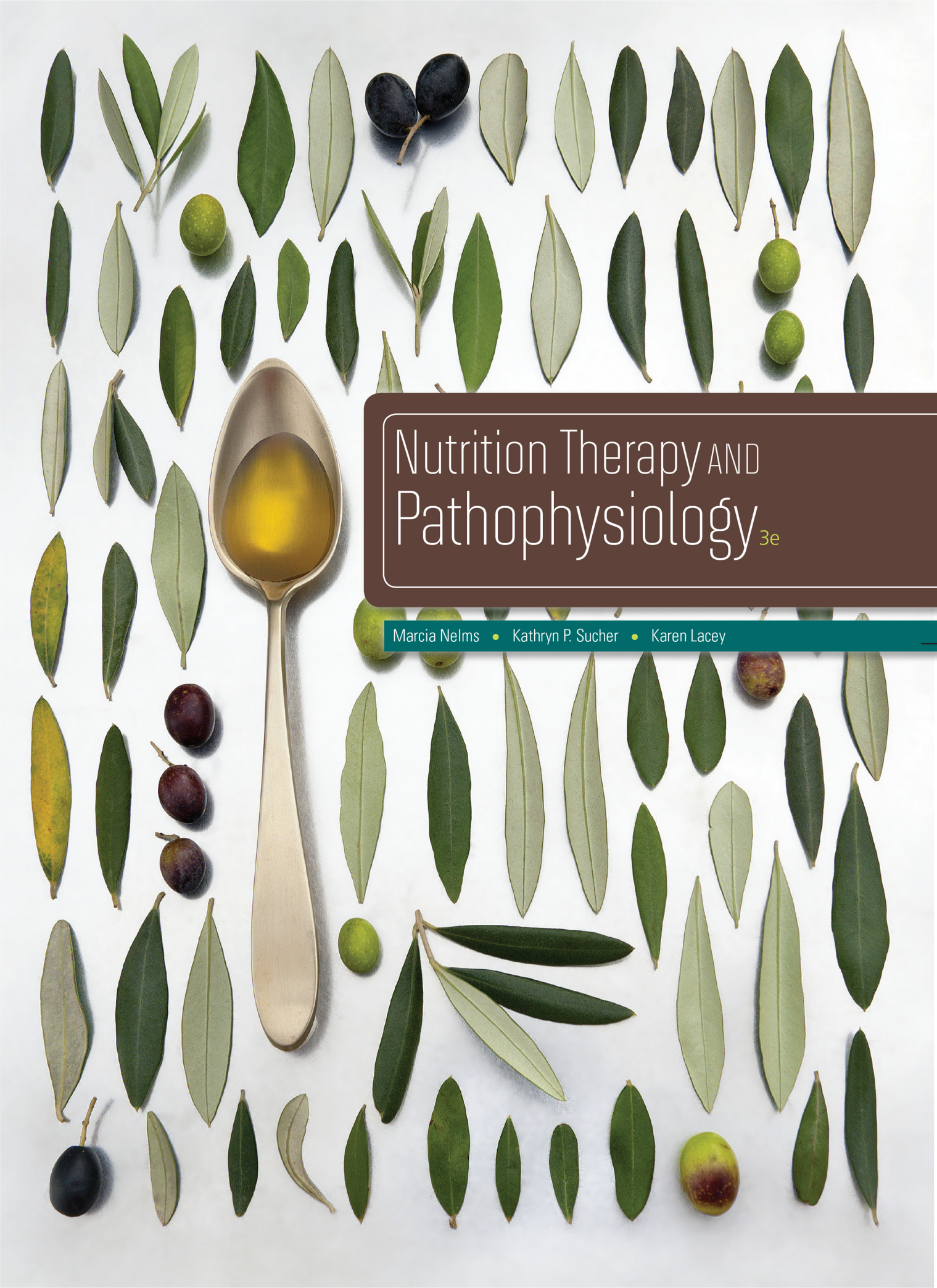

Nutrition Therapy AND Pathophysiology 3e

Marcia Nelms • Kathryn P. Sucher • Karen Lacey

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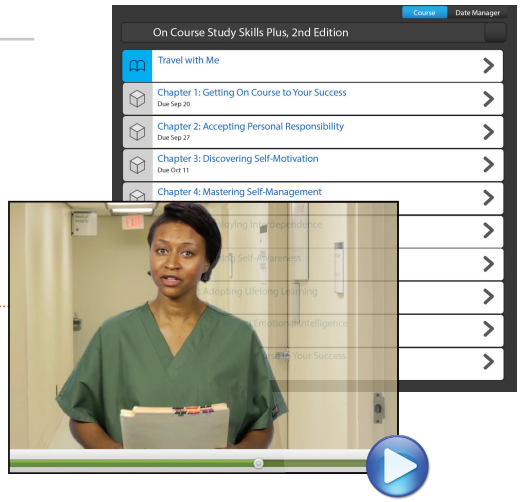

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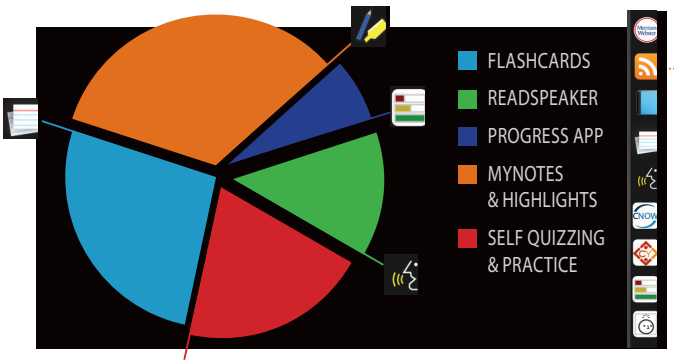

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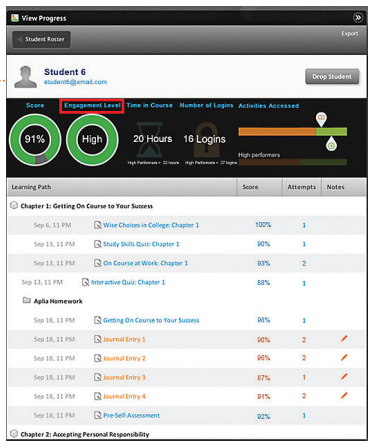

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Aids to Calculation

Conversion Factors

A conversion factor is a fraction in which the numerator (top) and the denominator (bottom) express the same quantity in different units. For example, 2.2 pounds (lb) and 1 kilogram (kg) are equivalent; they express the same weight. The conversion factors used to change pounds to kilograms and vice versa are:

$$\frac{1\text{ kg}}{2.2\text{ lb}} \text{ and } \frac{2.2\text{ lb}}{1\text{ kg}}.$$

Because a conversion factor equals 1, measurements can be multiplied by the factor to change the *unit* of measure without changing the *value* of the measurement. To change one unit of measurement to another, use the factor with the unit you are seeking in the numerator (top) of the fraction.

Example 1 Convert the weight of 130 pounds to kilograms.

- Choose the conversion factor in which the kilograms are on top and multiply by 130 pounds:

$$\frac{1\text{ kg}}{2.2\text{ lb}} \times 130\text{ lb} = \frac{130\text{ kg}}{2.2} = 59\text{ kg}.$$

Example 2 Consider a 4-ounce (oz) hamburger that contains 7 grams (g) of saturated fat. How many grams of saturated fat are contained in a 3-ounce hamburger?

- Because you are seeking grams of saturated fat, the conversion factor is:

$$\frac{7\text{ g saturated fat}}{4\text{ oz hamburger}}.$$

- Multiply 3 ounces of hamburger by the conversion factor:

$$3\text{ oz hamburger} \times \frac{7\text{ g saturated fat}}{4\text{ oz hamburger}} = \frac{3 \times 7}{4} = \frac{21}{4} =$$

5 g saturated fat (rounded off).

Percentages

A percentage is a comparison between a number of items (perhaps the number of kcalories in your daily energy intake) and a standard number (perhaps the number of kcalories used for Daily Values on food labels). To find a percentage, first divide by the standard number and then multiply by 100 to state the answer as a percentage (*percent* means "per 100").

Example 3 Suppose your energy intake for the day is 1500 kcalories (kcal): What percentage of the Daily Value (DV) for energy does your intake represent? (Use the Daily Value of 2000 kcalories as the standard.)

- Divide your kcalorie intake by the Daily Value:

  1500 kcal (your intake) ÷ 2000 kcal (DV) = 0.75.

- Multiply your answer by 100 to state it as a percentage:

  0.75 × 100 = 75% of the Daily Value.

Example 4 Sometimes the percentage is more than 100. Suppose your daily intake of vitamin C is 120 milligrams (mg) and your RDA (male) is 90 milligrams. What percentage of the RDA for vitamin C is your intake?

120 mg (your intake) ÷ 90 mg (RDA) = 1.33.

1.33 × 100 = 133% of the RDA.

Example 5 Sometimes the comparison is between a part of a whole (for example, your kcalories from protein) and the total amount (your total kcalories). In this case, the total is the number you divide by. If you consume 60 grams (g) protein, 80 grams fat, and 310 grams carbohydrate, what percentages of your total kcalories for the day come from protein, fat, and carbohydrate?

- Multiply the number of grams by the number of kcalories from 1 gram of each energy nutrient (conversion factors):

$$60\text{ g protein} \times \frac{4\text{ kcal}}{1\text{ g protein}} = 240\text{ kcal}.$$

$$80\text{ g fat} \times \frac{9\text{ kcal}}{1\text{ g fat}} = 720\text{ kcal}.$$

Milliequivalents to Milligrams

Cations		Anions	
Milliequivalents	**Milligrams**	**Milliequivalents**	**Milligrams**
1 mEq Potassium (K^+)	39 mg	1 mEq Chloride (Cl^-)	35.5 mg
1 mEq Sodium (Na^{2+})	23 mg	1 mEq Bicarbonate (HCO_3^-)	61 mg
1 mEq Calcium (Ca^{2+})	20 mg	1 mEq Potassium (PO_4^{3-})	31.67 mg
1 mEq Magnesium (Mg^{2+})	12.2 mg		

The equivalent weight of an electrolyte is its molecular weight divided by its valence. Therefore, because the molecular weight of K^+ is 39 and its valance is one, 39/1 is 39 grams. Milliequivalents would be 1/1000 of the equivalents or 39 milligrams. One milliequivalent of Na^+ is 23 milligrams [(23 grams/1) divided by 1000].

$$310 \text{ g carbohydrate} \times \frac{4 \text{ kcal}}{1 \text{ g carbohydrate}} = 1240 \text{ kcal.}$$

- Find the total kcalories:

  240 + 720 + 1240 = 2200 kcal.

- Find the percentage of total kcalories from each energy nutrient (see Example 3):

  Protein: 240 ÷ 2200 = 0.109 × 100 = 10.9 = 11% of kcal.

  Fat: 720 ÷ 2200 = 0.327 × 100 = 32.7 = 33% of kcal.

  Carbohydrate: 1240 ÷ 2200 = 0.563 × 100 = 56.3 = 56% of kcal.

  Total: 11% + 33% + 56% = 100% of kcal.

In this case, the percentages total 100 percent, but sometimes they total 99 or 101 because of rounding—a reasonable estimate.

Ratios

A ratio is a comparison of two (or three) values in which one of the values is reduced to 1. A ratio compares identical units and so is expressed without units.

Example 6 Suppose your daily intakes of potassium and sodium are 3000 milligrams (mg) and 2500 milligrams, respectively. What is the potassium-to-sodium ratio?

- Divide the potassium milligrams by the sodium milligrams:

  3000 mg potassium ÷ 2500 mg sodium = 1.2.

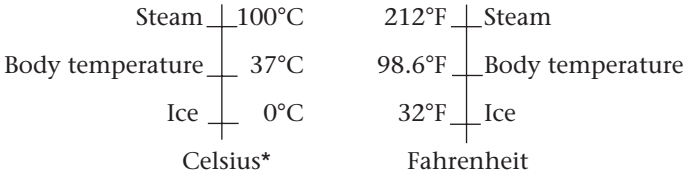
The potassium-to-sodium ratio is 1.2:1 (read as "one point two to one" or simply "one point two"), which means there are 1.2 milligrams of potassium for every 1 milligram of sodium. A ratio greater than 1 means that the first value (in this case, potassium) is greater than the second (sodium). When the ratio is less than 1, the second value is larger.

Weights and Measures

LENGTH

1 meter (m) = 39 in.
1 centimeter (cm) = 0.4 in.
1 inch (in) = 2.5 cm.
1 foot (ft) = 30 cm.

TEMPERATURE



- To find degrees Fahrenheit (°F) when you know degrees Celsius (°C), multiply by 9/5 and then add 32.
- To find degrees Celsius (°C) when you know degrees Fahrenheit (°F), subtract 32 and then multiply by 5/9.

VOLUME

1 liter (L) = 1000 mL, 0.26 gal, 1.06 qt, or 2.1 pt.
1 milliliter (mL) = 1/1000 L or 0.03 fluid oz.
1 gallon (gal) = 128 oz, 8 c, or 3.8 L.
1 quart (qt) = 32 oz, 4 c, or 0.95 L.
1 pint (pt) = 16 oz, 2 c, or 0.47 L.
1 cup (c) = 8 oz, 16 tbs, about 250 mL, or 0.25 L.
1 ounce (oz) = 30 mL.
1 tablespoon (tbs) = 3 tsp or 15 mL.
1 teaspoon (tsp) = 5 mL.

WEIGHT

1 kilogram (kg) = 1000 g or 2.2 lb.
1 gram (g) = 1/1000 kg, 1000 mg, or 0.035 oz.
1 milligram (mg) = 1/1000 g or 1000 µg.
1 microgram (µg) = 1/1000 mg.
1 pound (lb) = 16 oz, 454 g, or 0.45 kg.
1 ounce (oz) = about 28 g.

ENERGY

1 kilojoule (kJ) = 0.24 kcal.
1 millijoule (mJ) = 240 kcal.
1 kcalorie (kcal) = 4.2 kJ.
1 g carbohydrate = 4 kcal = 17 kJ.
1 g fat = 9 kcal = 37 kJ.
1 g protein = 4 kcal = 17 kJ.
1 g alcohol = 7 kcal = 29 kJ.

*Also known as *centigrade*.

Nutrition Therapy and Pathophysiology

Third Edition

Marcia Nahikian Nelms
The Ohio State University

Kathryn Sucher
San Jose State University

Karen Lacey
University of Wisconsin, Green Bay

Diane Habash
The Ohio State University

R. Gerald Nelms
Wright State University

Melissa Hansen-Petrik
The University of Tennessee–Knoxville

Colette LaSalle
San Jose State University

Thomas J. Pujol
Southeast Missouri State University

Jeremy T. Barnes
Southeast Missouri State University

Mildred Mattfeldt-Beman
Saint Louis University

Roschelle A. Heuberger
Central Michigan University

Kathy Jones Irwin
Tennova HealthCare

Ethan A. Bergman
Central Washington University

Susan N. Hawk
Central Washington University

Deborah A. Cohen
University of New Mexico

Robert D. Lee
Central Michigan University

Elaina Jurecki
BioMarin Pharmaceutical Inc.

Shana Maloney
Kaiser Permanente Medical Center, Northern California

Joyce Wong
Kaiser Permanente Medical Center, Northern California

Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

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Marcia Nahikian Nelms,
Kathryn P. Sucher, Karen Lacey
Product Director: Mary Finch
Product Team Director: Yolanda Cossio
Product Manager: Peggy Williams
Content Developer: Elesha Hyde
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Dedication

For our colleagues in
nutrition and dietetics

For our students: past,
present, and future

In memory of Irma and Robert Nahikian
Marcia Nahikian-Nelms

For my supportive and loving husband Peter,
and my son Alexander
Kathryn Sucher

For my husband Jim; your
encouragement and support
mean the world to me
Karen Lacey

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Preface

The authors of this text are educators, clinicians, and researchers. Therefore, our purpose in the third edition of this text is to continue to provide the most up-to-date research and application of evidence-based nutritional care for students, clinicians, and researchers as they seek to understand and treat nutrition-related disease. Most of us look to primary reference texts as the cornerstone of our practice. Many names come to mind—*Modern Nutrition in Health and Disease*; the ASPEN Nutrition Support Core Curriculum; Harrison's *Book of Internal Medicine*; and *The Merck Manual of Diagnosis and Therapy*. We continue to strive for this text to not only provide the reference material necessary to understand clinical nutrition practice, but provide it in such a way that the learning environment will support students' development of critical thinking, clinical reasoning, and decision-making skills.

What continues to make *this* text different from other clinical nutrition texts? The clinical environment evolves as a result of the impacting forces of research, health care funding, evidence-based nutrition practice, and development of the nutrition care process, standardized language, and standardized nutrition diagnoses. To meet the demands of these evolving forces, this text includes not only the most current research and integration of evidence-based practice within the context of the nutrition care process, but also an overview of health care systems and the dietitian's role within these systems as a member of the health care team; guidelines for documentation and other professional writings; and coverage of emerging fields such as nutrigenomics. Furthermore, as the framework for the nutrition care process has progressed over the previous seven years, the structure for our text has organized its pedagogy to be consistent with each step of the nutrition care process. This text incorporates standardized language, the Evidence Analysis Library, the American Dietetic Association's Nutrition Care Manual, and Standards of Practice.

The text begins with a discussion of the dietitian's role as a nutrition expert, and then proceeds through the nutrition care process, introducing the basics of assessment, diagnosis, intervention, and monitoring/evaluation. Next, a comprehensive review of physiological concepts required to integrate nutrition therapy as a component of medical care is presented. These foundational chapters cover physiological response to injury, the immune system, fluid and electrolyte balance, pharmacology, and genetics—focusing specifically on the application of each of these topics to clinical nutrition practice.

The final section of this text is organized using a systems approach consistent with other medical texts. Each nutrition therapy chapter discusses normal structure and function of a body system, explains how the disease process interrupts normal functioning, and then describes appropriate medical and nutrition interventions. This third edition has retained the pedagogical features students and educators found especially helpful—Clinical Applications boxes, nutrition assessment summary tables, sample documentation, PES statements, case studies, overviews of common medical care and drug–nutrient interactions, and interviews with current clinical practitioners. New features for this edition include many additional Life Cycle Perspectives boxes for applications of nutritional care for pediatrics and older adults. This approach allows any health care professional to benefit from this text.

Though every effort has been made to address the most recent research and the most common clinical and medical practices, this text has the same limitation any medical textbook will have: new diagnoses, new drugs, new treatments, and a new understanding of the relationship between nutrition and disease will inevitably continue to be cultivated after publication. Thus, this book strives to educate students about not only facts and theories that comprise current medical knowledge, but also the process of skill development that empowers students to grow in expertise within their field. As practitioners of the future utilize the nutrition care process, it will be refined even as their knowledge of disease and its treatment evolves.

As clinical practitioners and current dietetic educators, we have experienced a need for not only this different approach to a clinical nutrition text, but also a reference for clinical practitioners. We believe that this third edition continues to serve this purpose.

New to This Edition

The third edition of *Nutrition Therapy and Pathophysiology* has built upon the strengths of prior editions a comprehensive focus on pathophysiology and medical treatment with a thorough review of the most current research. Specific diets and food recommendations are covered within each chapter, and new research and life-cycle perspectives are integrated throughout. This text's chapter organization will allow the student and practitioner to follow the steps of the nutrition care process. Nutrition therapy within each systems chapter emphasizes real-life application of the standards in patient care and has been updated with the latest evidence-based practice. Figures and tables have been modified to provide visual explanations of concepts within the text. New photos of wholesome foods and real clinical settings have been added to both enhance chapters pedagogically and add visual appeal.

Specific changes for the third edition include the following:

Part 1 The Role of Nutrition Therapy in Health Care

- ***Chapter 1 Role of the Dietitian in the Health Care System*** provides updated information on the nutrition care process, evidence-based practice, and Standards of Professional Practice as well as new information on the Affordable Care Act and the Academy of Nutrition and Dietetics *Scope of Practice*.

Part 2 The Nutrition Care Process

- ***Chapter 2 The Nutrition Care Process*** has been updated to include the most current terminology for all steps of the NCP. An enhanced figure more clearly depicts the interrelationships of the steps of the NCP.
- ***Chapter 3 Nutrition Assessment: Foundation of the Nutrition Care Process*** integrates the newly proposed criteria for malnutrition within the tools for nutrition assessment; a new figure and table demonstrate these criteria and their use in practice. An additional new figure illustrates the decision-making process for estimating energy requirements.
- ***Chapter 4 Nutrition Intervention and Nutrition Monitoring and Evaluation*** builds on the updated intervention terminology from Chapter 2 to explain the process of developing interventions, beginning with oral diets as examples of interventions within the acute care setting. This chapter includes a new section discussing the monitoring and evaluation step of the nutrition care process.
- ***Chapter 5 Enteral and Parenteral Nutrition Support*** has been extensively revised to incorporate ASPEN and EAL guidelines for prescribing nutrition support. A new figure details the thinking process for selecting the appropriate nutrition support route.
- ***Chapter 6 Documentation of the Nutrition Care Process*** has been reorganized to focus more closely on the ADIME documentation style and features a new table providing specific guidance on completing each section of an ADIME chart note. Examples of older charting styles have been eliminated.

Part 3 Introduction to Pathophysiology

- ***Chapter 7 Fluid and Electrolyte Balance*** and ***Chapter 8 Acid-Base Balance*** have been updated with the latest research to provide a thorough review for the student and comprehensive reference for the practitioner. Chapter 7 also features a new Life Cycle Perspectives box.
- ***Chapter 9 Cellular and Physiological Response to Injury: The Role of the Immune System*** features additional information on both the acute and chronic inflammatory response and its application to the disease process.
- ***Chapter 10 Nutritional Genomics*** presents new research on the genetics of cancer and obesity and a snapshot of the nutritional genetics marketplace, incorporating the AND's latest position paper on nutritional genomics.
- ***Chapter 11 Pharmacology*** includes updated information on drug–nutrient interactions, especially in adults over age 65, and an updated table and box on complementary/alternative supplements.

Part 4 Nutrition Therapy

Each chapter in Part 4 provides updated coverage of common diagnostic procedures and medications; many chapters include a reference table for complementary/alternative treatments that are often encountered by the registered dietitian.

- ***Chapter 12 Diseases and Disorders of Energy Imbalance*** explains the application of the latest obesity treatment guidelines from the ACC/AHA/Obesity Society in clinical practice. It also presents new findings and guidelines on risk factors for obesity, assessment of health risks related to body fatness, and diagnosis of eating disorders.
- ***Chapter 13 Diseases of the Cardiovascular System*** has been reorganized and includes updated information on epidemiology, pathophysiology, and risk factors, along with the most recent treatment guidelines and medications. The chapter includes a new section on heart transplantation and three new boxes discussing aging and heart disease, congenital heart defects, and food safety for immune-compromised patients.
- ***Chapter 14 Diseases of the Upper Gastrointestinal Tract*** has been updated with the latest research. New or revised figures including fundoplication demonstrate the pathophysiology of and medical care for upper GI disease.
- ***Chapter 15 Diseases of the Lower Gastrointestinal Tract*** provides application of new research and evidenced-based guidelines for the care of individuals with inflammatory bowel disease, irritable bowel syndrome (IBS), and celiac disease. Two new figures help illustrate the complex etiology of IBS.
- ***Chapter 16 Diseases of the Liver, Gallbladder, and Exocrine Pancreas*** includes updated epidemiology, pathophysiology, treatment guidelines, and medications for liver and pancreatic disorders as well as for liver transplants. A new box addresses alcoholism in older adults.
- ***Chapter 17 Diseases of the Endocrine System*** has been revised to reflect the American Diabetes Association's 2014 standards of medical care in diabetes.
- ***Chapter 18 Diseases of the Renal System*** features a new discussion of the pathophysiology of acute kidney injury, along with the latest diagnostic criteria and nutrition support guidelines for this disorder.
- ***Chapter 19 Diseases of the Hematological System*** has been reorganized to improve its use as a reference and incorporates updated information on vitamin B_{12} and aging.

- ***Chapter 20 Diseases and Disorders of the Neurological System*** incorporates the most recent research through enhanced discussions of the ketogenic diet and interventions for prominent nutrition problems such as dysphagia and drug–nutrient interactions.
- ***Chapter 21 Diseases of the Respiratory System*** addresses specific nutrition support guidelines for COPD, asthma, respiratory failure, and mechanical ventilation.
- ***Chapter 22 Metabolic Stress and the Critically Ill*** incorporates the newly proposed criteria for malnutrition. It directs both the student and clinician in appropriate application of evidence-based guidelines to plan nutrition interventions for surgery, trauma, sepsis, traumatic brain injury, and burns, with the aid of a new table and figure demonstrating the decision-making process.
- ***Chapter 23 Neoplastic Disease*** has been reorganized. The discussions of cancer-related genetics, nutrigenomics, and cancer risk have been expanded, and a new box on pediatric leukemia has been added. The information on epidemiology, pathophysiology, medical treatments, medications, and nutrition care guidelines has been updated.
- ***Chapter 24 HIV and AIDS*** includes updated epidemiology, pathophysiology, medical treatment guidelines, medications (and their impact on nutritional status), and nutrition care guidelines.
- ***Chapter 25 Diseases of the Musculoskeletal System*** has been reorganized and thoroughly updated, with a focus on osteoporosis, osteoarthritis, and gout, and features new boxes covering pediatric muscular dystrophy and the use of alternative treatments for arthritis among older adults.
- ***Chapter 26 Metabolic Disorders*** has been thoroughly updated with the latest phenylketonuria treatment guidelines from the American College of Medical Genetics and a discussion of the newest adjunct treatments for glycogen storage diseases, as well as several new or enhanced figures illustrating various metabolic defects.

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Southeast Missouri State University

Ethan A. Bergman, PhD, RD, CD, FADA
Central Washington University

Deborah A. Cohen, DCN, RD
University of New Mexico

Diane Habash, PhD, RD, LD
The Ohio State University

Melissa Hansen-Petrik, PhD, RD, LDN
The University of Tennessee–Knoxville

Susan N. Hawk, PhD, RD
Central Washington University

Roschelle A. Heuberger, PhD, RD
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Tennova HealthCare Knoxville, Tennessee

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Eileen MacKusick, MS, RD
Watsonville Community Hospital, Watsonville, California

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Digestive Center of Excellence, Gastroenterology and Hepatology, University of Virginia Health System

La Paula Sakai, RD, MS, CNSD
Retired

Lynne Schonder, RD, MS, CNSC
Valley Care Medical Center, Pleasanton, California

Kathryn Sikorski, RD, CDE
Santa Clara Valley Medical Center, San Jose, California

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Arizona State University

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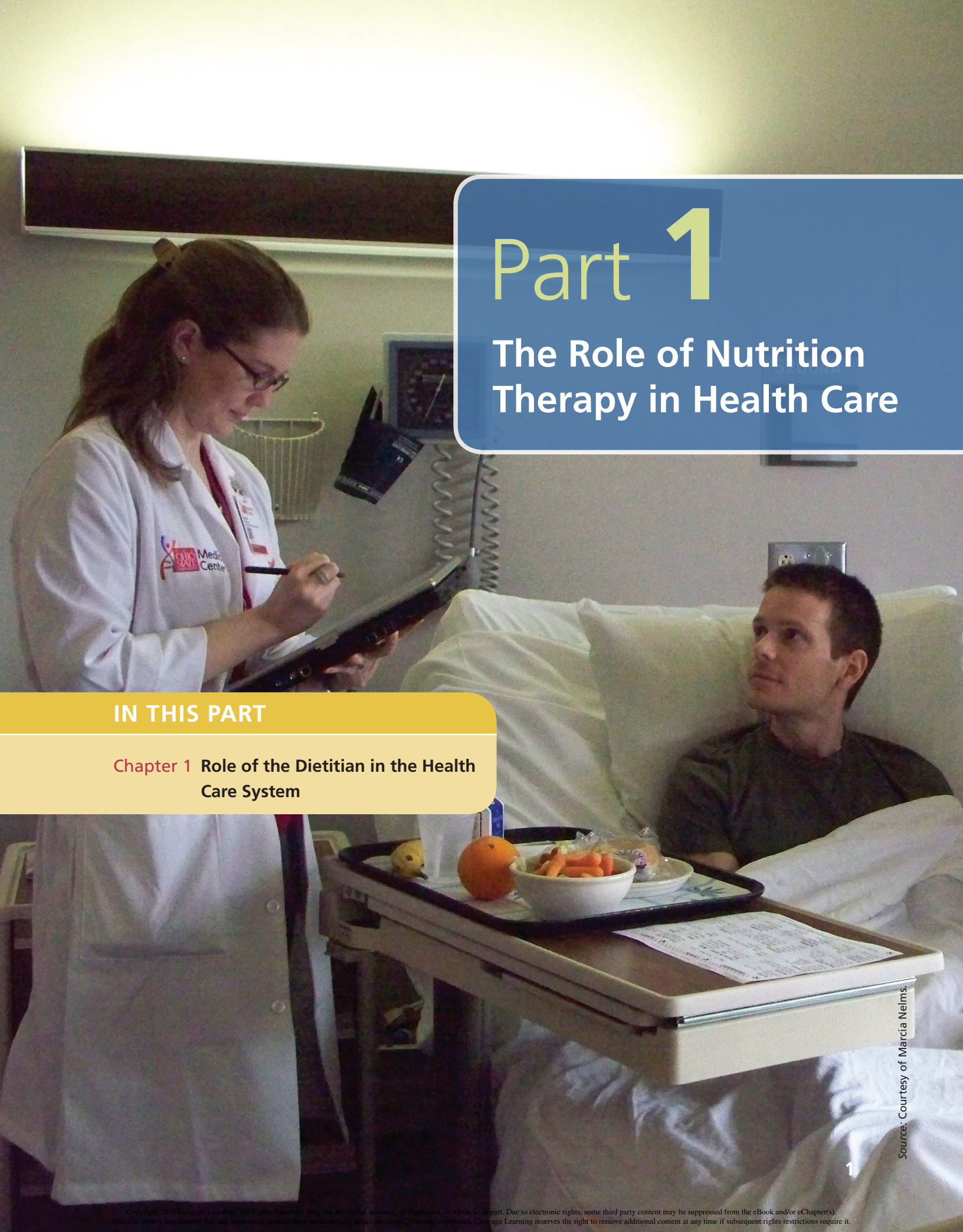


Part 1

The Role of Nutrition Therapy in Health Care

IN THIS PART

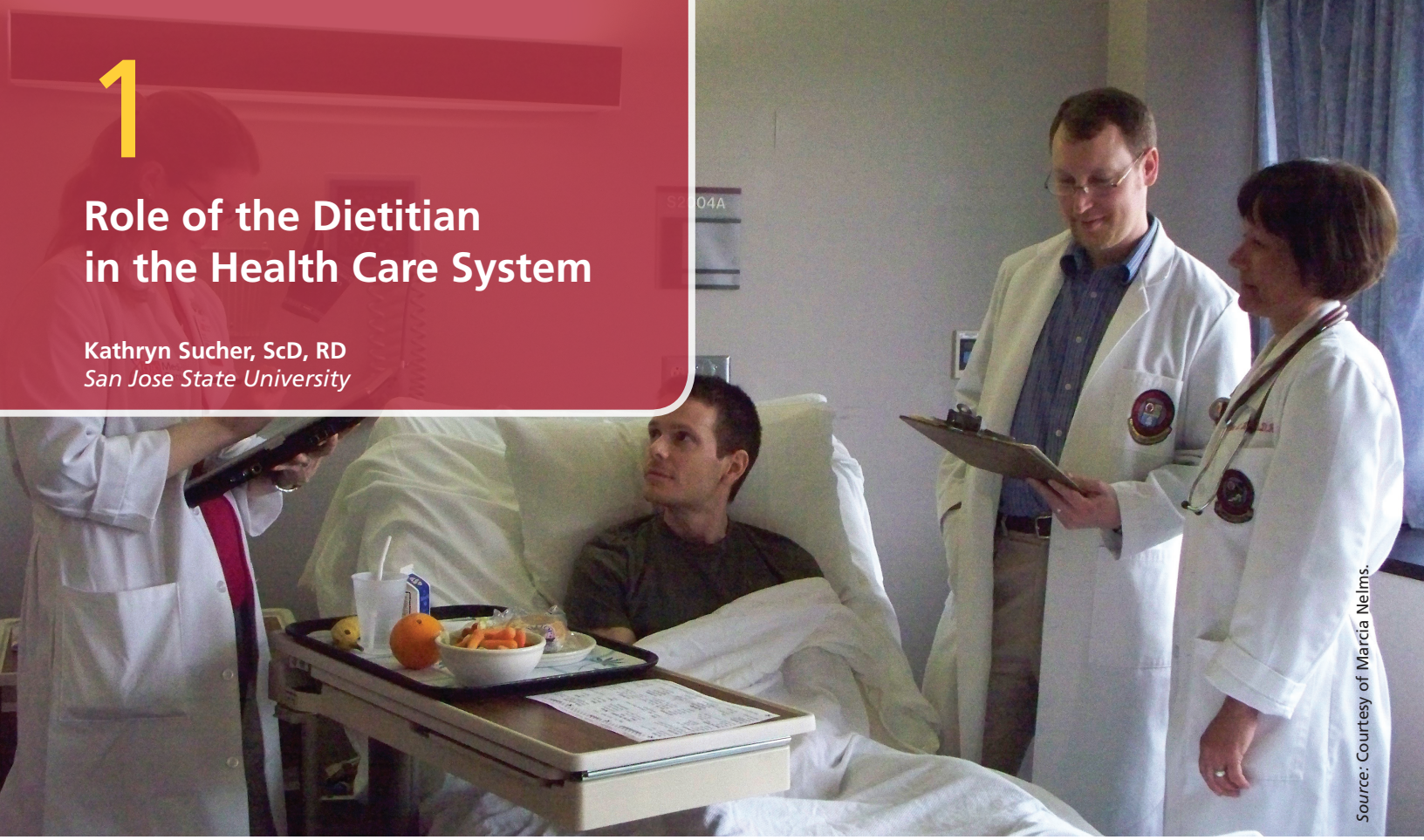
Chapter 1 **Role of the Dietitian in the Health Care System**

Source: Courtesy of Marcia Nelms.

1

Role of the Dietitian in the Health Care System

Kathryn Sucher, ScD, RD
San Jose State University



Source: Courtesy of Marcia Nelms.

Introduction

The connection between diet and health has long been recognized. The profession of dietetics was first defined in 1899 by the American Home Economics Association as "individuals with knowledge of food who provide diet therapy for the medical profession." After 1917, dietitians were affiliated with the Academy of Nutrition and Dietetics (AND),[1] formerly known as the American Dietetic Association (ADA). Dietitians who were employed in hospitals became known as *clinical dietitians*. Over time, the clinical dietitian's role became the provision of specialized care and modification of diets to treat various medical conditions.

In the early 1970s, after high levels of malnutrition in hospitalized patients were reported[2] and new and improved procedures for delivering enteral and parenteral nutrition were developed, clinical dietitians began to take a leadership role in screening patients and monitoring their needs for adequate nutrition support. In addition, as research pointed to the role of diet in the development of chronic disease, clinical dietitians began to provide primary and secondary disease prevention for such diseases as atherosclerosis, cancer, and type 2 diabetes mellitus.[3] The information provided in this chapter is meant to help you understand where you might find potential sources of employment, your contribution to the nutrition care of a patient as part of the heath care team, reimbursement issues that you might encounter, and your professional responsibilities, and to help you develop critical thinking skills that are necessary for the nutrition care process.

The Registered Dietitian* in Clinical Practice

The Role of the Clinical Dietitian

The practice of clinical nutrition is called *nutrition therapy*. Clinical dietitians are the educated and trained professionals who can best deliver nutrition therapy by using the nutrition care process (NCP). The nutrition care process consists of four major components: (1) nutrition assessment, (2) nutrition diagnosis, (3) nutrition intervention, and (4) nutrition monitoring and evaluation.[4,5]

*The Commission on Dietetic Registration allows registered dietitians (RDs) to also use the registered dietitian nutritionist (RDN) credential.

GLOSSARY

Affordable Care Act (ACA)—federal legislation meant to ensure that all Americans have access to affordable health care while containing U.S. health care costs

evidence-based dietetics practice—dietetics practice in which systematically reviewed scientific evidence is used to make food and nutrition practice decisions

health insurance—financial protection against health care costs associated with treatment of disease or accidental injury

medical doctor—a health professional who has earned a post-bachelor degree of doctor of medicine or doctor of osteopathy and who has passed a licensing examination

nurse—a health care professional who has earned at least an associate's degree in nursing, has been licensed by the state, and assists patients in activities related to maintaining or recovering health

occupational therapist—a health professional who has obtained a master's degree and passed a national registration exam, who helps individuals with mentally, physically, developmentally, or emotionally disabling conditions improve their ability to perform tasks in their daily living and working environments

outcomes research—evaluation of care that focuses on the status of participants after receiving care

pharmacist—a licensed health professional with a doctorate of pharmacy who compounds and dispenses medications, checks laboratory results for therapeutic drug levels, and reviews risk for drug interactions

social worker—a professional with at least a bachelor's degree in social work who provides persons, families, or vulnerable populations with psychosocial support, advises family caregivers, counsels patients, and helps plan for patients' needs after discharge

speech-language pathologist—a health professional who has earned a master's degree and passed a national examination, who assesses, diagnoses, treats, and helps to prevent speech, language, cognitive, communication, voice, swallowing, fluency, and other related disorders

Scope of Practice

The Scope of Practice (Figure 1.1) was developed by the Academy of Nutrition and Dietetics and "encompasses the range of roles, activities, and regulations within which nutrition and dietetics practitioners perform." You will notice that the Scope of Practice is divided into three categories, and that all three are supported by the education and credentials you are now in the process of obtaining. The first area is Practice Standards, which defines the roles, functions, responsibilities, and activities that dietetics practitioners are educated and authorized/proficient to perform within the boundaries of federal, state, and facility regulations. Practice Standards are used to evaluate a dietitian's job performance. The next area, Practice Management and Advancement, provides tools, guides, and information to help an RD determine whether she or he has the necessary knowledge and skills to take on a new job responsibility within her or his scope of practice. Career advancement may require obtaining additional credentials, certifications, and/or advanced degrees. The last area, Practice Resources, includes materials available to help the practitioner provide current, safe, ethical, and high-quality food/nutrition services. The Scope of Practice is meant to be flexible so that, as the profession changes or as an individual specializes or advances in her or his practice, evaluation resources and decision aids will also be modified. See Box 1.1 for more details.

The Clinical Nutrition Team

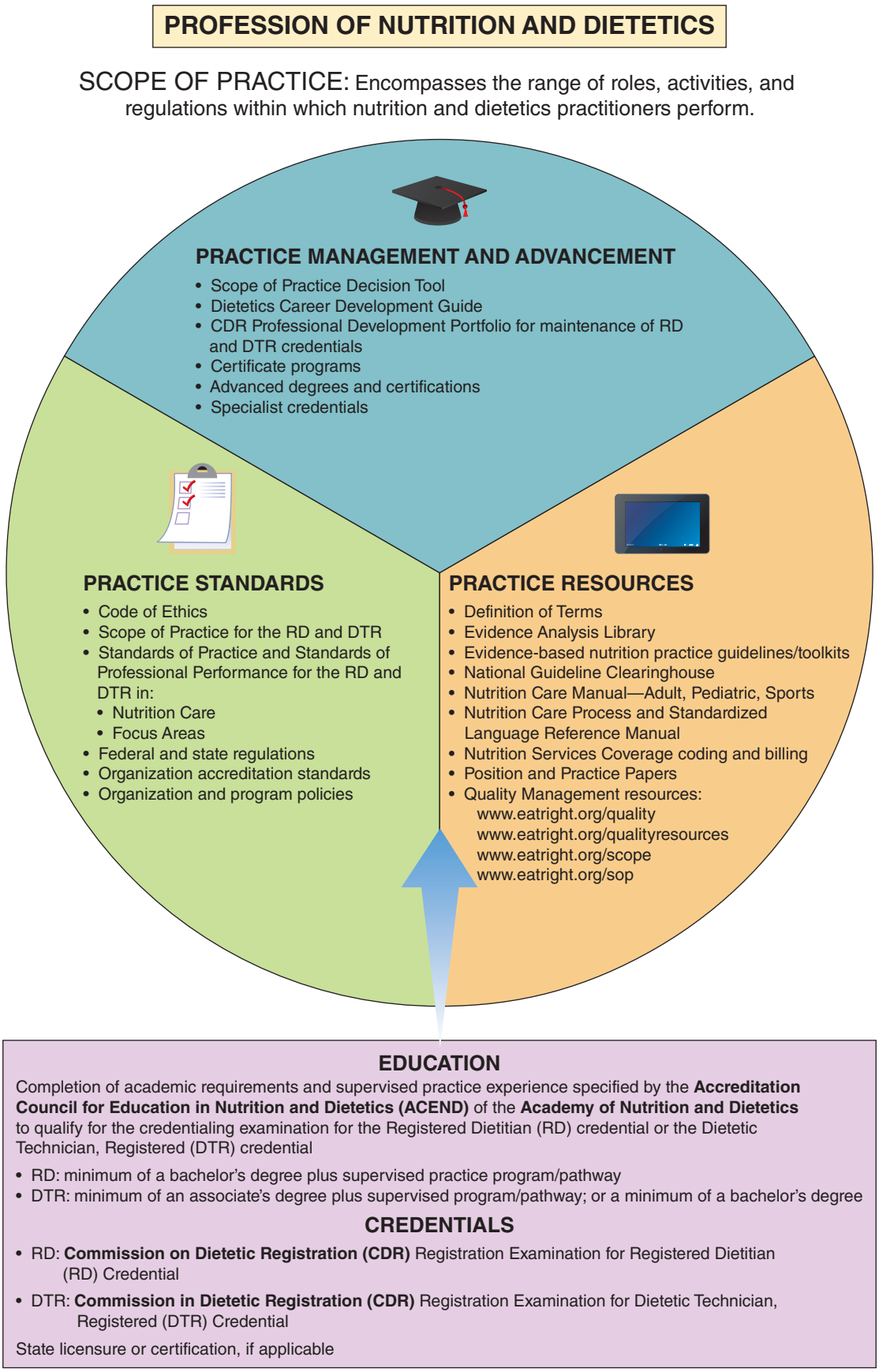
Health care is defined as the prevention, treatment, and/or management of illness. Clinical dietitians are employed in a number of acute and chronic health care facilities, as listed in Table 1.1. Depending on the facility, nutrition therapy services may be organized along different lines. The manager of the services may have the title of chief clinical manager or clinical nutrition manager. This person often reports to the director of nutrition service, who commonly supervises the clinical nutrition manager

Table 1.1 Types of Acute and Chronic Health Care Facilities in the United States

Acute Care Facilities	
Hospitals	
Public not for profit	Often owned and managed by the county or state government
Private not for profit	Owned or managed by the community, a religious organization, district health councils, or their own hospital board
Private for profit	Investor-owned (for-profit) health care organizations
Veterans and military	Government-run health care facilities for veterans of the U.S. military service and active-duty enlisted men and women
Clinics	
Outpatient	For preventative, primary health care (e.g., treatment for ear infection) and secondary health care (e.g., treatment of type 2 diabetes)
Urgent care	Provide primary care
Longer-Care Facilities	
Skilled nursing facilities	Provide constant nursing care for chronic illness and significant deficiencies with activities of daily living
Residential/assisted living	Provide for activities of daily living (e.g., bathing)
Rehabilitation/restorative	Provide integrated, multidisciplinary assistance for recovery from acute or chronic illness and/or surgical procedures (e.g., stroke)
Hospice	Focus on relieving symptoms and supporting those with a life expectancy of 6 months or less

Source: © Cengage Learning.

Figure 1.1 AND Scope of Practice in Nutrition and Dietetics



Source: Journal of the Academy of Nutrition and Dietetics, Volume 113, Issue 6, Pages S11-S16 (June 2013) DOI: 10.1016/j.jand.2012.12.009.

BOX 1.1 CLINICAL APPLICATIONS

AND Scope of Practice for the Profession of Nutrition and Dietetics: A Roadmap and Resource for Your Current Education and Training and Future Career

When you look at the Scope of Practice diagram (Figure 1.1), the first thing you notice is probably the education block since you are likely taking a course to complete the academic requirements for becoming a credentialed registered dietitian (RD) or dietetic technician, registered (DTR). You are probably less familiar with the three sections of the circle—Practice Standards, Practice Management and Advancement, and Practice Resources—but they provide the roadmap and resources for your education, training, and future career.

1. **Practice Standards** include the *Scope of Practice for the RD and DTR, Standards of Practice*, and *Standards of Professional Practice*, along with other documents. The Scope of Practice is used by licensing or certifying boards to define the procedures, actions, and processes that are permitted for practice. The AND Scope of Practice is the guide for dietetics education requirements at your college or university and demonstrated competency for supervised practice sites (e.g., dietetic internships). Your dietetics education and supervised practice are accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND), whose mission is to ensure educational quality that "prepares graduates with the foundation knowledge, skills and/or competencies for current dietetics practice and lifelong learning."

   The Standards of Professional Practice are developed by the AND to ensure that RDs or DTRs are competent to provide safe, ethical, and high-quality nutrition care; plus, they provide criteria for evaluating care. The standards may be used to develop job descriptions or evaluate your performance. Practice Standards also require continued education for RDs and DTRs for maintenance of their credentials and nutrition care competencies.

2. After you become an RD or DTR, **Practice Management and Advancement** will provide tools to assist you in determining whether (1) a new work activity is within your scope of practice and (2) this activity will require you to obtain additional training or education. These tools are meant to help you expand your practice as food and nutrition opportunities, roles, and services evolve. In addition, any education and training you complete, which you will document in the online Commission on Dietetic Registration (CDR) Professional Development Portfolio, will help you maintain your credential.

3. **Practice Resources** provide materials to support quality nutrition care. You may already be familiar with some of the resources, such as the AND Evidence Analysis Library (www.adaevidencelibrary.com), from your dietetics coursework. The AND's "Definition of Terms List" can be found at www.eatright.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=6442451086&libID=6442451082. In your medical nutrition therapy course you will learn the nutrition care process and use of the International Dietetics and Nutrition Terminology (IDNT) so you can appropriately document medical nutrition therapy in the medical record. You may also use the AND *Nutrition Care Manual* to increase your understanding of medical conditions that require nutrition support or dietary modification.

Source: Academy of Nutrition and Dietetics Quality Management Committee and Scope of Practice Subcommittee of the Quality Management Committee. Academy of Nutrition and Dietetics: Scope of Practice in Nutrition and Dietetics. *J Acad Nutr Diet*. 2013; 113(6 Suppl 2): S11–S16.

and food service manager/directors. In turn, inpatient and outpatient clinical dietitians usually report to the clinical manager. Other important personnel in nutrition therapy services are registered dietetic technicians (DTRs), who assist dietitians in the nutritional screening of patients and provision of nutrition education in addition to other duties, and dietary assistants/diet clerks who are often responsible for the documentation and processing of diet orders and assuring accuracy of the meals that are provided for patients. Table 1.2 provides common job specifications for clinical nutrition team members.

Clinical dietitians' services may be provided to general patient care units, such as those on a general medical or surgical floor, or may be based on a medical specialization, such as treatment of patients in intensive care units (e.g., burn/trauma unit or pediatric/neonatal intensive care units). Boxes 1.2 and 1.3 discuss dietetics practice in a few common settings. In addition, clinical dietitians may be certified in a medical specialty and become, for example, diabetes educators, lactation consultants, or nutrition support specialists. Nutrition therapy practice certifications and their requirements are listed in Table 1.3.

Other Health Professionals—Interdisciplinary Teams

In the health care setting, individuals from different disciplines communicate with each other regularly in order to best care for their patients. Dietitians are integral members of the patient's health care team and collaborate with physicians, pharmacists, nurses, speech pathologists, occupational therapists, social workers, and many others when providing nutritional treatment. Dietitians must know the roles of the other team members in order to be effective and to ensure optimal patient care. Table 1.4 covers the education and training requirements for health professionals and the job roles with which a dietetics student should be familiar when first starting to practice dietetics.

Table 1.2 Responsibilities and Tasks of Clinical Nutrition Team Members

Clinical Nutrition Team Member	Responsibilities	Major Tasks
Clinical nutrition manager	Directs the activities of clinical dietitians, dietetic technicians, and dietetic assistants	Hiring, evaluating, and training employees; reviewing productivity reports, writing job descriptions, scheduling employees, developing policies and procedures, designing performance standards, and developing and implementing goals and objectives of the department*
Registered (clinical) dietitian (RD)	Provides nutritional care for patients	Nutritional screening/assessment of patients to determine the presence or risks of developing a nutrition-related problem, development of nutritional diagnosis, nutrition intervention, and monitoring and evaluation of the nutrition care plan
Dietetic technician (DTR)	Assists the clinical dietitian	Gathering data for nutritional screening; assigning a level of risk for malnutrition according to predetermined criteria; administering nourishment and dietary supplements for patients and monitoring tolerance; and providing information to help patients select menus and giving simple diet instructions
Dietetic assistant/diet clerk	Assists the clinical dietitian and/or dietetic technician in some routine aspects of nutritional care	Processing diet orders, checking menus against standards, setting up standard nourishment, tallying special food requests; distributing and collecting patient menus and trays; may be involved in evaluating patient food satisfaction and helping to gather food records used to evaluate nutrient intake

*Digh EW, Dowdy RP. A survey of management tasks, completed by clinical dietitians in the practice setting. *J Am Diet Assoc*. 1994; 94: 1381–84.
Source: © Cengage Learning.

BOX 1.2 LIFE CYCLE PERSPECTIVES

The Role of the RD in Long-Term Care

Colette LaSalle, PhD, RD *San Jose State University*

The aging population has resulted in an increased need for staff registered dietitians in long-term care (LTC) facilities. The working environment for LTC has a few advantages over other settings because typically there is only one RD on site and she or he has greater autonomy and can set flexible schedules. Though the long-term residents tend to have multiple chronic and acute medical problems, which increases the complexity of care required, the RD has time to get to know them and their families and can follow up regularly to monitor the outcomes of each nutrition intervention.

The RD is an integral part of the interdisciplinary health care team and works closely with other health professionals to optimize the nutritional status of the residents. The RD has several important roles in LTC, the first of which is related directly to patient care. Many residents have physical and cognitive limitations secondary to chronic disease that can impact intake; thus, the prevalence of malnutrition (both under- and overnutrition) in this population is high. The RD is responsible for conducting a thorough nutrition assessment of the resident, evaluating the potential for functional problems during eating, such as impaired chewing ability, dental status, or swallow function, and disabilities such as the presence of contractures or postural impairments. RDs also assess dietary intake by investigating dislikes and allergies, typical meal patterns at home, beverage preferences, diet knowledge, weight history, and previous diet restrictions. RDs work to correct or attenuate nutrition-related problems by recommending diet changes and educating staff, families, and residents regarding the risks and benefits associated with therapeutic diet orders including restrictive diets, altered diet textures, and thickened fluid viscosities. RDs in LTC also play a role in discussing end-of-life care, honoring advance directives, coordinating hospice care, and initiating and monitoring adequacy of enteral feeding orders. While it is of primary importance to honor the wishes of the residents, complicating factors arise related to issues of mental competency, conservatorship, and family dynamics, with family members sometimes desiring different levels of care for the resident.

The length of stay and required level of care vary widely; some residents are admitted for short-term injury rehabilitation or caregiver respite, whereas others are admitted long term with no expected discharge date. This means that the RD in LTC is usually able to follow up with residents and evaluate the outcome of nutrition-related interventions by monitoring oral food and beverage intake, acceptance of snacks and supplements, wound status, laboratory values, and weekly or monthly weights. Also, because this population is often at risk for weight loss and decline, RDs look not only for significant changes in weight but also for gradual, "insidious" weight loss.

In addition to providing direct clinical care, the RD in LTC may also be responsible for overseeing the kitchen and all aspects of food service and food safety. The RD conducts in-services for nurses, diet clerks, and all food service staff

regarding safe food-handling practices (including HACCP) and preparing texture-modified and other therapeutic diets. Additionally, the RD performs extensive kitchen inspections and monitors the tray line, the dish room, emergency menu, emergency food and water supplies, and cleaning, sanitizer, and temperature logs in order to ensure compliance with extensive federal, state, and city regulations.

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BOX 1.3 LIFE CYCLE PERSPECTIVES

The Role of the RD in Pediatric Care

Colette LaSalle, PhD, RD *San Jose State University*

The role of the registered dietitian in pediatric care encompasses distinct challenges related to meeting the specialized needs of children. The primary role of the pediatric RD is to optimize nutrient intake to promote growth and development in the presence of complicating factors such as acute or chronic illness or developmental delays. The RD conducts a comprehensive nutrition assessment to obtain information related to medical history, feeding history, preferences, typical eating patterns, and allergies while using child-specific guidelines to estimate needs, analyze intake, and assess weight as compared to standards for age and length. One unique feature of pediatric dietetics is that, depending on the age of the child, some if not all of this information will be obtained from the parents. Pediatric RDs design nutrition interventions to address feeding problems, behavior at mealtimes, and altered energy and nutrient needs. While these interventions focus on optimizing intake for the child, this cannot be accomplished unless the family or caregiver understands the recommendations and is willing and able to adhere. Thus, pediatric RDs also educate family members and provide referrals to other health care providers such as speech-language pathologists, occupational therapists, and community food programs.

RDs may work in intensive care units (ICUs) that are specialized to either neonates (NICU) or pediatrics (PICU). In each of these ICUs, the RD plays a specialized role due to the increased level of nutritional risk associated with preterm birth, congenital defects, trauma, sepsis, and critical care. RDs working in these settings screen patients for level of risk and develop early nutrition interventions for high-risk cases such as children who require enteral and parenteral feedings. Additionally, in the neonate unit, RDs may educate mothers on how to breastfeed premature infants or, if necessary, supplement infant feeding with high-kcalorie breast milk fortifiers.

Pediatric dietitians work with diverse disorders in several specialized areas of practice encompassing a large variety of conditions that may impact nutritional needs or status, including:

- Metabolic disorders such as phenylketonuria, homocystinuria, tyrosinemia, disorders of the urea cycle pathways, methylmalonic and propionic acidemia, fatty acid oxidation disorders, mitochondrial disorders, disorders of carbohydrate metabolism
- Genetic disorders such as cystic fibrosis, fragile X syndrome
- Gastrointestinal diseases such as inflammatory bowel disease, Crohn's disease, ulcerative colitis
- Chronic organ disease (kidney disease, heart disease)
- Respiratory diseases such as bronchodysplasia
- Feeding difficulties related to developmental delay or functional impairments such as cleft palate, eating disorders
- Infectious diseases such as HIV
- Cancers
- Endocrine disorders such as type 1 or type 2 diabetes mellitus

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Table 1.3 Dietetics Practice Certifications Requirements

Specialty	Certifying Organization (webpage)	Requirements
Board Certified Specialist in Pediatric Nutrition (CSP)	Academy of Nutrition and Dietetics / Commission on Dietetic Registration (http://cdrnet.org)	Current RD, 2 years minimum length of RD status, 2000 hours of pediatric practice within the last 5 years, and successful completion of the Board Certification as a Specialist in Dietetics examination.
Board Certified Specialist in Renal Nutrition (CSR)	Academy of Nutrition and Dietetics / Commission on Dietetic Registration (http://cdrnet.org)	Current RD, 2 years minimum length of RD status, 2000 hours of renal practice within the last 5 years, and successful completion of the Board Certification as a Specialist in Dietetics examination.
Board Certified Specialist in Gerontological Nutrition (CSG)	Academy of Nutrition and Dietetics / Commission on Dietetic Registration (http://cdrnet.org)	Current RD, 2 years minimum length of RD status, 2000 hours of gerontological practice within the last 5 years, and successful completion of the Board Certification as a Specialist in Dietetics examination.
Board Certified Specialist in Sports Dietetics (CSSD)	Academy of Nutrition and Dietetics / Commission on Dietetic Registration (http://cdrnet.org)	Current RD, 2 years minimum length of RD status, 1500 hours of sports dietetics practice within the last 5 years, and successful completion of the Board Certification as a Specialist in Dietetics examination
Board Certified Specialist in Oncology Nutrition (CSO)	Academy of Nutrition and Dietetics / Commission on Dietetic Registration (http://cdrnet.org)	Current RD, 2 years minimum length of RD status, 2000 hours of oncology dietetics practice within the last 5 years, and successful completion of the Board Certification as a Specialist in Dietetics examination.
Certified Diabetes Educator (CDE)	National Certification Board for Diabetes Education (www.ncbde.org)	Minimum of 2 years' experience working as a registered dietitian. Minimum of 1000 hours of professional practice experience in diabetes self-management education with a minimum of 40% (400 hours) accrued in the most recent year preceding application. Minimum of 15 clock hours of continuing education activities applicable to diabetes within the 2 years prior to applying for certification. Successful completion of the Certified Diabetes Educator Examination.
Certified Nutrition Support Clinician® (CNSC)	National Board of Nutrition Support Certification (www.nutritioncare.org/nbnsc)	Current RD or Canadian equivalent. It is recommended that candidates have at least 2 years' experience in specialized nutrition support (parenteral and enteral nutrition). Successful completion of the Certification Examination for Nutrition Support Clinician.
Lactation Consultant (IBCLC)	International Board of Lactation Consultant Examiners (http://iblce.org)	Minimum of 90 hours of continuing education in lactation, 1000 hours of lactation-specific clinical practice within 5 years, and successful completion of the certification examination.

Source: © Cengage Learning.

Table 1.4 Education and Certification Requirements of Selected Members of the Health Care Team

Health Profession	Education	Degree Initials	Credentialing
Medical doctor and osteopathic doctor	Four-year post-bachelor degree plus internship and residency	MD; DO	State licensure exam
Nurse	Two- or 4-year degree	AA (2-year); BSN (4-year)	State licensure exam (RN)
Pharmacist	Six-year postsecondary education	PharmD	State licensure exam
Occupational therapist	Master's degree	MOT, MS, or MA	National exam for registration (OTR)
Speech-language pathologist	Master's degree plus a clinical fellowship	MS or MA	National exam for Certificate of Clinical Competence (CCC)
Social worker	Bachelor's degree or master's degree	BSW or MSW	State licensing, certification, or registration

Source: Occupational Outlook Handbook (OOH), 2012 Ed. Washington, DC: U.S. Bureau of Labor Statistics. http://www.bls.gov/ooh/.

The practice of medicine by **medical doctors** includes the diagnosis, treatment, correction, advisement, or prescription for any human disease, ailment, injury, infirmity, deformity, pain, or other condition, physical or mental. All physicians in the United States have advanced training and certification in a specialized area of medicine or surgery.[6] Table 1.5 lists the recognized board specialties and subspecialties. Nutritionally, doctors are responsible for prescribing nutrition support and nutrition prescriptions for their patients.

The largest group of health care workers in the United States is **nurses**. Registered nurses (RNs) assist in the treatment of patients, administer medications and intravenous solutions, educate patients on various medical conditions, and provide advice, follow-up care, and emotional support to patients' family members.[6] Since they provide care 24 hours a day, 7 days a week, nurses are commonly responsible for the initial nutrition screening of patients and then documenting a patient's food intake during hospitalization as well as notifying the dietitian if a patient's intake is inadequate.

A licensed **pharmacist** dispenses medications and advises the medical staff on the selection and effects of drugs. In addition, pharmacists monitor laboratory results for therapeutic drug levels as well as electrolyte levels for patients receiving parenteral nutrition, and review risks for drug–drug and drug–nutrient interactions. Pharmacists are commonly responsible for compounding sterile solutions including parenteral nutrition support solutions.[6]

Occupational therapists assist patients to improve their ability to perform tasks in living and working environments. Many of their clients suffer from disabling mental, physical, developmental, and/or emotional conditions. Occupational therapists help clients to perform all types of activities, from using a computer to caring for daily needs (dressing, cooking, and eating).[6]

Table 1.5 American Boards of Medical Specialties

- Allergy & Immunology
- Anesthesiology
- Colon & Rectal Surgery
- Dermatology
- Emergency Medicine
- Family Practice
- Internal Medicine*
- Hospital Medicine**
- Medical Genetics
- Neurological Surgery
- Nuclear Medicine
- Obstetrics & Gynecology
- Ophthalmology
- Orthopedic Surgery
- Otolaryngology
- Pathology
- Pediatrics
- Physical Medicine & Rehabilitation
- Plastic Surgery
- Preventive Medicine
- Psychiatry & Neurology
- Radiology
- Surgery
- Thoracic Surgery
- Urology

*Subspecialties of Internal Medicine include Adolescent Medicine, Cardiovascular Disease, Critical Care Medicine, Endocrinology, Diabetes and Metabolism, Gastroenterology, Geriatric Medicine, Hematology, Hospice and Palliative Medicine, Infectious Disease, Medical Oncology, Nephrology, Pulmonary Disease, Rheumatology, Sleep Medicine, Sports Medicine. (This list was effective October 2013. American Board of Medical Specialties®, www.abms.org.) The subspecialties are only noted for Internal Medicine.

**Medical care of acutely ill hospitalized patients.

They often work with patients with swallowing disorders and clients with physical disabilities to provide special instructions on eating and use of adaptive feeding devices.

Speech-language pathologists—sometimes called *speech therapists*—assess, diagnose, treat, and help to prevent speech, language, cognitive, communication, voice, swallowing, fluency, and other related disorders. Speech-language pathologists working in a health center provide clinical services to individuals with swallowing disorders, and they work closely with physicians, nurses, and dietitians to help assess the need for and to provide nutrition support.[6]

Medical **social workers** work with individuals and families to provide the psychosocial support needed to cope with chronic, acute, or terminal illnesses. They also educate family caregivers, counsel patients, and help plan for patients' needs after discharge by arranging community and financial resources to cover medical needs, food-related services, and costs.[6]

Health Care Services and Reimbursement for Medical Nutrition Therapy (MNT)

Where do nutrition services fit within our current health care picture? Nutrition therapy remains an essential component of medical treatments, and research indicates its importance will continue to be recognized. The provision of nutrition therapy and its reimbursement are affected by health care financing.

The pluralistic system of health care in the United States includes many components: private insurance, group insurance, Medicare, Medicaid, workers' compensation, the Veterans Health Administration medical care system, Department of Defense hospitals and clinics, the Public Health Service's Indian Health Service, state and local public health programs, and the Department of Justice's Federal Bureau of Prisons. Currently, the system is structured around the provision of **health insurance**. In 2012, 84.6% of the U.S. population was insured, and 15.4% was not.[7] Many Americans are forced to live without health insurance because they cannot afford it. In the United States currently, there are two general categories of health insurance: private and public. Of the insured population, approximately 64% under age 65 has private insurance and 33% is covered by public health insurance provided by the government. Table 1.6 lists the types of private and public health insurance and typical reimbursements for medical nutrition therapy.

The **Affordable Care Act (ACA)**, enacted under President Barack Obama, extends the availability of health insurance to all Americans, beginning in 2014. The ACA allows individuals and small businesses to compare and purchase health plans similar to those traditionally provided by larger companies. For middle- and low-income families, a significant portion of the cost of health care programs is covered