principles involved will make for better person-centered care in any case.

## ACKNOWLEDGMENTS

A realistic and useful textbook is never the work of one person. It develops into the planned product through the committed hands and hearts of a number of persons. It would be impossible to name all the individuals involved here, but several groups deserve special recognition.

First, I am indebted to Mosby–Year Book Publishing and the many persons there, new and old friends, who have had a part in this project. Especially do I thank my publisher and editorial staff, including Ed Murphy, Vicki Van Ry-Malinee, Francine Trtanj, and Peggy Fagen, all of whom helped shape the manuscript and support my efforts and goals.

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Third, I am grateful to my own production staff, especially to my expert business manager and systems analyst, Jim Williams, who has developed and set up my expanded computer system, a true joy to work with. And to Tony Rinella, friend and computer expert, who has responded with grace to my calls for help at all sorts of odd hours, I give special thanks for being there when I needed him.

Fourth, many students and interns, colleagues, clients, and patients over the years have enriched my life; their contributions are revealed in all my work. Each one has taught me something about human experience, and I am grateful for those opportunities for personal growth.

And finally, but most of all, I want to thank my family — my “home team.” These beautiful people never cease to provide loving support for all my work, and to each one I am eternally grateful.

I hope that those who use this text will continue to give me feedback and suggestions for future editions. My constant purpose is to provide a useful and practical beginning text for students, one that can help them understand some of the elemental principles of nutritional science and apply them in personal patient care — and one that they can enjoy.

**Sue Rodwell Williams**

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## CHAPTER

# 1



## *Food, nutrition, and health*

### KEY CONCEPTS

*An integral component of health promotion is optimal personal and community nutrition.*

*Certain nutrients in the food we eat are essential to our health and well-being.*

*Food and nutrient guides help us to plan a balanced diet according to individual needs and goals.*

*We* live in a world with rapidly changing elements — our environment, food supply, population, and scientific knowledge. Within individual environments, our physical bodies and our personalities change and with them our personal needs and goals. These *constant changes* of life must be in some kind of *positive balance* to produce healthy living. Thus within these life concepts of change and balance, to be realistic our study of food, nutrition, and health care must focus on **health promotion**. Although we may view and define health and disease in different ways, a primary basis for promoting health and preventing disease must always be good food and the sound nutrition it provides. This basic study of nutrition, then, has primary importance in two ways. First, of course, it is fundamental for our own health. But as health care workers, we also know that good nutrition is essential for the health and well-being of our patients and clients.

## HEALTH PROMOTION

### Basic definitions

**Nutrition and dietetics.** *Nutrition* concerns the food people eat and how their bodies use it. *Nutritional science* comprises the body of scientific knowledge governing the food requirements of humans for maintenance, growth, activity, reproduction, and lactation. *Dietetics* is the health profession responsible for the application of nutritional science to promote human health and treat disease. The *registered dietitian (RD)*, especially the *clinical nutrition specialist*, or the *public health nutritionist* in the community, is the nutrition authority on the health care team. These health care professionals carry the major responsibility for nutritional care of patients and clients.

**Health and wellness.** Good nutrition is essential to good health throughout life, beginning with prenatal life and extending through old age. In its simplest terms, *health* is defined as the absence of disease. But this is far too narrow a definition. Life experience shows that it is much more. It must include broader attention to the roots of health in meeting basic human needs—physical, mental, psychological, and social well-being.<sup>1</sup> This approach recognizes the individual as a whole person and relates health to both internal and external environments. The added positive concept of *wellness* carries this broader approach one step further. It seeks for all individuals full development of their potential, within whatever environment they may find themselves. It implies a balance among activities and goals: work versus leisure, life-style choices versus health risks, and personal needs versus expectations of others. Wellness implies a positive dynamic state motivating a person to seek a higher level of function.

**Wellness movement and national health goals.** The current wellness or fitness movement began in the 1970s in response to the medical care system's emphasis on illness and disease and the rising costs of medical care. Since then, "holistic" health and health promotion have focused on life-style and personal choice in helping individuals and families develop plans for wellness. During the past decade the U.S. national health goals have reflected this wellness philosophy. The current report of the U.S. Department of Health and Human Services, Public Health Service, *Healthy People 2000*, focuses on the nation's main objective of positive health promotion and disease prevention. It outlines specific objectives for meeting three broad public health goals over the next 10 years: an increase in the span of healthy life for Americans, reduction of health disparities among Americans, and access to preventative health care services for all Americans.<sup>2</sup> A major theme throughout the report is the encouragement of healthy choices in diet, weight control, and other risk factors for disease, especially in its 21 specific nutrition objectives. Community health agencies are implementing these goals and objectives in local and state public and private health programs.<sup>3</sup> All of these efforts recognize personal nutrition as an integral component of health and health care.

**Traditional and preventive approaches to health.** The *preventive* approach to health involves identifying risk factors that increase an individual's chances of developing a particular health problem.<sup>4</sup> Knowing these factors, individuals can then make behavior choices that will prevent or minimize their risks of disease. On the other hand, the *traditional* approach to health attempts change



only when symptoms of illness or disease already exist. Then ill persons seek out a physician to diagnose, treat, and “cure” the condition. This approach has little value for lifelong positive health. Major chronic problems such as heart disease or cancer may be developing long before overt signs become apparent.

### Importance of a balanced diet

**Food and health.** Food has always been one of the necessities of life. Many people, however, are concerned only with food that relieves their hunger or satisfies their appetites but are not concerned about whether it supplies their bodies with all the components of good nutrition. The health care team core practitioners—physician, clinical nutritionist, and nurse—are all aware of the important part that food plays in maintaining good health and recovery from illness. Chronic ill health in patients requires checking food habits as possible contributing factors. Thus assessing the patient’s nutritional status and identifying nutritional needs are primary activities in planning care.

**Signs of good nutrition.** Evidence of good nutrition is a well-developed body, ideal weight for body composition (ratio of muscle mass to fat) and height, and good muscle development and tone. The skin is smooth and clear, the hair glossy, and the eyes clear and bright. Posture is good, and the facial expression alert. Appetite, digestion, and elimination are normal. Well-nourished persons are much more likely to be alert, both mentally and physically, and to have a positive outlook on life. They are also more able to resist infectious diseases than are undernourished people. Proper diet not only creates healthier persons but also extends the years of normal functioning.

## FUNCTIONS OF NUTRIENTS IN FOOD

To sustain life, the nutrients in foods must perform three basic overall functions within the body: provide energy sources, build tissue, and regulate metabolic processes. *Metabolism* refers to the sum of all body processes that accomplish these three basic life-sustaining tasks.

An important nutritional-metabolic fact emerges in the following outline of these three basic nutrient functions. It is the fundamental principle of *nutrient interaction*. This means two things: individual nutrients have many specific metabolic functions, including primary and supporting roles, and no nutrient ever works alone. The human body is a fascinating whole made up of many parts and processes. Intimate metabolic relationships exist among all the basic nutrients and their metabolic products. This key principle of nutrient interaction will be demonstrated more clearly in the following chapters. Although the various nutrients may be separated for study purposes, remember that in the body they do not exist that way. They always interact as a dynamic whole to produce and maintain the human body.

### Energy sources

**Carbohydrates.** Dietary carbohydrates—starches and sugars—provide the body’s primary source of fuel for heat and energy. They also maintain the body’s backup store of quick energy as *glycogen*, sometimes called “animal starch” (p. 17). Each gram of carbohydrate consumed yields 4 kilocalories