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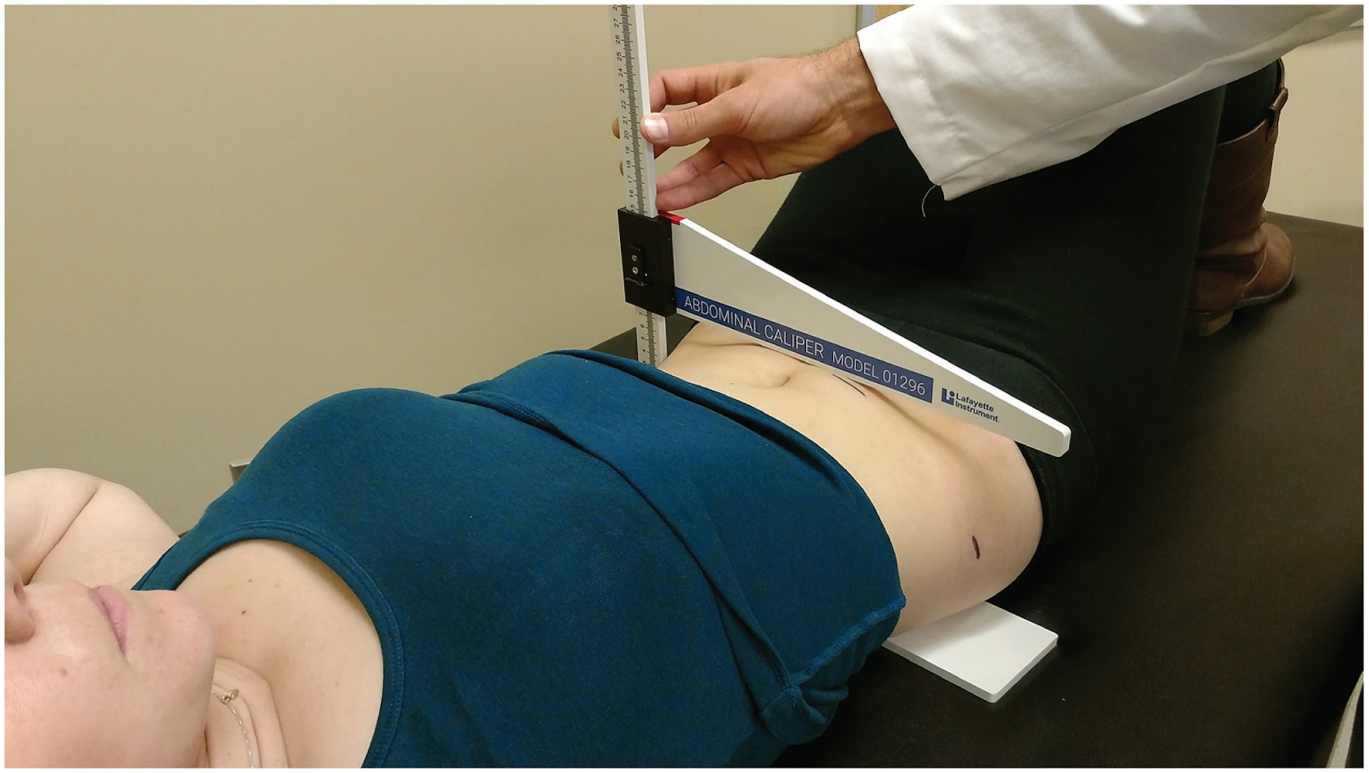

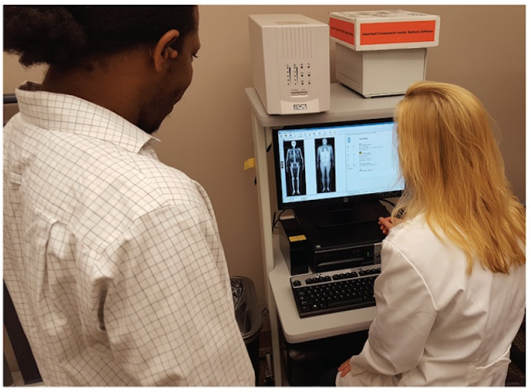

DAVID C. NIEMAN

NUTRITIONAL ASSESSMENT

Seventh Edition

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Mc Graw Hill Education

NUTRITIONAL ASSESSMENT, SEVENTH EDITION

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To my loving wife, Cathy, who has supported me and shared her insights as a practicing dietitian throughout the writing process.

Brief Contents

CONTENTS

PREFACE

The leading causes of death are chronic, noncommunicable diseases, including heart disease, stroke, cancer, and diabetes, which are and most often linked to dietary patterns. The continuing presence of nutrition-related disease makes it essential for health professionals to have the ability to determine the nutritional status of individuals. As defined by the Academy of Nutrition and Dietetics, nutritional assessment is "a systematic method for obtaining, verifying, and interpreting data needed to identify nutrition-related problems, their causes, and significance." In other words, nutritional assessment is critical to determine whether a person is at nutritional risk, the nutritional problem, and best strategy to monitor responses to nutrition- and lifestyle-based treatment. Nutritional assessment methods can be divided into anthropometric, biochemical, clinical, and dietary categories, and each is fully described in this textbook.

The Seventh Edition of *Nutritional Assessment* addresses these and many other topics, including computerized dietary analysis systems, national surveys of dietary intake and nutritional status, assessment techniques and standards for the hospitalized patient, nutritional assessment for the prevention of diseases such as coronary heart disease, osteoporosis, and diabetes. Proper counseling and clinical assessment techinques are also featured.

This extensively revised edition builds on the strengths of the previous six editions. Nearly all photos and graphs in this textbook have been updated, and the reference list for each chapter has been refreshed with essential, topical references. The appendices have been reorganized, with numerous tables added to provide current reference data important to the field of nutritional assessment.

This textbook was written for students of dietetics and public health nutrition, but is also intended to be a valuable reference for health professionals who work with patients who have diet-related medical problems.

CHANGES IN THE SEVENTH EDITION

Numerous revisions and additions to the Seventh Edition of *Nutritional Assessment* make it the most comprehensive and up-to-date textbook available on the subject. Included in this edition are extensive updates to nutrient intake recommendations, guidelines, and indices including the 2015–2020 Dietary Guidelines for Americans, Healthy Eating Index, American Heart Association's Cardiovascular Disease Metrics, Evidence-Based Guidelines for the Management of High Blood Pressure in Adults, and American College of Cardiology/American Heart Association practice guidelines on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults. Updated methods and standards for a wide variety of anthropometric, body composition, and malnutrition assessment procedures have also been added. Photos, graphs, tables, and references are updated throughout the entire textbook, while the appendices have been thoroughly reorganized and updated to provide the most current nutritional assessment standards and reference data.

Chapter 1 Introduction to Nutritional Assessment (Provides thorough introduction to Nutritional Assessment and Nutrition Care Process; explores definitions and concepts)

- Updated section on opportunities in nutrition assessment with current information provided on monitoring the incidence and prevalence of conditions such as diabetes, obesity, heart disease, cancer, and osteoporosis.

Chapter 2 Standards for Nutrient Intake (Reviews standards for nutrient intake)

- Detailed description of the five guidelines and 13 key recommendations of the 2015–2020 Dietary Guidelines for Americans.

- Updated information on the Healthy Eating Index, a review of the new Nutrition Facts label and most current standards for Daily Values, and a description of the "Choose Your Foods" system.

Chapter 3 Measuring Diet (Explores methods for measuring diet)

- New assessment activity on dietary screeners, and summary of nutrients and food components analyzed by the Diet History Questionnaire II.

Chapter 4 National Dietary and Nutrition Surveys (Reviews statistics on the trends in food availability)

- Revised data and graphs on food security and insecurity from the USDA.
- Updated tables summarize the major components of the continuous NHANES and the Total Diet Study.
- New graphs summarize nutrient intake information from food availability estimates and the NHANES What We Eat in America surveys, and current Behavioral Risk Factor Surveillance System Questionnaire (Appendix F).

Chapter 5 Computerized Dietary Analysis Systems (Reviews the use of computerized dietary analysis systems and provides guidelines for evaluation)

- Updated tables and information from the USDA Nutrient Database for Standard Reference and the USDA Food and Nutrient Database for Dietary Studies (FNDDS).
- A revised summary of databases maintained by the USDA, Nutrient Data Laboratory (NDL), and Agricultural Research Service (ARS).

Chapter 6 Anthropometry (Describes anthropometric techniques)

- This chapter has been extensively revised with the inclusion of new photos, current prevalence data for overweight and obesity in adults, children, and adolescents.
- Added information on the sagittal abdominal diameter measurement as an anthropometric index of visceral adiposity and a description of the American Body Composition Calculator (ABCC) (with a new, related assessment activity).
- Updated sections on segmental multi-frequency bioelectrical impedance (BIA) and dual-energy X-ray absorptiometry (DXA) testing for body composition and osteoporosis.
- Many new tables on body composition, bone mineral density, and anthropometric reference data in Appendices H through L.

Chapter 7 Assessment of the Hospitalized Patient (Provides a thorough description of methods to assess malnutrition)

- This chapter has also been completely revised, with a focus on current recommendations for the assessment of malnutrition using the Mini Nutritional Assessment Short Form (MNA-SF), Malnutrition University Screening Tool (MUST), Subjective Global Assessment (SGA), Nutritional Risk Screening (NRS), and the Simplified Nutritional Appetite Questionnaire (SNAQ).
- New sections have been added on the use of hand-grip strength testing to determine weakness and sarcopenia, arm anthropometry, the use of the Pediatric Nutrition Screening Tool (PNST), mental health and quality of life (QOL) testing, functional status assessment using activities of daily living (ADLs) and instrumental activities of daily living (IADLs), and guidelines for measuring energy expenditure using indirect calorimetry.

Chapter 8 Nutritional Assessment in Prevention and Treatment of Cardiovascular Disease (Relates nutrition to the prevention of disease)

- This chapter has also been completed revised, with emphasis placed on the American Heart Association's (AHA) cardiovascular disease metrics system for tracking key health factors and behaviors in children, adolescents, and adults. Current AHA diet and lifestyle recommendations are described in detail, with information provided for six tools to assess and monitor dietary patterns.
- Prevalence data on risk factors for heart disease and stroke have been updated with numerous new graphs and tables (also see new reference and trend tables in Appendix M).
- A detailed description of the American College of Cardiology (ACC) and AHA guidelines for the treatment of high blood cholesterol is provided, with a new related assessment activity. Screening guidelines for dyslipidemia in children and adolescents are detailed.
- Updated information is given for hypertension, with a focus on the current Evidence-Based Guideline for the Management of High Blood Pressure in Adults from the Eight Joint National Committee Panel (JNC8).
- The section on diabetes mellitus has been completely updated, with emphasis on risk factors and screening guidelines for diabetes mellitus in children, adolescents, and adults, and related medical nutrition therapy (MNT) recommendations.

Chapter 9 Biochemical Assessment of Nutritional Status (Interprets laboratory tests and reviews methods for assessing nutrient status)

- A new section has been added on using the complete blood count (CBC) to assess nutritional status and updated guidelines and graphs for assessment of vitamin D status.

Chapter 10 Clinical Assessment of Nutritional Status (Provides overview of clinical assessment of nutrition status)

- This chapter now includes the World Health Organization (WHO) clinical staging criteria for HIV/AIDS for adults and adolescents.
- Updated information on diagnostic criteria, signs and symptoms, and potential medical consequences for anorexia nervosa and bulimia nervosa.

Appendices

- Updated anthropometric, skinfold, body composition, and bone density reference and trend data are presented in Appendices H through L.
- Appendix M provides current reference and trend data for serum lipid and lipoprotein levels in adults.

Nutritional Assessment Website (www.mhhe.com/nieman7)

This website provides instructors with a convenient and authoritative online source for additional information and resources on nutritional assessment. It serves to update readers about new information and developments in the field of nutritional assessment as they become available. A password-protected test bank and PPT lecture outlines are also available.

Features

Chapter Outline and Student Learning Outcomes

Each chapter begins with an outline of the chapter contents and set of student learning outcomes. Reading these before beginning the chapter gives the student an idea of the material to be covered and key concepts contained in the chapter, while serving as useful review tools when the student studies for exams.

Figures and Tables

There are more than 100 tables in the text, supplemented with over 150 graphs, illustrations, photographs, and nearly 70 text boxes. Figures in Chapter 4, for example, illustrate trends in food and nutrient intake based on data from the National Health and Nutrition Examination Survey and U.S. Department of Agriculture's monitoring of food available for consumption from the U.S. food supply. Chapters 6 and 7 contain numerous photographs illustrating the exact procedures involved in skinfold measurement and other anthropometric techniques used to assess nutritional status.

Summaries

A summary at the end of each chapter highlights all important chapter information and will be especially helpful when the student reviews for exams.

References

A complete list of up-to-date references is included at the end of each chapter. This list provides the student and instructor with extensive sources for continued study.

Assessment Activities

Most of the chapters end with two or three practical assessment activities to help the student better understand concepts presented in the chapter. For example, some activities involve the analysis of diet records using software on a personal computer, obtaining information on food composition from online databases, accessing nutritional monitoring data from government websites, practicing anthropometry, one-on-one dietary counseling, and interpreting serum lipid and lipoprotein results.

Appendices

Appendices A through F provide numerous recording forms and questionnaires used to measure diet intake at the individual and population level. Appendix G provides the CDC clinical growth charts for children and adolescents, including charts for infants and children from birth to two years of age. Anthropometric, skinfold, body composition, and bone density reference and trend data are presented in Appendices H through L. Appendix M gives reference and trend data for serum lipid and lipoprotein levels in adults. Appendix N contains a form for self-monitoring dietary intake, and Appendix O has a checklist for counseling competencies.

Glossary

Throughout the text, important terms are shown in boldface type. Concise definitions for more than 360 terms can be found in the glossary.

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CHAPTER

Introduction to Nutritional Assessment 1

Outline

Student Learning Outcomes

After studying this chapter, the student will be able to:

1. Describe the factors that contributed to a change in the leading causes of death during the 20th century.
2. Name the leading causes of death in the United States in which diet plays a role.
3. Distinguish between nutritional screening and nutritional assessment.
4. Name the four methods used to collect nutritional assessment data.
5. Explain the Nutrition Care Process Model.
6. Discuss the role of nutritional assessment in the Nutrition Care Process.
7. Discuss the role of nutritional assessment in the prevention and treatment of disease.

Introduction

Throughout most of human history, agriculture has been a labor-intensive process with relatively small yields of a limited number of crops. Hunger, nutrient deficiency, and starvation were common, and infectious diseases were the leading causes of death. Beginning in the late 19th century and early 20th century, improvements in plant breeding, the mechanization of agriculture, and the widespread use of fertilizers and pesticides resulted in dramatic increases in crop yields per unit of land. Food became much more available and less expensive, and by the middle of the 20th century developed nations went from a dismal era of food scarcity to one of food excess. Nutrient deficiency diseases have become much less common and chronic diseases related to excess consumption of food, tobacco and alcohol use, and a lack of physical activity are now the leading causes of death and disability throughout the world. During the same time, improvements in sanitation, convenient access to safe drinking water, vaccine and antibiotic development, and improvements in health care have dramatically reduced the **incidence** and **prevalence** of infectious diseases and dramatically increased **life expectancy** in developed countries. However, many developing countries experience a double burden of death from chronic diseases and infectious diseases.[1,2]

These changes have resulted in an **epidemic** of chronic diseases, many of which are directly linked to excess consumption of high-fat foods and alcoholic beverages, inadequate consumption of foods high in complex carbohydrates and fiber, and a sedentary lifestyle. This situation, along with heightened public and professional interest in the role of nutrition in health and disease, has created an increased need for health professionals proficient in nutritional assessment. The ability to identify persons at nutritional risk, describe and label an existing nutrition problem, and then plan and implement a nutrition intervention addressing the nutrition problem has made nutritional assessment an essential element of health care and a necessary skill for health professionals concerned about making health care more cost-effective.

Good Nutrition Essential for Health

Good nutrition is critical for the well-being of any society and to each individual within that society. The variety, quality, quantity, cost, and accessibility of food and the patterns of food consumption can profoundly affect health.

Scurvy, for example, was among the first diseases recognized as being caused by a nutritional deficiency. One of the earliest descriptions of scurvy was made in 1250 by French writer Joinville, who observed it among the troops of Louis IX at the siege of Cairo. When Vasco da Gama sailed to the East Indies around the Cape of Good Hope in 1497, more than 60% of his crew died of scurvy.[3] In 1747, James Lind, a British naval surgeon, conducted the first controlled human dietary experiment showing that consumption of citrus fruits cures scurvy.[4]

Deficiency Diseases Once Common

Up until the middle of the 20th century, scurvy and other **deficiency diseases,** such as **rickets, pellagra, beriberi, xerophthalmia,** and iodine-deficiency diseases such as **goiter** and **cretinism** (caused by inadequate dietary vitamin D, niacin, thiamin, vitamin A, and iodine, respectively), were commonly seen in the United States and throughout the world and posed a significant threat to human health.[3,4]

Infectious disease and malnutrition remain serious problems in developing nations. According to the World Health Organization, infectious diseases are responsible for 52% of deaths in children less than 5 years of age, and improved breast-feeding practices and nutrition interventions are needed to reduce deaths from infections and improve child survival.[5] Sanitation measures, improved health care, vaccine development, and mass immunization programs have dramatically reduced the incidence of infectious disease in developed nations. An abundant food supply, **fortification** of some foods with important nutrients, **enrichment** to replace certain nutrients lost in food processing, and better methods of determining the nutrient content of foods have made nutrient-deficiency diseases relatively uncommon in developed nations. Despite these gains, 5% of American households experience very low food security, meaning that the food intake of one or more household members was reduced and their eating patterns were disrupted at times during the year because the household lacked money.[6]

Chronic Diseases Now Epidemic

Despite the many advances of nutritional science, nutrition-related diseases not only continue to exist but also result in a heavy toll of disease and death. In recent decades, however, they have taken a form different from the nutrient-deficiency diseases common in the early 1900s. Diseases of dietary excess and imbalance now rank among the leading causes of illness and death in North America and play a prominent role in the epidemic of chronic disease that all nations are currently experiencing.[5] Table 1.1 ranks the 10 leading causes of death in the United States. Four of these are related directly to diet, including heart disease, cancer, stroke, and diabetes.[7]

Overweight and obesity prevalence has risen to high levels and contributes to risk for heart disease, certain types of cancer, and type 2 diabetes. In the United States, 71% of adults are overweight or obese (body mass index, or BMI, of 25 kg/m^2 and higher), and 38% are obese (BMI of 30 and higher). About one in five children (ages 6–11 years) and adolescents (ages 12–19 years) is considered obese, according to the National Center for Health Statistics.[8]

The continuing presence of nutrition-related disease makes it essential that health professionals be able to determine the nutritional status of individuals. Nutritional assessment is critical in determining whether a person is at nutritional risk, what the nutritional problem is, and

Table 1.1 Leading Causes of Death, United States

Rank	Cause of Death	% of all Deaths
1*	**Heart Disease**	23.5
2*	**Cancer**	22.5
3	**COPD**	5.7
4	**Injuries**	5
5*	**Stroke**	5
6	**Alzheimer's disease**	3.3
7*	**Diabetes**	2.9
8	**Pneumonia/influenza**	2.2
9	**Kidney disease**	1.8
10	**Suicide**	1.6

Source: National Center for Health Statistics.

*Causes of death in which diet plays a role.

how best to treat it and to monitor the person's response to the treatment. Nutritional assessment is the first of the four steps in the Nutrition Care Process.[9–12]

NUTRITIONAL SCREENING AND ASSESSMENT

Nutritional screening can be defined as "a process to identify an individual who is malnourished or who is at risk for malnutrition to determine if a detailed nutrition assessment is indicated."[13] If nutritional screening identifies a person at nutritional risk, a more thorough assessment of the individual's nutritional status can be performed. Nutritional screening can be done by any member of the health-care team such as a dietitian, dietetic technician, dietary manager, nurse, or physician. Nutritional screening and how it fits into the nutritional care process are discussed in greater detail in Chapter 7, and examples of screening instruments are shown there.

Nutritional assessment is defined by the American Society for Parenteral and Enteral Nutrition as "a comprehensive approach to diagnosing nutrition problems that uses a combination of the following: medical, nutrition, and medication histories; physical examination; anthropometric measurement; and laboratory data."[13] The Academy of Nutrition and Dietetics defines nutritional assessment as "a systematic method for obtaining, verifying, and interpreting data needed to identify nutrition-related problems, their causes. and their significance."[9] It involves initial data collection and continuous reassessment and analysis of data, which are compared to certain criteria such as the Dietary Reference Intakes or other nutrient intake recommendations.[9]

Nutritional Assessment Methods

Four different methods are used to collect data used in assessing a person's nutritional status: anthropometric, biochemical or laboratory, clinical, and dietary. The reader may find the mnemonic "ABCD" helpful in remembering these four different methods.

Anthropometric Methods

Anthropometry is the measurement of the physical dimensions and gross composition of the body. Examples of anthropometry include measurements of height, weight, and head circumference and the use of measurements of **skinfold thickness, body density** (underwater weighing), **air-displacement plethysmography, magnetic resonance imaging,** and **bioelectrical impedance** to estimate the percentage of fat and lean tissue in the body. These results often are compared with standard values obtained from measurements of large numbers of subjects. Anthropometry will be covered in Chapters 6 and 7. At the end of most chapters are suggested exercises, called assessment activities, that allow you to apply the concepts covered. In the assessment activities of Chapter 6, you will try your hand at skinfold measurements to estimate percent body fat and compare several methods of determining body composition.

Biochemical Methods

In nutritional assessment, biochemical or laboratory methods include measuring a nutrient or its metabolite in blood, feces, or urine or measuring a variety of other components in blood and other tissues that have a relationship to nutritional status. The quantity of **albumin** and other **serum proteins** frequently is regarded as an indicator of the body's protein status, and **hemoglobin** and serum ferritin levels reflect iron status. Serum lipid and lipoprotein levels, which are influenced by diet and other lifestyle factors, reflect coronary heart disease risk.

Biochemical methods are covered in Chapters 7 through 9. An assessment activity in Chapter 8 suggests that you have your blood drawn and tested at a clinical laboratory and compare your results with recommended values. Assessment activities in Chapters 7 and 9 guide you through the application of key concepts as you evaluate biochemical and other data from patient records.

Clinical Methods

The patient's personal and family history, medical and health history, and physical examination are clinical methods used to detect **signs** and **symptoms** of **malnutrition.** Symptoms are disease manifestations that the patient is usually aware of and often complains about. Signs are observations made by a qualified examiner during physical examination. Enlargement of the salivary glands and loss of tooth enamel are clinical signs of frequent vomiting sometimes seen in patients with bulimia nervosa. Examining a patient for loss of subcutaneous fat and muscle in the neck, shoulders, and upper arms, a clinical sign of inadequate calorie intake, is included in **Subjective Global Assessment,** a clinical approach for assessing nutritional status that relies on information collected by the clinician through observation and interviews at the patient's bedside. Clinical signs and symptoms in nutritional assessment will be discussed in Chapter 10.

Dietary Methods

Dietary methods generally involve surveys measuring the quantity of the individual foods and beverages consumed during the course of one to several days or assessing the pattern of food use during the previous several months. These can provide data on intake of nutrients or specific classes of foods. Chapters 2 through 4 cover dietary methods. One of the assessment activities in Chapter 3 involves collecting a 24-hour dietary recall from a classmate and analyzing his or her nutrient intake using food composition tables.

Included among dietary methods is the use of computers to analyze dietary intake. A number of online dietary and physical activity assessment tools are available, as are numerous software programs for computers that allow nutritionists and dietitians to quickly analyze the nutrient composition of dietary intake. These online systems and software programs vary widely in price and certain features, such as the number and types of different foods and nutrients that each contains. Chapter 5 covers selection and use of nutritional analysis software and online systems. The assessment activity in Chapter 5 involves computerized analysis of the 24-hour recall and 3-day food record collected as part of the assessment activities in Chapter 3.

Importance of Nutritional Assessment

The use of nutritional assessment to identify diet-related disease has increased in importance in recent years because of our greater knowledge of the relationship between nutrition and health and our expanded ability to alter the nutritional state.

Evidence related to the role of diet in maternal and child health indicates that well-nourished mothers produce healthier children.[15,16] Sufficient intake of energy and nutrients, including appropriate body weight before pregnancy and adequate weight gain during pregnancy, improves infant birth weight and reduces infant **morbidity** and **mortality.** Consequently, nutritional assessment has become an integral part of maternity care at the beginning of pregnancy and periodically throughout pregnancy and lactation.[15,17] Nutrition also can have a profound influence on health, affecting growth and development of infants, children, and adolescents; immunity against disease; morbidity and mortality from illness or surgery; and risk of such diseases as cancer, coronary heart disease, and diabetes.[17–19]

Interventions to alter a person's nutritional state can take many forms. In certain situations, nutrient mixes can be delivered into the stomach or small intestine through feeding tubes **(enteral nutrition)** or administered directly into veins **(parenteral nutrition)** to improve nutritional status. Thus, nutritional assessment is important in identifying persons at nutritional risk, in determining what type of nutrition intervention, if any, may be appropriate to alter nutritional status, and in monitoring the effects of nutrition intervention.

The Nutrition Care Process

The Nutrition Care Process (NCP) is "a systematic problem-solving method" in which dietetic practitioners use critical-thinking skills to make evidence-based decisions addressing the nutrition-related problems of those they serve, whether it be patients, clients, groups, or communities of any age or health condition (collectively referred to as "patients/clients").[9–12] Developed by the Academy of Nutrition and Dietetics (formerly known as the American Dietetic Association), the NCP establishes a consistent, *standardized process* for the delivery of nutrition-related care to patients/clients that is safe, effective, and of high quality. In addition, the Academy of Nutrition and Dietetics has created a set of standardized phrases or "terms" that are organized into categories or "domains," with each phrase having its own unique alphanumeric code for identification and documentation purposes. These phrases or terms were developed to allow dietetic practitioners to clearly describe, document, and evaluate the nutrition-related care they provide to their patients/clients. The terms facilitate clear and specific communication among practitioners and with other members of the health-care team.[9,12] This standardized terminology is described in greater detail later in this chapter.

It is important to note that while the NCP is intended to help standardize the process of delivering nutrition-related care, is not intended to standardize the actual nutrition care that different patients/clients receive.[9,10] The nutrition-related problems experienced by different patients/clients are highly variable, depending on numerous individual characteristics and circumstances that are unique to each patient/client and that will require an intervention that is uniquely suited to the condition of each individual patient/client. The NCP is designed to improve the consistency and quality of nutrition-related care that patients/clients receive and to ensure that the outcomes or results of that care are more predictable.[9,10]

There are four steps in the NCP: nutritional assessment, nutrition diagnosis, nutrition intervention, and nutritional monitoring and evaluation, as depicted in Figure 1.1.[9,10] Nutritional assessment, the first step, involves collecting, verifying, recording, and interpreting a variety of data that are relevant to the nutritional status of the patient or client. These data, also referred to as **nutrition care indicators,** allow the practitioner to determine whether a nutrition problem exists and to make informed decisions about the nature, cause, and significance of nutrition-related problems that do exist.[10] Thus, nutritional assessment is essential to and an initial step in the delivery of cost-effective and high-quality nutrition care.

The Nutrition Care Process Model

At the very center of the NCP is the relationship between the dietetic professional and the patient/client, illustrating that the nutrition care provided is to be patient/client-centered. The practitioner should interact with the patient/client in a respectful, empathetic, nonjudgmental, and culturally sensitive manner and demonstrate good listening skills. This will help ensure that the patient/client is actively involved in setting the goals and outcomes of any intervention and that these are patient-focused, reasonable, achievable, incremental, and measurable.

Nutritional assessment is the initial step in the NCP, and its purpose is to establish a foundation for progressing

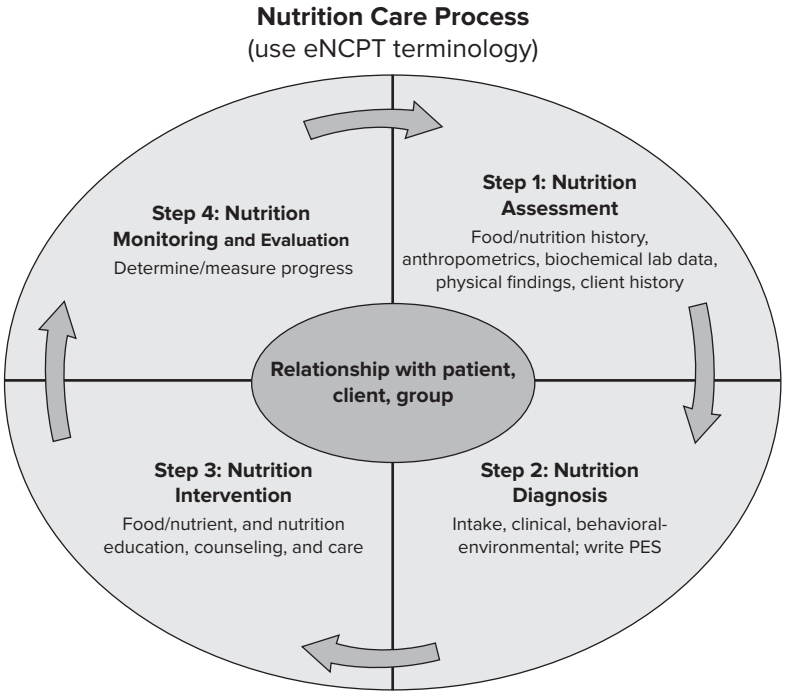

Figure 1.1 **The four distinct but interrelated and connected steps of the Nutrition Care Process and model.**

through the remaining three steps. The strengths and abilities that the practitioner brings to the process include unique dietetics knowledge, skills and competencies, critical-thinking skills, collaboration, communication, evidence-based practice, and a code of ethics. Evidence-based practice involves incorporating the most current available scientific information in the nutrition-related care provided. Adherence to a professional code of ethics ensures that patients/clients are cared for in a manner conforming to strict social, professional, and moral standards of conduct.[9,10]

Environmental factors that can impact the patient/client's ability to receive and benefit from the NCP include practice settings, health-care systems, social systems, and economics. For example, the patient/client's income and health insurance coverage will significantly impact the type and extent of nutrition care that is provided. The patient/client's living arrangements, access to food, and social-support system can impact the ability to adopt and maintain healthful changes in diet, physical activity, etc. These environmental factors can have either a positive or a negative effect on the outcome of the nutrition care provided and must be assessed and considered in providing care.

Two supporting systems that play important roles in providing nutrition care include a screening and referral system and an outcomes management system. Nutritional screening can be defined as "a process to identify an individual who is malnourished or who is at risk for malnutrition to determine if a detailed nutritional assessment is indicated."[13] Because nutritional screening may be done by someone other than a dietetics professional, such as a registered dietitian or dietetic technician, this is considered an external supportive system and not a step within the NCP.[10] If nutritional screening identifies a person at nutritional risk, a more thorough assessment of the individual's nutritional status should be performed. Nutritional screening is discussed in greater detail in Chapter 7, and examples of screening instruments are shown there. The outcomes management system evaluates the effectiveness and efficiency of the process by collecting and analyzing relevant data in a timely manner in order to adjust and improve the performance of the process.[10]

Nutritional Assessment in the Nutrition Care Process

Nutrition assessment is the first step in the Nutrition Care Process and involves obtaining, verifying, and interpreting data that are needed to identify a particular nutrition-related problem. Nutritional assessment is organized into five domains: food/nutrition-related history, anthropometric measurements, biochemical data (with medical tests and procedures), and client history. Nutritional assessment begins once the nutritional screening indicates that the patient/client is at risk of malnutrition or may benefit from nutrition-related care. This in-depth assessment involves collecting a variety of relevant data, reviewing the data for factors affecting nutritional and health status, clustering or grouping various data points in order to establish a nutrition diagnosis, and then identifying

nutrition care criteria against which the data will be compared for purposes of analysis. The NCP groups these nutrition care criteria into two categories: (1) a nutrition prescription or goal established by the nutrition practitioner in consultation with the medical team and (2) reference standards for food and nutrient intake. A nutrition prescription or goal for a patient whose nutrition diagnosis is inadequate energy intake would include a level of energy intake that is considered appropriate for the patient's height, activity, and age and that would be expected to return the patient to a healthy body weight over time. Examples of reference standards for food and nutrient intake include the Dietary Reference Intakes (DRIs), the Dietary Reference Values for Food and Energy for the United Kingdom, the Dietary Guidelines for Americans, and clinical practice guidelines for specific conditions established by organizations such as the American Diabetes Association, the Canadian Diabetes Association, Diabetes UK, the National Kidney Foundation, or the Kidney Foundation of Canada.

When evaluating biochemical measures such as lipid and lipoprotein values, standards established by the American Heart Association, the Canadian Heart and Stroke Foundation, the British Heart Foundation, or the National Heart, Lung, and Blood Institute can be used. Individual health-care facilities generally have their own criteria for evaluating anthropometric, biochemical, and clinical indicators of nutritional status. Anthropometric measurements can be compared against what are considered normal values or ranges typically seen in healthy populations, such as the pediatric growth charts issued by the U.S. Centers for Disease Control and Prevention. Because laboratory values may vary depending on the laboratory performing the assay, as discussed in Chapter 8, normal ranges provided by the individual laboratory should be consulted.[9,10]

When assessing food and nutrient intake using information provided by the patient/client, it is important to remember that such assessments are only *estimates* of actual consumption because they are based on subjective information provided by the patient or a member of the patient's family. One exception to this is when the patient's sole source of nutrition is enteral and/or parenteral nutrition support, which can be objectively and accurately measured. Data on food and nutrient intake can then be compared to the patient/client's nutrition prescription or goal or to some reference standard such as the DRIs. When using the DRIs, it is important to note that they are intended for healthy populations and that clinical judgment is necessary when applying them to those who are ill or injured. In addition, an intake less than the Recommended Dietary Allowance or Adequate Intake does not necessarily mean that a nutrient deficiency exists. Finally, a thorough assessment of nutritional status must also include evaluation of anthropometric, biochemical, and clinical data, consideration of the patient's history, and relevant information collected by other members of the health-care team.[9–12]

If a nutrition problem exists, the data collected during the nutritional assessment and its analysis serve as the foundation for establishing the nutrition diagnosis, which is the second step in the NCP. Nutritional assessment is not a one-time, isolated event occurring at the beginning of a patient's nutrition-related care. It is more than simply the initial step of the NCP. It is a continuous, ongoing, nonlinear, data collection process spanning the entire duration of the patient/client's care and serving as the basis for the reassessment and reanalysis of relevant data in the fourth step of the NCP, nutritional monitoring and evaluation.[9,10]

Standardized Terminology in the Nutrition Care Process

In the NCP, numerous types of data or nutrition care indicators are used to assess, describe, and document a patient's nutritional status and to monitor and evaluate the outcomes of the nutritional intervention. The Nutrition Care Process Terminology, or NCPT, contains more than 1000 terms categorized to describe the four steps of the Nutrition Care Process: nutrition assessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation. The electronic Nutrition Care Process Terminology (eNCPT) is the online publication that provides access to the most up-to-date terminology and requires a modest subscription. Also included are reference sheets that provide clear definitions and explanation of all terms, including indicators, criteria for evaluation, etiologies, and signs and symptoms. Go to this website for more information: https://ncpt.webauthor.com/. The standardized language ensures that individuals in the dietetic profession will clearly articulate the exact nature of the nutrition problem, the intervention, and goals and approaches. When the nutritional assessment identifies a nutrition problem in a patient (that is, the patient's nutrition care indicator deviates in a clinically significant way from what would be expected or considered normal), a standardized term is used so that the problem can be specifically identified, clearly described, and easily documented. Because nutritional assessment and nutritional monitoring and evaluation share common elements (as discussed in greater detail below), most of the terms used in nutritional assessment are also used in monitoring, evaluating, and documenting the patient's response to any nutrition intervention he or she is receiving.[9] Similar sets of standardized terms have been developed for use when making nutrition diagnoses and planning and implementing any nutrition intervention.

Because of the large amount of data that could potentially be considered for analysis, critical-thinking skills are necessary to enable the practitioner to limit the selection of data for analysis to only the data that are clinically relevant to the unique circumstances of the

patient/client. Likewise, critical-thinking skills are necessary in the appropriate interpretation of the collected data. The set of data that is considered relevant and how those data are interpreted will vary from one patient to another, depending on the patient's status.[9]

Nutrition Diagnosis in the Nutrition Care Process

Nutrition diagnosis is a critical bridge in the Nutrition Care Process between nutrition assessment and nutrition intervention. The purpose of the second step in the NCP is to establish a nutrition diagnosis that specifically identifies and describes a nutrition problem that a dietetic practitioner is responsible for independently treating.[9] The eNCPT provides standardized nutrition diagnosis language so that the information is clear within and outside the profession. Nutrition diagnosis is organized into three domains, including food/nutrient intake, clinical conditions, and behavioral-environmental factors. It is important to note that a nutrition diagnosis is different from a medical diagnosis. The medical diagnosis refers to the process of determining the existence of a disease and identifying or classifying the disease based on various criteria, such as the patient's **signs** and **symptoms,** the results of diagnostic tests, and relevant data from the nutritional assessment. The medical diagnosis then allows the medical practitioner (e.g., physician, physician assistant, nurse practitioner) to make medical decisions about treating the disease and predicting the likely outcome of the disease. In contrast, the nutrition diagnosis is the "identification and labeling of a specific nutrition problem that food and nutrition professionals are responsible for treating independently."[9] The nutrition diagnosis and subsequent intervention focus on specific nutrition and dietary issues and food-related behaviors that may cause a disease or be a consequence of a disease. In other words, the dietetic practitioner establishes the nutrition diagnosis by identifying and labeling a nutrition problem which he or she is legally and professionally responsible for treating by working collaboratively with the patient and with other members of the health-care team to improve the patient's nutritional status.[9,11] Data from the nutritional assessment are the basis for establishing the nutrition diagnosis and for setting reasonable and measurable outcomes that can be expected from any subsequent intervention in the third step of the NCP.

During documentation, the nutrition diagnosis is summarized in a single, structured sentence or nutrition diagnosis statement having three distinct components: the problem (P), the etiology (E), and the signs and symptoms (S). Also known as a PES statement, it identifies the problem using the appropriate diagnostic term, addresses the etiology or root cause or contributing risk factors of the problem, and lists signs and symptoms and other data from the nutritional assessment that provide evidence to support the nutrition diagnosis.

The problem or diagnostic term describes the alteration in the patient's nutritional status that the dietetic practitioner is responsible for independently treating. It allows the practitioner to identify reasonable and measurable outcomes for an intervention and to monitor and evaluate changes in the patient's nutritional status. The etiology is the factors that are causally related to the problem or contribute to it. Clearly identifying the etiology will allow the practitioner to design a nutrition intervention intended to resolve the underlying cause of the nutrition problem, if possible. Evidence substantiating the nutrition diagnosis is relevant data from the nutritional assessment, the signs (objective data) reported by a physician or other qualified member of the health-care team, and the symptoms (subjective data) reported by the patient.

The PES statement is to be written following a specific format beginning with the nutrition diagnostic label, followed by the etiology, and ending with the signs and symptoms. These three components of the PES statement are linked together with the words "related to" and "as evidenced by." The format is (the nutrition diagnostic label) related to (the etiology) as evidenced by (the signs and symptoms). For example, consider a 61-year-old male who has had a poor appetite and an unintentional weight loss of 15% during the past three months since he had a medical diagnosis of colon cancer, underwent a partial resection of his colon, and began receiving chemotherapy. The weight loss is based on the patient's weight history as documented in the medical record. The patient complains that since beginning chemotherapy, "food has tasted funny" and consequently he doesn't eat as much as usual. Dysgeusia, a distorted sense of taste, is a common drug–nutrient interaction associated with the chemotherapy agents he is receiving, and this often leads to inadequate oral intake. An assessment of the patient's usual diet for the past three months shows that his usual energy intake is approximately 60% of his estimated needs, clearly indicating inadequate oral intake (eNCPT provides the appropriate terminology). An example of a PES statement for this patient would be "Inadequate oral intake related to chemotherapy-associated dysgeusia as evidenced by oral intake at 60% of estimated needs." In this instance, the nutrition diagnostic label is inadequate oral intake, the etiology is the chemotherapy-associated dysgeusia, and the signs and symptoms are an oral intake at 60% of the patient's estimated needs.

Nutrition Intervention in the Nutrition Care Process

The purpose of nutrition intervention is to resolve or improve the patient/client's nutrition problem by planning and implementing appropriate strategies that will change nutritional intake, nutrition-related knowledge and behavior, environmental conditions impacting diet, or access to supportive care and services.[9] The dietetics professional

works in conjunction with patients, other health-care providers, and agencies during the nutrition intervention phase. The selection of the intervention is driven by the nutrition diagnosis and its etiology. The objectives and goals of the intervention serve as the basis for measuring the outcome of the intervention and monitoring the patient/client's progress.[9,11]

Nutrition intervention has two basic components: planning and implementation. During planning, multiple nutrition diagnoses must be prioritized based on the severity of the nutrition problem, the intervention's potential impact on the problem, and the patient's needs and perceptions. Ideally, the intervention should target the etiology or root cause of the nutrition problem, although in some instances it may not be possible for the dietetic practitioner to change the etiology, in which case the signs and symptoms may have to be targeted. When determining the patient's recommended intake of energy, nutrients, and foods, the most current and appropriate reference standards and dietary guidelines should be used and modified, if necessary, based on the patient's nutrition diagnosis and health condition. These intake recommendations, along with a brief description of the patient's health condition and the nutrition diagnosis, are concisely summarized in a statement known as the nutrition prescription. Once the nutrition prescription is written, the specific strategies and goals of the intervention can be established. The intervention strategies should be based on the best available evidence and consistent with institutional policies and procedures. The goals of the intervention should be patient-focused, reasonable, achievable, measurable, and incremental, and, whenever possible, established in collaboration with the patient. During implementation, the dietetic practitioner communicates the plan to all relevant parties and carries it out. Relevant data on the patient's nutritional status are collected and used to monitor and evaluate the intervention's effectiveness and the patient's progress and, when warranted, to change the intervention to improve its safety and effectiveness.[9,11]

Nutritional Monitoring and Evaluation in the Nutrition Care Process

The purpose of the fourth step in the NCP, nutritional monitoring and evaluation, is to determine whether and to what extent the goals and objectives of the intervention are being met. In the NCP, nutritional monitoring and evaluation begins by identifying specific and measurable nutrition care indicators of the patient's behavior and/or nutritional status that are the desired results of the patient's nutrition care. These nutrition care indicators should be carefully selected so that they are relevant to the nutrition diagnosis, the etiology of the nutrition problem, the patient's signs and symptoms, and the goals and objectives of the intervention. In many instances the nutrition care indicators selected for monitoring and evaluation will be the same as those used in the initial assessment of the patient's nutritional status. The practitioner then monitors, measures, and evaluates changes in these nutrition care indicators to determine whether the patient's behavior and/or nutritional status are improved in response to the intervention.[9] The practitioner monitors the patient's knowledge, beliefs, and behaviors for evidence indicating whether the nutrition intervention is meeting its intended goals and objectives. Measurements of specific nutrition care indicators provide objective data on whether intervention outcomes are being met. The practitioner then evaluates the intervention's overall impact on the patient's behavior or status by comparing the current findings to those obtained earlier—for example, during the initial assessment of the patient's nutritional status.[9]

The definition of nutritional monitoring used in the NCP is somewhat different from that used when discussing national surveys of diet and health, which are covered in Chapter 4. When discussing these surveys of population groups, the term *nutritional monitoring* is defined as "an ongoing description of nutrition conditions in the population, with particular attention to subgroups defined in socioeconomic terms, for purposes of planning, analyzing the effects of policies and programs on nutrition problems, and predicting future trends."[14]

Opportunities in Nutritional Assessment

Numerous opportunities currently exist for applying nutritional assessment skills. As our understanding of the relationships between nutrition and health increases, these opportunities will only increase. Following are some examples of areas in which nutritional assessment is making a significant contribution to health care.

Meeting the *Healthy People 2020* Objectives

The *Healthy People 2020* objectives outline a comprehensive, nationwide health promotion and disease prevention agenda designed to improve the health of all people in the United States during the second decade of the 21st century.[20] Like the preceding *Healthy People 2010* initiative, *Healthy People 2020* is committed to a single, fundamental purpose: promoting health and preventing illness, disability, and premature death.[21] The 2020 objectives focus on four overarching goals: attain high-quality, longer lives free of preventable disease, disability, injury, and premature death; achieve health equity, eliminate disparities, and improve the health of all groups; create social and physical environments that promote good health for all; and promote quality of life, healthy development, and healthy behaviors across all life stages.[21] There are approximately 1200 objectives organized into 42 topic areas, with each topic area representing

Box 1.1 ***Healthy People 2020*** **Topic Areas**

1. Access to health services
2. Adolescent health
3. Arthritis, osteoporosis, and chronic back pain
4. Blood disorders and blood safety
5. Cancer
6. Chronic kidney disease
7. Dementias, including Alzheimer's disease
8. Diabetes
9. Disability and health
10. Early and middle childhood
11. Educational and community-based programs
12. Environmental health
13. Family planning
14. Genomics
15. Global health
16. Health communication and information technology
17. Healthcare-associated infections
18. Health-related quality of life and well-being
19. Hearing, sensory, and communication disorders
20. Heart disease and stroke
21. HIV
22. Immunization and infectious disease
23. Injury and violence prevention
24. Lesbian, gay, bisexual, and transgender health
25. Maternal, infant, and child health
26. Medical product safety
27. Mental health and mental disorders
28. Nutrition and weight status
29. Occupational safety and health
30. Older adults
31. Oral health
32. Physical activity
33. Preparedness
34. Public health infrastructure
35. Respiratory diseases
36. Sexually transmitted diseases
37. Sleep health
38. Social determinants of health
39. Substance abuse
40. Tobacco use
41. Vision

Source: U.S. Department of Health and Human Services. 2010. *Healthy People 2020.* Office of Disease Prevention and Health Promotion. www.healthypeople.gov.

an important public health concern. The 42 topic areas are shown in Box 1.1. Of the approximately 1200 objectives, 22 are listed in the nutrition and weight status topic area, as shown in Box 1.2. Numerous other nutrition-related objectives are listed under other topic areas, such as cancer, diabetes, food safety, heart disease and stroke, physical activity, and maternal, infant, and child health.

For example, meeting objective NWS-10 (Reduce the proportion of children and adolescents who are considered obese) requires health professionals skillful in anthropometry and able to intelligently use the CDC growth charts or other appropriate methods for assessing body mass index or body composition. The ability to evaluate dietary intake and interpret laboratory data and physical signs and symptoms reflecting iron status would be important in evaluating progress on objectives NWS-21 and NWS-22. Objective NWS-18 (Reduce consumption of saturated fat in the population aged 2 years and older) requires a working knowledge of dietary survey methods to initially assess fat intake and to monitor long-term adherence to the objective.

Health-Care Organizations

Health-care organizations such as physicians' offices, urgent-care clinics, emergency rooms, acute-care hospitals, and long-term care facilities offer many opportunities for health professionals trained in nutritional assessment. Inadequate food and nutrient intake are commonly seen in chronically ill patients, and one manifestation of this is **protein-energy malnutrition (PEM),** which is a loss of lean body mass resulting from inadequate consumption of energy and/or protein or resulting from the increased energy and nutrient requirements of certain diseases.[23]

Although the relationship between malnutrition and treatment outcome often is obscured by other factors that can affect the outcome of a patient's hospital stay (for example, the nature and severity of the disease process), several researchers have reported that patients with PEM tend to have a longer hospital stay, a higher incidence of complications, and a higher mortality rate.[22–26]

Identifying patients at nutritional risk is a major activity necessary for providing cost-effective medical treatment and helping contain health-care costs. Good medical practice and economic considerations make it imperative that hospital patients be nutritionally assessed and that steps be taken, if necessary, to improve their nutritional status. Evaluation of a patient's weight, height, midarm muscle area, and triceps skinfold thickness and values from various laboratory tests can be valuable aids in assessing protein and energy nutriture. Some researchers believe that rapid, nonpurposeful weight loss is the single best predictor of malnutrition currently available. These and other assessment techniques for hospitalized patients will be discussed in detail in Chapter 8.