eat right. Academy of Nutrition and Dietetics

POCKET GUIDE TO Nutrition Assessment

FOURTH EDITION

Pamela Charney
PhD, MS, RDN, LDN, FAND

Ainsley Malone
MS, RDN, LD, CNSC, FAND, FASPEN

Academy of Nutrition and Dietetics
Chicago, IL

Academy of Nutrition and Dietetics
120 S. Riverside Plaza, Suite 2190
Chicago, IL 60606

Academy of Nutrition and Dietetics Pocket Guide to Nutrition Assessment, Fourth Edition

ISBN 978-0-88091-069-9 (print)
ISBN 978-0-88091-188-7 (eBook)
Catalog Number 406122 (print)
Catalog Number 406122e (eBook)

10 9 8 7 6 5 4 3 2 1

For more information on the Academy of Nutrition and Dietetics, visit www.eatright.org.

[Insert Library of Congress data]

Contents

List of Boxes, Tables, and Figures ..... *iv*
Frequently Used Terms and Abbreviations ..... *xii*
About the Authors ..... *xviii*
Reviewers ..... *xx*
Preface ..... *xxi*
Acknowledgments ..... *xxiii*
Publisher's Note on Gender-Inclusive Language ..... *xxiv*
Chapter 1: The Nutrition Care Process 1
Chapter 2: Nutrition Screening 20
Chapter 3: Food- and Nutrition-Related History 40
Chapter 4: Anthropometric Measurements *57*
Chapter 5: Nutrition Focused Physical Assessment 83
Chapter 6: Biochemical Tests, Medical Data, and Procedures 111
Chapter 7: Client History 202
Chapter 8: Nutrient Requirements 220
Glossary *243*
Continuing Professional Education *270*
Index *271*

List of Boxes, Tables, and Figures

Boxes

Box 1.1 Examples of Diagnostic Thought Processes 8

Box 1.2 Tips for Documenting Nutrition Diagnoses 9

Box 1.3 Examples of Improved PES Statements 10

Box 1.4 Examples of Correct Nutrition Interventions 12

Box 1.5 Malnutrition Assessment Characteristics Compared With Nutrition Care Process Terminology Nutrition Assessment Domains 16

Box 1.6 Case Study Utilizing the Nutrition Care Process 17

Box 2.1 Regulatory Issues Related to Nutrition Screening 21

Box 2.2 Characteristics of Effective Nutrition Screening Tools 21

Box 2.3 Impact of False-Positive and False-Negative Nutrition Screens 22

Box 2.4 Academy of Nutrition and Dietetics Nutrition Screening Definition and Key Considerations 23

Box 2.5 Components of the Malnutrition Universal Screening Tool 29

Box 2.6 Components of the Mini Nutritional Assessment–Short Form 32

Box 2.7 Selected Nutrition Assessment Factors and Related Nutrition Diagnoses Following a Positive Nutrition Screen 34

Box 3.1 Components of the Food- and Nutrition-Related History 41

Box 3.2 Methods for Determining Food and Nutrient Intake 44

Box 3.3 Food and Nutrient Intake History Questions for Caregivers of Infants and Children 47

Box 3.4 Food and Nutrient Intake and History Questions for Adolescents 48

Box 3.5 Food and Nutrient Intake and History Questions for Older Adults 48

Box 3.6 Food and Nutrient Intake and History Questions for Pregnant Persons 49

Box 3.7 Food and Nutrition Administration Components 51

Box 3.8 Areas of Assessment for Nutrition-Related Knowledge, Beliefs, and Attitudes 52

Box 4.1 Technique for Measuring Standing Height 58

Box 4.2 Arm Span Method for Estimating Height 59

Box 4.3 Measurement of Knee Height 60

Box 4.4 Calculating Body Mass Index 63

Box 4.5 Body Mass Index Classification in Adults 63

Box 4.6 Calculating Weight Range Within Normal Body Mass Index Range 66

Box 4.7 Estimating Ideal Body Weight With the Hamwi Formula 67

Box 4.8 Estimating Ideal Body Weight With the Devine Formula 67

Box 4.9 Estimating Ideal Body Weight With the Robinson Formula 68

Box 4.10 Adjusting Ideal Body Weight for Amputation 69

Box 4.11 Assessing Percentage of Weight Change 71

Box 4.12 Calculating Total Upper Arm Area, Uncorrected and Corrected Arm Muscle Area, and Mid-Upper Arm Fat Area 73

Box 4.13 Arm Muscle and Arm Fat Areas Reflecting Alterations in Total Body Weight 79

Box 5.1 Responsibilities of Performing Physical Assessment 84
Box 5.2 Outline for Performing a Physical Examination 85
Box 5.3 Inspection Techniques 87
Box 5.4 Palpation Technique 88
Box 5.5 Auscultation of Bowel Technique 88
Box 5.6 Auscultation of Heart Technique 89
Box 5.7 Auscultation of Lungs Technique 89
Box 5.8 Percussion Technique 90
Box 5.9 Blood Pressure Assessment 92
Box 5.10 Radial Pulse Assessment 92
Box 5.11 Respiration Assessment 93
Box 5.12 Temperature Assessment 93
Box 5.13 Selected Neurological Examination Findings 94
Box 5.14 Selected Skin Examination Findings 95
Box 5.15 Selected Nail Examination Findings 97
Box 5.16 Selected Hair Examination Findings 97
Box 5.17 Selected Head Examination Findings 98
Box 5.18 Selected Eye Examination Findings 99
Box 5.19 Selected Nose Examination Findings 101
Box 5.20 Selected Mouth Examination Findings 102
Box 5.21 Selected Abdomen Examination Findings 106
Box 5.22 Selected Musculoskeletal Examination Findings 107
Box 5.23 Dehydration (Fluid Deficit) 108
Box 5.24 Overhydration (Fluid Excess) 109
Box 6.1 Factors That Decrease or Increase Albumin 114
Box 6.2 Factors That Decrease or Increase Transferrin 115
Box 6.3 Factors That Decrease or Increase Prealbumin 116

Box 6.4 AACE/ACE and ADA Diabetes Screening Criteria for Asymptomatic Adults 118

Box 6.5 Interpretation of Glucose Testing and Diagnosis of Prediabetes and Diabetes 119

Box 6.6 Screening for and Diagnosis of Gestational Diabetes Mellitus 123

Box 6.7 Potential Causes and Symptoms of Hypoglycemia 124

Box 6.8 Potential Causes and Symptoms of Hyperglycemia 125

Box 6.9 Laboratory Abnormalities Often Seen With Diabetic Ketoacidosis and Hyperosmolar, Hyperglycemic State 127

Box 6.10 Evaluation of Hyponatremia When Serum Osmolality Is Low (<280 mOsm/kg H_2O) 130

Box 6.11 Evaluation of Hyponatremia When Serum Osmolality Is Normal or High 132

Box 6.12 Hypernatremia and Evaluation of Extracellular Fluid Volume 134

Box 6.13 Potential Etiologies and Signs and Symptoms of Hypokalemia 136

Box 6.14 Potential Etiologies and Signs and Symptoms of Hyperkalemia 138

Box 6.15 Potential Etiologies and Signs and Symptoms of Hypocalcemia 140

Box 6.16 Potential Etiologies and Signs and Symptoms of Hypercalcemia 142

Box 6.17 Potential Etiologies and Signs and Symptoms of Hypophosphatemia 143

Box 6.18 Potential Etiologies and Signs and Symptoms of Hyperphosphatemia 145

Box 6.19 Potential Etiologies and Signs and Symptoms of Hypomagnesemia 146

Box 6.20 Potential Etiologies and Signs and Symptoms of Hypermagnesemia 148

Box 6.21 Expected Compensation, Causes, and Treatment of Metabolic Acidosis 151

Box 6.22 Expected Compensation, Causes, and Treatment of Metabolic Alkalosis 152

Box 6.23 Expected Compensation, Causes, and Treatment of Respiratory Acidosis 154

Box 6.24 Expected Compensation, Causes, and Treatment of Respiratory Alkalosis 155

Box 6.25 Selected Laboratory Values and Hydration Status 158

Box 6.26 Most Useful Laboratory Indexes for Diagnosis of Iron-Deficiency Anemia and Anemia of Chronic Disease 161

Box 6.27 Most Useful Laboratory Indexes for Diagnosis of Vitamin B12–Deficiency Anemia and Folate-Deficiency Anemia 165

Box 6.28 Laboratory Assessment of Vitamin A 168

Box 6.29 Laboratory Assessment of Vitamin D 169

Box 6.30 Laboratory Assessment of Vitamin E 170

Box 6.31 Laboratory Assessment of Vitamin K 170

Box 6.32 Laboratory Assessment of Vitamin C 171

Box 6.33 Laboratory Assessment of Thiamin (Vitamin B1) 172

Box 6.34 Laboratory Assessment of Riboflavin (Vitamin B2) 173

Box 6.35 Laboratory Assessment of Niacin (Vitamin B3) 174

Box 6.36 Laboratory Assessment of Panothenic Acid (Vitamin B5) 174

Box 6.37 Laboratory Assessment of Pyridoxine (Vitamin B6) 175

Box 6.38 Laboratory Assessment of Folic Acid 175

Box 6.39 Laboratory Assessment of Vitamin B12 177

Box 6.40 Laboratory Assessment of Biotin 178

Box 6.41 Laboratory Assessment of Iron 178

Box 6.42 Laboratory Assessment of Zinc 180

Box 6.43 Laboratory Assessment of Copper 181
Box 6.44 Laboratory Assessment of Selenium 182
Box 6.45 Laboratory Assessment of Chromium 182
Box 6.46 Laboratory Assessment of Manganese 183
Box 6.47 Laboratory Assessment of Molybdenum 183
Box 6.48 Laboratory Assessment of Iodine 184
Box 6.49 Stool Studies: Laboratory Tests, Frequency of Monitoring, and Rationale 185
Box 6.50 Chronic Kidney Disease: Laboratory Tests, Frequency of Monitoring, and Rationale 187
Box 6.51 Risk of Refeeding Syndrome: Laboratory Tests, Frequency of Monitoring, and Rationale 189
Box 6.52 Essential Fatty Acid Deficiency: Laboratory Tests, Frequency of Monitoring, and Rationale 190
Box 6.53 Criteria for Clinical Diagnosis of Metabolic Syndrome 190
Box 6.54 Acute Enteral Nutrition or Parenteral Nutrition: Laboratory Tests and Frequency of Monitoring 192
Box 6.55 Home Enteral Nutrition: Laboratory Tests and Frequency of Monitoring 194
Box 6.56 Home Parenteral Nutrition: Laboratory Tests and Frequency of Monitoring 195
Box 6.57 Metabolic Bone Disease Monitoring in Patients Receiving Long-Term Home Parenteral Nutrition 196
Box 7.1 Health Literacy Resources 203
Box 7.2 Selected Components of the Past Medical History 205
Box 7.3 Potential Nutritional Consequences of Upper Gastrointestinal Surgery 208
Box 7.4 Potential Nutritional Consequences of Lower Gastrointestinal Surgery 210
Box 7.5 Potential Drug-Nutrient Interactions That May Require Nutrition-Related Medication Management and Education 210

Box 7.6 Drug-Induced Nutritional and Metabolic Alterations 215
Box 7.7 Components of a Social History 217
Box 8.1 Equations for Estimating Resting Metabolic Rate 222
Box 8.2 Recommendations for Improving Accuracy of Indirect Calorimetry 224
Box 8.3 Recommended Equations for Estimating Energy Requirements in Adults Who Are Mechanically Ventilated and Critically Ill 227
Box 8.4 Evaluation of Predictive Equations for RMR in Critically Ill Patients 227
Box 8.5 Magnesium Supplementation Guidelines 235
Box 8.6 Phosphorus Supplementation Guidelines 236
Box 8.7 Potassium Supplementation Guidelines 236
Box 8.8 Sodium Supplementation Guidelines 237
Box 8.9 Calculation of Fluid Deficit 237
Box 8.10 Estimating Fluid Needs 238

Tables

Table 1.1 Clinical Characteristics of Malnutrition in Acute Illness or Injury 14
Table 1.2 Clinical Characteristics of Malnutrition in Chronic Illness 15
Table 1.3 Clinical Characteristics of Malnutrition in Social or Environmental Circumstances 15
Table 4.1 Selected Equations for Estimating Height From Knee Height in Males 61
Table 4.2 Selected Equations for Estimating Height From Knee Height in Females 61
Table 4.3 Arm Muscle Area Percentiles for Males 75
Table 4.4 Arm Muscle Area Percentiles for Females 76

Table 4.5 Arm Fat Area Percentiles for Males 77
Table 4.6 Arm Fat Area Percentiles for Females 78
Table 8.1 Daily Protein Requirement for Adults 231
Table 8.2 Volume and Electrolyte Composition of Selected Body Fluids 233
Table 8.3 Electrolyte Concentrations and Osmolality of Common Intravenous Fluids 234
Table 8.4 Factors That Affect Fluid Requirements 235

Figures

Figure 1.1 Nutrition Care Process Model 4
Figure 2.1 Malnutrition Screening Tool 27
Figure 2.2 Short Nutritional Assessment Questionnaire 28
Figure 2.3 Nutrition Risk Score-2002 30
Figure 5.1 The abdominal quadrants 90
Figure 5.2 Anatomy of the eye 99
Figure 5.3 Mouth and facial anatomy 102
Figure 5.4 Anatomy of the chest 104
Figure 8.1 Using predictive equations to estimate energy requirements 221

Frequently Used Terms and Abbreviations

AACE/ACE	American Association of Clinical Endocrinologists/ American College of Endocrinology
ABG	arterial blood gas
ABW	adjusted body weight
ACD	anemia of chronic disease
ACE	angiotensin-converting enzyme
ADA	American Diabetes Association
ADH	antidiuretic hormone
ADL	activities of daily living
AFA	arm fat area
AI	Adequate Intake
AHA	American Heart Association
ALP	alkaline phosphatase
ALT	alanine aminotransferase
AMA	arm muscle area
AMDR	Acceptable Macronutrient Distribution Range

ASPEN	American Society for Parenteral and Enteral Nutrition
AST	aspartate aminotransferase
BIA	bioelectrical impedance analysis
BMI	body mass index
BMR	basal metabolic rate
BP	blood pressure
BUN	blood urea nitrogen
CAM	complementary and alternative medicine
CBC	complete blood count
CKD	chronic kidney disease
CMS	Centers for Medicare & Medicaid Services
COPD	chronic obstructive pulmonary disease
CT	computed tomography
CVD	cardiovascular disease
DBW	desired body weight
DKA	diabetic ketoacidosis
DNS	Dietitians in Nutrition Support
DRI	Dietary Reference Intake
DXA	dual-energy x-ray absorptiometry
EAL	Evidence Analysis Library
EAR	Estimated Average Requirement
ECF	extracellular fluid
EER	estimated energy requirement
EFAD	essential fatty acid deficiency
EHR	electronic health record
EN	enteral nutrition

ESR	erythrocyte sedimentation rate
FFM	fat-free mass
FNRH	food- and nutrition-related history
FPG	fasting plasma glucose
GDH	glutamate dehydrogenase
GDM	gestational diabetes mellitus
GERD	gastroesophageal reflux disease
GGT	gamma-glutamyl transferase
GI	gastrointestinal
HbA1c	hemoglobin A1c
HBE	Harris-Benedict equation
HDL	high-density lipoprotein
Hgb	hemoglobin
HHS	hyperosmolar hyperglycemic state
HMG CoA	hydroxymethylglutaryl coenzyme A
HPN	home parenteral nutrition
HTN	hypertension
IBD	inflammatory bowel disease
IBS	irritable bowel syndrome
IBW	ideal body weight
ICF	intracellular fluid
ICU	intensive care unit
IDA	iron-deficiency anemia
IDF	International Diabetes Foundation
IDNT	International Dietetics and Nutrition Terminology

IFG	impaired fasting glucose
IGT	impaired glucose tolerance
IJ	Ireton-Jones
INR	international normalized ratio
LOS	length of stay
MAC	midarm circumference
MAMC	midarm muscle circumference
MAOI	monoamine oxidase inhibitor
MCT	medium-chain triglyceride
MCV	mean corpuscular volume
MDS	Minimum Data Set
MMA	methylmalonic acid
MNA	Mini Nutrition Assessment
MNA-SF	Mini Nutrition Assessment-Short Form
MPG	mean plasma glucose
MSJ	Mifflin-St Jeor
MST	Malnutrition Screening Tool
MUST	Malnutrition Universal Screening Tool
NA	not applicable
NAFLD	nonalcoholic fatty liver disease
NANDA	North American Nursing Diagnosis Association
NCI	National Cancer Institute
NCP	Nutrition Care Process
NCPM	Nutrition Care Process and Model
NCPT	Nutrition Care Process Terminology

NDTR	nutrition and dietetic technician, registered
NHANES	National Health and Nutrition Examination Surveys
NHLBI	National Heart, Lung, and Blood Institute
NPO	nil per os (nothing by mouth)
NRS	Nutrition Risk Score
NSAID	nonsteroidal anti-inflammatory drug
OSA	obstructive sleep apnea
OTC	over the counter
PCOS	polycystic ovary syndrome
PES	problem, etiology, signs and symptoms
PG	plasma glucose
PLP	pyridoxal phosphate
PMH	past medical history
PN	parenteral nutrition
POA	power of attorney
POC	point of care
PSU	Penn State University
PT	prothrombin time
PTH	parathyroid hormone
QOL	quality of life
RBC	red blood cells
RDA	Recommended Dietary Allowance
RDN	registered dietitian nutritionist
RDW	red cell distribution width
REE	resting energy expenditure

RLQ	right lower quadrant
RMR	resting metabolic rate
RQ	respiratory quotient
SEI	standard error for an individual
SGA	Subjective Global Assessment
SIADH	syndrome of inappropriate antidiuretic hormone
SNAQ	Short Nutrition Assessment Questionnaire
sTfR	soluble transferrin receptor
TAA	total upper arm area
TCA	tricyclic antidepressants
TfR	transferrin receptor
TG	triglycerides
TIBC	total iron-binding capacity
T_{max}	maximum daily body temperature (degrees Celsius)
TSAT	transferrin saturation
TSF	triceps skinfold
UBW	usual body weight
UL	Tolerable Upper Intake Level
US	ultrasound
V_E	minute ventilation
WC	waist circumference
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

About the Authors

Pamela Charney, PhD, MS, RDN, LDN, FAND, has years of experience in nutrition support in both adult and pediatric care and in a variety of settings ranging from small community hospitals to large, tertiary, teaching medical centers. She has also managed clinical nutrition departments, nutrition support teams, and multidisciplinary clinics for children with special health care needs. She has led groups forming teams or looking to improve team effectiveness. Dr Charney completed her PhD at Rutgers University and has worked as a consultant in the areas of nutrition informatics, evaluation of health care quality, and evaluation of clinical information systems. She has extensive volunteer service to both the Academy of Nutrition and Dietetics and the American Society for Parenteral and Enteral Nutrition, including service on the boards of directors for both organizations. As a charter member of the Standardized Language Committee for the Academy of Nutrition and Dietetics, Dr Charney is considered an expert in nutrition and clinical informatics, nutrition diagnosis, and the use of standardized terminology in clinical care.

Ainsley Malone, MS, RDN, LD, CNSC, FAND, FASPEN, is a nutrition support dietitian at Mt Carmel East Hospital in Columbus, OH, where she is involved in managing nutrition care for patients requiring enteral and parenteral nutrition. In addition, Ms Malone serves as a clinical practice specialist for the American Society for Parenteral and Enteral Nutrition (ASPEN), where she works to support clinical practice activities for the organization. Ms Malone is a certified nutrition support clinician and has given international, national, and local presentations on many aspects of nutrition support practice. In addition to her clinical practice

activities, Ms Malone has authored multiple peer-reviewed articles and book chapters on nutrition support. Over her career, she has served in many nutrition leadership capacities, including president of ASPEN, and on the Academy of Nutrition and Dietetics Board of Directors.

Reviewers

Sarah Blackburn, MS, RD, LDN
Registered Dietitian, Compass Group USA
Chicago, IL

Susan L. Brantley, MS, RDN, LDN, FAND
Program Director, Department of Family and Consumer Sciences,
Carson-Newman University
Jefferson City, TN

Theresa Cattell, RD, LD, CNSC
Lead Clinical Dietitian, Riverside Methodist Hospital
Columbus, OH

Stephanie Cutrell, MS, RD, LDN, CNSC
Nutrition Support Dietitian, Vidant Medical Center
Greenville, NC

Stephanie Dobak, MS, RD, LDN, CNSC
Clinical Dietitian III, Jefferson Weinberg ALS Center
Philadelphia, PA

Mary E. (Beth) Mills, MS, RD, LDN, CNSC
Clinical Dietitian, RD IV Nutrition Coordinator,
Vanderbilt University Medical Center
Nashville, TN

Christina M. Rollins, MBA, MS, RDN, LDN, FAND, CNSC
Manager, Quality Programs, Option Care Health
Bannockburn, IL

Elizabeth Smith, PhD, RD, LDN
Assistant Professor, Middle Tennessee State University
Murfreesboro, TN

Karen Wiesen, MS, RDN, LDN, FNKF
Inpatient Dietitian Supervisor/Renal Dietitian, Geisinger Medical Center
Danville, PA

Preface

It has been a professional honor to be involved in the *Academy of Nutrition and Dietetics Pocket Guide to Nutrition Assessment*, beginning with publication of the first edition in 2004, now in its fourth edition. Development of the first edition began as a project for the Dietitians in Nutrition Support dietetic practice group. We quickly realized that there was a need for a resource that crossed all areas of clinical dietetics practice and was not limited to nutrition support. Because the first edition of the *Pocket Guide to Nutrition Assessment* was released before the advent of smartphones, tablets, and easy access to online information, we wanted the pocket guide to be a resource that clinicians would have at their fingertips. As the title indicated, the size of the book would literally fit into a lab-coat pocket. Today, clinicians have the option to purchase a slightly larger print copy or an electronic version, making the fourth edition of the *Pocket Guide to Nutrition Assessment* truly flexible, made to meet the needs of busy dietetics professionals.

Before each revision of the *Pocket Guide to Nutrition Assessment*, we reviewed the landscape of dietetics practice. When the Nutrition Care Process (NCP) and standardized dietetics terminology were released, we added a chapter designed to illustrate how nutrition assessment was the critical first step in the NCP. With subsequent updates to the NCP, the outline of the book was revised to ensure that we included the appropriate nutrition assessment domains. We are proud to include in this latest edition a section on malnutrition. While dietitians have always been responsible for diagnosing and treating patients who are malnourished, it is only recently that our standardized terminology provided a way to consistently define the characteristics associated with malnutrition in all patient types in all care settings. Additional updates have been made with each edition to reflect new evidence and address user feedback.

The *Academy of Nutrition and Dietetics Pocket Guide to Nutrition Assessment* has proven to be an invaluable resource for clinicians at all levels of practice. It is especially gratifying to know that it is used in many education programs as an authoritative teaching tool for students and interns. We remain inspired by the ongoing use of this pocket guide and look forward to its continued evolution.

Pamela Charney, PhD, MS, RDN, LDN, FAND
Ainsley Malone, MS, RDN, LD, CNSC, FAND, FASPEN

Acknowledgments

We wish to thank the reviewers of this fourth edition for providing insightful feedback and the students, interns, clinicians, and educators who have shared their appreciation and suggestions over the years, which helps motivate us in creating each new edition.

We gratefully acknowledge all of the past contributors to this pocket guide, including Gail Cresci, PhD, RD; Marion F. Winkler, PhD, RD, CNSD; Trisha Fuhrman, MS, RDN, LD, FAND; Jennifer C. Lefton, MS, RD, LD, CNSC, FAND; Mary J. Marian, DCN, RDN, CSO, FAND; Susan R. Roberts, MS, RDN, LD, CNSC; Mary Russell, MS, RDN, LDN, FAND, FASPEN; Annalynn Skipper, PhD, RD, CNSC, FADA; and Cheryl W. Thompson, PhD, RD, CNSC.

Publisher's Note on Gender-Inclusive Language

The Academy of Nutrition and Dietetics encourages diversity and inclusion by striving to recognize, respect, and include differences in ability, age, creed, culture, ethnicity, gender, gender identity, political affiliation, race, religion, sexual orientation, size, and socioeconomic characteristics in the nutrition and dietetics profession.[1]

As part of our commitment to diversity and inclusion, all new and updated editions of professional books and practitioner resources published by the Academy of Nutrition and Dietetics will transition to the use of inclusive language. As appropriate, inclusive language, including person/persons, individual/individuals, or patient/patients, is used to respect and recognize transgender and nonbinary people. Where gender or sex is referred to in this book, it is important to note that gender was not further specified for study participants and specific recommendations for transgender people were not provided.

Existing guidelines for nutrition assessment and interventions rely primarily on gender-specific values and recommendations. As research continues to explore the unique health and nutrition needs of transgender people, nutrition and health practitioners can expand their knowledge and understanding by reviewing available resources that provide guidance for person-centered nutrition care of gender-diverse individuals.[2-4] The use of inclusive language is consistent with the American Medical Association's *AMA Manual of Style*[5] as well as other health

professional groups and government organizations. The Academy of Nutrition and Dietetics will continue to evolve to adopt consensus best practices related to nutrition care of gender-diverse individuals that maximize inclusivity and improve equitable and evidence-based care.

1. Diversity and Inclusion Statement. Academy of Nutrition and Dietetics website. Accessed July 16, 2021. www.eatrightpro.org/practice/practice-resources/diversity-and-inclusion
2. Rozga M, Linsenmeyer W, Cantwell Wood J, Darst V, Gradwell EK. Hormone therapy, health outcomes and the role of nutrition in transgender individuals: A scoping review. *Clinical Nutrition ESPEN*. 2020;40:42-56. doi:10.1016/j.clnesp.2020.08.011
3. Rahman R, Linsenmeyer WR. Caring for transgender patients and clients: nutrition-related clinical and psychosocial considerations. *J Acad Nutr Diet*. 2019;119(5):727-732. doi:10.1016/j.jand.2018.03.006CTICE
4. Fergusson P, Greenspan N, Maitland L, Huberdeau R. Towards providing culturally aware nutritional care for transgender people: key issues and considerations. *Can J Diet Pract Res*. 2018;79(2):74-79. doi:10.3148/cjdpr-2018-001
5. JAMA Network. *AMA Manual of Style*. 11th ed. Oxford University Press; 2020:543-544.

CHAPTER 1

The Nutrition Care Process

With the introduction of the Nutrition Care Process and Model (NCPM) in 2003, the dietetics profession established a framework for communicating specific interventions unique to dietetics practice. This framework consistently describes the process that registered dietitian nutritionists (RDNs) use to think critically and to make decisions in all care settings.[1-4] Recent updates allow the NCPM to guide dietetics practice in all care settings.[1,2] As such, the NCPM helps RDNs clearly and systematically articulate the vital services they provide and demonstrate that they are integral members of the health care team.

Both patients/clients and other health care providers generally recognize that the RDN provides a unique and highly valued service. However, regulatory agencies and third-party payers are focused on outcomes. When evaluating nutrition care, these agencies ask, "Do RDN services positively impact health outcomes or quality of care in ways that can be documented and measured?"[5] Use of the NCPM helps answer this question by collecting and analyzing data regarding outcomes of nutrition care.

Health Care Processes and Quality of Care

Avedis Donabedian, MD, the "father of health care quality," noted that health outcomes are a key component of any assessment of care quality.[6] Donabedian also recognized that evaluation of health care quality can be complicated because many outside factors may influence health outcomes. There may be, for example, a lengthy time lag between the time of the intervention and significant improvement in the health outcome of interest.[7] When health outcomes are not as expected or desired, health care administrators are tasked with determining why outcome goals were not achieved. Outcomes can be affected by a particular health care provider's actions or by *how* care is provided (ie, the care process). A physician may decide, for example, that a patient with a wound infection needs to receive a specific antibiotic. The infection might fail to improve because the provider ordered the wrong antibiotic (an issue specific to the provider) or because too much time elapsed between entry of the order and the antibiotic being administered (an issue related to the process of care). Having a standardized care process for a profession, such as the NCPM, helps differentiate between provider-specific causes and process-related issues when evaluating health outcomes.

RDNs are not the only health care providers who utilize a care process to guide critical thinking and decision-making in practice. Each health care profession has a care process that allows members to delineate the aspects of care that are unique to their profession.

The Nutrition Care Process and Model Explained

In the original (2008) visual representation of the NCPM,[2] the relationship between the RDN and the patient/client or group is positioned in a circle at the center of the graphic and surrounded by three rings. More recent updates included minor changes to the model.[1,2] The interior ring depicts the four steps of the Nutrition Care Process (NCP):

- nutrition assessment and reassessment
- nutrition diagnosis
- nutrition intervention
- nutrition monitoring and evaluation

The next ring lists factors intrinsic to the practice of dietetics that affect nutrition care, and the outer ring identifies concepts that define the environment in which nutrition care is provided.[2] Finally, the graphic shows the screening and referral system and the outcomes management system as supporting systems of the NCP (see Figure 1.1). Although not integral parts of the NCP, the screening and referral system and the outcomes management system are closely related and are important to the overall process.

Documenting Care Using the Nutrition Care Process Terminology

Successful implementation of the NCP in clinical practice is supported by the use of standardized dietetics terminology, known as the Nutrition Care Process Terminology (NCPT). Note that the website platform that hosts the list of terms is referred to as eNCPT. Before the development of the NCPT, RDNs would use a variety of words and phrases to describe nutrition problems. In most cases, the words and phrases used were accepted and understood by other RDNs and members of the particular health care team; this is known as local terminology. However, providers in other settings may use different terms with different definitions when describing the same concept. RDNs in one location might use the term "malnutrition," whereas RDNs in another setting might use the term "undernutrition" when describing a situation in which nutrient intake is less than the requirements for a given length of time. This use of locally developed terminologies may be convenient at the local level but makes it difficult to correctly aggregate and analyze data from multiple care settings over a wider geographical area.

Use of the standardized NCPT ensures consistent use of words and phrases that have the same meaning, regardless of practice setting and

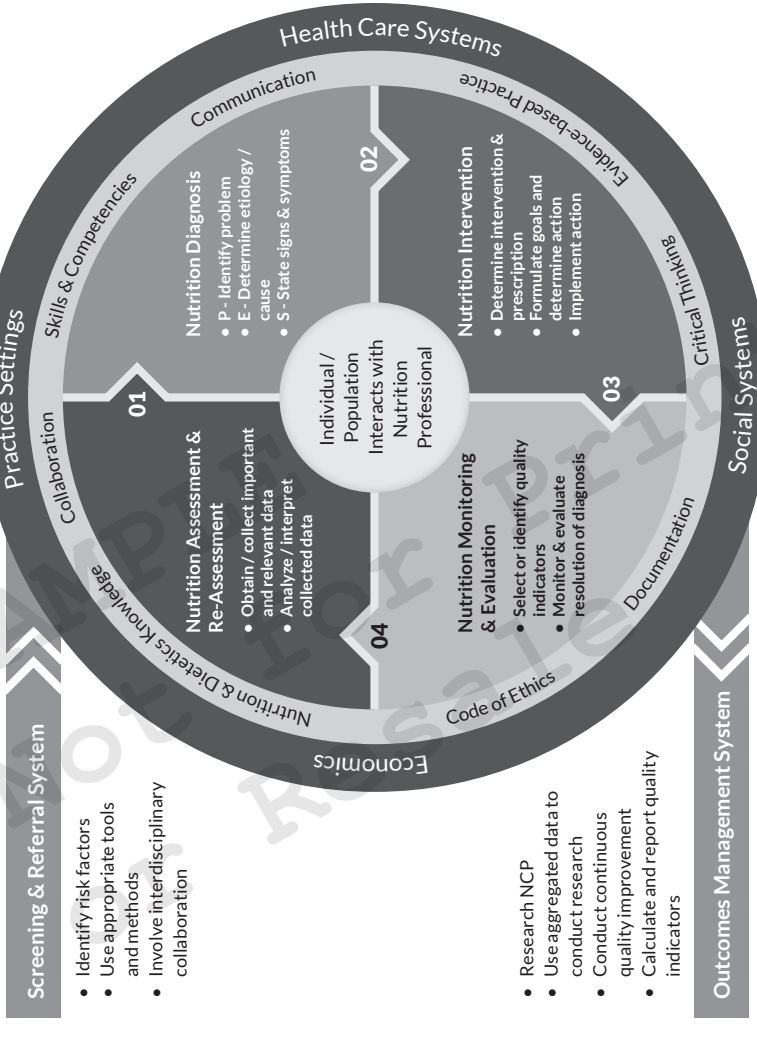

FIGURE 1.1 Nutrition Care Process Model[2]

Adapted with permission from Swan WI, Vivanti A, Hakel-Smith NA, et al. Nutrition Care Process and Model update: toward realizing people-centered care and outcomes management. *J Acad Nutr Diet*. 2017;117(12):2003-2014.

geographic location.[4] Data from the nutrition assessment may indicate, for example, that intake of food and beverages is not sufficient to meet estimated nutrient requirements. When the RDN uses the NCPT term "inadequate oral intake" to label the problem, the meaning is understood as "oral food/beverage intake is less than established reference standards or recommendations based on physiological needs."[4]

Nutrition Assessment and the Nutrition Care Process

As noted, nutrition assessment is the first step of the NCP. Nutrition screening is used to identify patients/clients who may have a nutrition diagnosis even though they do not have overt signs or symptoms of a nutrition problem. If the nutrition screen indicates risk for a nutrition problem, the RDN completes a nutrition assessment to correctly diagnose existing nutrition problems (see Chapter 2 for more information on nutritional risk screening).

Nutrition Assessment Components

Nutrition assessment terms are organized into domains (sometimes called categories).[2,4] Assessment techniques for the domains listed below are discussed in detail in Chapters 3 through 7:

- food/nutrition-related history
- anthropometric measurements
- biochemical data, medical tests, and procedures
- nutrition focused physical findings
- client history

Other assessment domains include:

- Assessment, monitoring, and evaluation tools: This domain addresses the tools used for health or disease status or risk assessment, reassessment, and monitoring and evaluation.

- Etiology: This domain helps communicate the cause or contributing factor of a nutrition diagnosis (problem) identified with evidence gathered in the nutrition assessment.
- Progress evaluation: This domain is used in nutrition reassessment to evaluate progress toward nutrition-related goals and resolution of a nutrition diagnosis.

Collecting and Evaluating Data

A great deal of research in medicine and nursing practice demonstrates that novice, proficient, and expert clinicians differ in the types and amounts of data needed to accurately diagnose health conditions. At this time, there is no reason to think that dietetics practice would differ. RDNs at different levels of practice may gather different amounts or types of data, but the correct diagnosis of the patient's/client's nutrition problem remains the goal.

Expert RDNs quickly determine the types and amounts of information needed, efficiently gather and evaluate the information, create a "nutrition differential" (list of potential diagnoses), rule out incorrect diagnoses, and correctly diagnose existing nutrition problems through an iterative process of gathering and evaluating new information as needed. Novice and proficient RDNs are also expected to diagnose nutrition problems correctly but may need additional time and resources. Regardless of the level of practice, RDNs are obligated to refer patients/clients to more experienced practitioners if the situation is outside their area of practice or experience.

What and How Much Data to Collect

Accurate and efficient diagnosis of nutrition problems requires that RDNs determine the types and amounts of nutrition assessment data that should be collected. Although novice and proficient RDNs may need to collect more data than expert RDNs, practitioners at all levels of experience must have an organized approach to data collection.

Nutrition assessment begins with the reason for referral to the RDN and information from the patient history. This information guides selection of the types and amounts of data collected. If the patient is not taking any medications, there would be little reason to conduct a detailed assessment of the diet for possible interactions of food and medication. In contrast, if the patient has a recent history of gastrointestinal (GI) surgery, weight loss, and chemotherapy for colorectal cancer, the RDN will focus on data that will help determine the extent and severity of weight loss and the impact of surgery and chemotherapy on nutrient needs, intake, and metabolism.

After collecting data, the RDN determines whether data fall within established normal limits. If the RDN determines that data are not normal, the clinical importance of the abnormality must be evaluated. The last step before diagnosing nutrition problems is to categorize data. In most cases, an expert RDN completes these final steps quickly. Experience has taught experts how to evaluate nutrition assessment data quickly. Proficient RDNs may complete part of this step efficiently, whereas other parts may require more thought and evaluation. Novice RDNs typically need more time to think and consider each alternative in evaluating assessment data.

Regardless of level of practice, the RDN is responsible for determining whether enough data have been collected to diagnose existing nutrition problems correctly. The collection of insufficient data may lead to an incorrect diagnosis. The collection of extraneous or unnecessary data may also lead to an incorrect diagnosis in addition to increased costs associated with nutrition care.

Nutrition Diagnosis

Nutrition diagnosis is the second step of the NCP. RDNs are responsible for correctly diagnosing nutrition problems. Research in medical and nursing education describes several patterns of thinking used to make decisions in patient care, shown in Box 1.1.[8–11] It may be assumed that RDNs would also utilize these patterns to make decisions in patient care.

BOX 1.1 Examples of Diagnostic Thought Processes[8-11]

Pattern recognition

Decision-making is based on past experience with similar cases

Most successfully used by clinicians with experience

Exhaustive thinking

As much data as possible are gathered and searched for all possible diagnoses

Typically used by novice clinicians

Algorithms

Answers to a series of yes/no questions lead to diagnosis

Most often used by novice and proficient clinicians

Hypothetico-deductive reasoning (Scientific Method)

A list of possible diagnoses is developed and revised as information gathering progresses

Most appropriately used by experienced clinicians

Documenting the Diagnosis

Recommendations for documenting and communicating nutrition diagnoses are often the least understood part of the NCP. The Academy of Nutrition and Dietetics recommends use of PES (problem, etiology, and signs and symptoms) statements when documenting nutrition diagnoses. This recommendation is based on nursing research that led to the creation of the North American Nursing Diagnosis Association (NANDA) nursing terminology.[12-14]

When written correctly, the PES statement can clearly and concisely describe what the RDN diagnosed, why the diagnosis was made, and the key finding that triggered the diagnosis. The statement reads like this:

> *Problem (the nutrition diagnosis) related to Etiology (the major factor[s] contributing to the nutrition diagnosis) as evidenced by Signs and Symptoms (the key abnormal finding[s] that determined the nutrition diagnosis).*

The following example shows a nutrition diagnosis written as a PES statement:

Inadequate oral intake related to chemotherapy-related nausea as evidenced by documented intake that is 25% of estimated requirements.

See Box 1.2 for tips to create clear and concise PES statements that communicate the value of nutrition care to all stakeholders.

Before documenting a nutrition diagnosis, the RDN must be sure that the diagnosis is correct and contextually appropriate. In many cases, more than one diagnosis could be made. It is not unusual, for example, for a patient who has the nutrition diagnosis "overweight/obesity" to also have "excessive oral intake," "physical inactivity," "food/nutrition-related knowledge deficit," or some combination of these diagnosis. RDNs (or their employers) will need to determine if a PES statement must be written for each diagnosis or if the RDN is able to prioritize and document based on the situation. Nevertheless, all nutrition diagnoses must be documented. Lack of documentation implies that the RDN did not correctly diagnose all nutrition problems. In addition,

BOX 1.2 Tips for Documenting Nutrition Diagnoses

The PES (problem, etiology, signs and symptoms) statement must be clear and concise—it must be easily understood by other members of the health care team.

Each PES statement must consist of one nutrition diagnosis, one etiology, and one set of signs and symptoms.

- If the patient has more than one nutrition diagnosis, facilities can determine if each diagnosis should have an associated PES statement or if only the primary diagnosis requires documentation using a PES statement. However, each diagnosis should be documented (with or without a PES statement).

Unless local synonyms have been developed and mapped to the Nutrition Care Process Terminology (NCPT), terms used should be from the standardized NCPT.

when nutrition diagnoses are not documented, the implication is that another health care professional would be responsible.

Note: *Use of PES statements to document nutrition diagnoses is not required by any regulatory agency. PES statements are one of a number of ways to communicate and document nutrition diagnoses. Each facility should determine how documentation should be accomplished.*

Improving PES Statements

Box 1.3 shows examples of PES statements that are rewritten to improve clarity. A brief explanation is also included.

BOX 1.3 Examples of Improved PES Statements

Example 1

Original: Inconsistent carbohydrate intake related to poor diet choices as evidenced by hemoglobin A1c (HbA1c).

Improved: Inconsistent carbohydrate intake related to poor diet choices as evidenced by significant differences in total carbohydrate consumed over 4 days.

Explanation: The original nutrition diagnosis is not supported by the sign or symptom. HbA1c is a laboratory test used to estimate long-term blood glucose control. HbA1c does not measure consistencies in carbohydrate intake. Because the diagnosis is focused on inconsistent carbohydrate intake, the sign or symptom must describe some aspects of carbohydrate intake consistency that can be measured to determine whether the nutrition intervention was effective.

Continued on next page

BOX 1.3 Examples of Improved PES Statements (cont.)

Example 2

Original: Altered gastrointestinal (GI) function related to short bowel syndrome as evidenced by hypoalbuminemia and need for parenteral nutrition.

Improved: Altered GI function related to short bowel syndrome as evidenced by seven watery stools per day for previous 5 days.

Explanation: There is some thought that the etiology of a nutrition diagnosis should never include a medical diagnosis, but in some cases, nutrition diagnoses are directly caused by a medical problem. In this example, altered GI function is a logical consequence of short bowel syndrome. Hypoalbuminemia is not a finding that can be directly related to altered GI function, nor will improvement in albumin levels indicate improvement in GI function. Parenteral nutrition is an intervention, not a sign/symptom of a nutrition diagnosis. Changes in stool output can be considered an indicator of bowel function in patients who have short bowel syndrome. Improvement in stool output following intervention would be seen as a sign that the correct nutrition intervention was implemented.

Nutrition Intervention

Nutrition intervention is the third step in the NCP and involves purposefully planned actions to change a nutrition-related behavior, a risk factor, an environmental condition, or an aspect of a patient's health status. After correctly diagnosing nutrition problems, the RDN is responsible for planning and ensuring that the appropriate intervention is implemented.

Ideally the intervention is directly related to resolving either the nutrition diagnosis or its etiology. Box 1.4 illustrates this point. Less often, it is directed at relieving the signs and symptoms of the nutrition problem. The interventions may be actions performed by the RDN, recommended to the physician or other health care professionals, or coordinated or delegated to other practitioners.

BOX 1.4 Examples of Correct Nutrition Interventions

Nutrition diagnosis (etiology)	*Intervention strategy*
Obesity (related to overeating)	*Correct:* Energy-modified diet: decreased energy diet *Incorrect:* Nutrition education—content: education on low-calorie diet *Rationale:* The correct intervention is related to the cause of the problem, overeating. Education would treat a knowledge deficit.
Food/nutrition-related knowledge deficit (related to inability to identify lower calorie foods)	*Correct:* Nutrition education—application: label-reading skills *Incorrect:* Energy-modified diet: decreased energy diet *Rationale:* A knowledge deficit is treated by increasing knowledge.

Nutrition Monitoring and Evaluation

Nutrition monitoring and evaluation is the fourth step of the NCP. In this step, the RDN assesses the patient/client to determine and document whether the intervention had the desired impact on the diagnosis. Because monitoring and evaluation involves reassessment, the standardized terminology for this step is mostly the same as the NCPT for nutrition assessment. The exception is the client history domain, which applies only to assessment (because an intervention could not change history).

During reassessment, the RDN evaluates and communicates whether the nutrition-related problem still exists and the progress made toward resolving the problem. This process involves identifying, in advance, the appropriate reassessment data or nutrition care indicators that will be reviewed and compared with recognized, science-based reference standards, recommendations, client goals, or baseline data.

Malnutrition Diagnosis and Treatment

The adoption of the NCP and standardized terminology aims to improve nutrition care in all areas of dietetics practice, including the care of patients who are malnourished or at risk of malnutrition. It is generally accepted that malnutrition is associated with increased risk for iatrogenic complications, increased length of hospital stay, and increased health care costs.[15] Despite these known negative associations with malnutrition, reimbursement for nutrition intervention has been inconsistent. Third-party payers have only recently acknowledged the link between nutrition interventions and outcomes, supporting the idea that correct diagnosis of malnutrition can improve reimbursement strategies.

Malnutrition is diagnosed using findings from the patient history and physical examination combined with the RDN's clinical judgment. Consensus statements recommend utilization of certain clinical characteristics for accurate diagnosis of malnutrition.[16] A minimum of two of the following six characteristics is recommended for diagnosis of either severe or nonsevere malnutrition:

- Energy intake: compare recent intake with estimated requirements; report inadequate intake as a percentage of estimated energy requirements over time.
- Interpretation of weight loss: evaluate weight with other clinical findings; assess weight change over time, reported as a percentage of weight lost from baseline.
- Body fat: perform physical assessment to identify loss of subcutaneous fat (eg, orbital, triceps, fat overlying the ribs).
- Muscle mass: perform physical assessment to assess muscle loss (eg, wasting of the temples, clavicles, shoulders, interosseous muscles, scapula, thigh, and calf).
- Fluid accumulation: evaluate generalized or localized fluid accumulation evident on examination (eg, extremities, vulvar/scrotal edema, ascites); determine whether weight loss is masked by edema.

- Reduced grip strength: consult normative standards supplied by the manufacturer of the measurement device.

See Tables 1.1 to 1.3 for clinical characteristics of malnutrition in the contexts of acute illness or injury, chronic illness, and social or environmental circumstances.

Practitioners should be aware that the consensus statements have not been validated and should be considered expert opinion. Use of hand-grip dynamometry is not evidence based and cannot be recommended at this time. NCPT incorporates similar characteristics and can be utilized to document the nutrition diagnosis of malnutrition (undernutrition) and to ensure that the role of the RDN in diagnosis and treatment of malnutrition is described clearly. Box 1.5 compares assessment and documentation of malnutrition characteristics with the associated NCPT domains.[2,16]

The Subjective Global Assessment (SGA), developed in 1982, uses information gathered from the physician's history and physical

TABLE 1.1 Clinical Characteristics of Malnutrition in Acute Illness or Injury[16]

	Nonsevere (moderate) malnutrition		Severe malnutrition	
Energy intake	<75% of EER for >7 d		≤50% of EER for ≥5 d	
Weight loss	1%–2%	1 wk	>2%	1 wk
	5%	1 mo	>5%	1 mo
	7.5%	3 mo	>7.5%	3 mo
Loss of body fat	Mild		Moderate	
Loss of muscle mass	Mild		Moderate	
Fluid accumulation	Mild		Moderate-severe	
Reduced grip strength	NA		Measurably reduced	

Abbreviations: EER, estimated energy requirement; NA, not applicable

TABLE 1.2 Clinical Characteristics of Malnutrition in Chronic Illness[16]

	Nonsevere (moderate) malnutrition		Severe malnutrition	
Energy intake	<75% of EER for ≥1 mo		≤75% of EER for ≥1 mo	
Weight loss	5%	1 mo	>5%	1 mo
	7.5%	3 mo	>7.5%	3 mo
	10%	6 mo	>10%	6 mo
	20%	1 y	>20%	1 y
Loss of body fat	Mild		Severe	
Loss of muscle mass	Mild		Severe	
Fluid accumulation	Mild		Severe	
Reduced grip strength	NA		Measurably reduced	

Abbreviations: EER, estimated energy requirement; NA, not applicable

TABLE 1.3 Clinical Characteristics of Malnutrition in Social or Environmental Circumstances[16]

	Nonsevere (moderate) malnutrition		Severe malnutrition	
Energy intake	<75% of EER for ≥3 mo		≤50% of EER for ≥1 mo	
Weight loss	5%	1 mo	>5%	1 mo
	7.5%	3 mo	>7.5%	3 mo
	10%	6 mo	>10%	6 mo
	20%	1 y	>20%	1 y
Loss of body fat	Mild		Severe	
Loss of muscle mass	Mild		Severe	
Fluid accumulation	Mild		Severe	
Reduced grip strength	NA		Measurably reduced	

Abbreviations: EER, estimated energy requirement; NA, not applicable

examination to diagnose malnutrition.[17,18] The following components are included in the SGA:

- weight and weight changes
- appetite and intake
- GI symptoms
- functional status
- physical exam for fat and muscle wasting

The SGA has been validated and, as such, is the gold standard with which the consensus statement assessment tool would be compared.[19]

The important role of the RDN in correctly diagnosing malnutrition cannot be overstated. See Box 1.6 for a case study.

BOX 1.5 Malnutrition Assessment Characteristics Compared With Nutrition Care Process Terminology Nutrition Assessment Domains[2,16]

Malnutrition assessment characteristic	*Nutrition care process terminology domain*
History and clinical diagnosis	Client history
Physical exam/clinical signs	Nutrition focused physical findings
Anthropometric data	Anthropometric measurements
Laboratory data	Biochemical data, medical tests, and procedures
Food or nutrient intake	Food- or nutrition-related history
Functional assessment	Nutrition focused physical findings

BOX 1.6 Case Study Utilizing the Nutrition Care Process

A 26-year-old woman was referred by her primary care provider to the outpatient registered dietitian nutritionist (RDN) for "treatment of malnutrition." On arrival at clinic, the patient was weighed and measured. She weighed 105 lb (47.7 kg) and was 66 in tall (167.6 cm). Her body mass index was 16.9. A review of the patient's medical record revealed that she weighed between 104 lb and 108 lb over the past 4 years. The medical and surgical history was unremarkable. The nutrition focused physical examination revealed only that the patient appeared to be very thin and had some mild temporal fat loss. The patient worked full time as an administrative assistant and had a part-time job (two to three evenings per week) as a musician. On nights that she worked, she would skip dinner and eat packaged cheese and crackers in the car and typically did not get home until after midnight. She stated that she "caught up on her sleep" by sleeping in until 1 PM or 2 PM on weekends. Otherwise her food and nutrition history revealed that her intake was adequate for weight maintenance 4 d/wk with possible sub-optimal intake only on days that she worked in the evenings and on weekends. The patient stated that she would like to gain 4 to 5 lb but was not sure how to do that. This meeting was her first with an RDN.

Based on the information gathered during the nutrition assessment, the RDN made the following diagnoses:

- Underweight related to diet and lifestyle, as evidenced by documented weight history and patient desire to gain weight
- Inadequate oral intake related to lack of time for several meals per week, as evidenced by diet recall
- Food- and nutrition-related knowledge deficit related to diet for weight gain, as evidenced by patient report of no prior nutrition education

The RDN did not diagnose malnutrition in this patient. The patient's weight had been stable for the past several years. There was also no indication that the patient would not be able to maintain or gain weight given implementation of the appropriate nutrition intervention.

Continued on next page

BOX 1.6 Case Study Utilizing the Nutrition Care Process (cont.)

The RDN provided nutrition education about methods to increase the energy content of meals and snacks. The patient also agreed to attempt to pack a high-energy snack to eat in the car on the way to her second job and to leave a snack at her bedside on weekends. She would also set an alarm for midmorning on weekends so she could consume the snack and go back to sleep. The patient returned for follow-up 3 months later and had gained 2 lb. She stopped eating the morning snack on weekends but added a midafternoon snack at work and continued to bring a high-energy snack to eat in the car. She was pleased with her progress and agreed to return in 3 months for a weight check. The RDN monitored the patient's weight and food intake to adjust future nutrition education plans.

At this point, if the patient had not gained weight, the RDN would reassess the patient and possibly diagnose malnutrition based on additional information gathered.

This case highlights the role of the RDN in ensuring that malnutrition is correctly diagnosed. Whereas other members of the health care team looked only at a snapshot of the patient's weight before diagnosing incorrectly, the RDN carefully evaluated all five components of the nutrition assessment. The RDN also kept the patient at the center of the care process by incorporating the patient's experiences and plans when deciding on an appropriate nutrition intervention.

References

1. Swan WI, Pertel DG, Hotson B, et al. Nutrition Care Process (NCP) update part 2: developing and using the NCP terminology to demonstrate efficacy of nutrition care and related outcomes. *J Acad Nutr Diet.* 2019;119(5):840-855.
2. Swan WI, Vivanti A, Hakel-Smith NA, et al. Nutrition care process and model update: toward realizing people-centered care and outcomes management. *J Acad Nutr Diet.* 2017;117(12):2003-2014.
3. Lacey K, Pritchett E. Nutrition care process and model: ADA adopts road map to quality care and outcomes management. *J Am Diet Assoc.* 2003;103(8):1061-1072.
4. Academy of Nutrition and Dietetics. Electronic Nutrition Care Process Terminology (eNCPT). 2020. Accessed January 16, 2021. www.ncpro.org

5. Blankenship J, Blancato RB, Kelly R. Quality improvement as the foundation for health care advancement. *J Acad Nutr Diet*. 2019;119(9):S15-S17.
6. Baker R. Avedis Donabedian: an interview. *Qual Health Care*. 1993;2(1):40-46.
7. Donabedian A. The quality of care. How can it be assessed? *JAMA*. 1988;260(12):1743-1748.
8. Brierley DJ, Farthing PM, Zijlstra-Shaw S. How consultants determine diagnostic competence in histopathology trainees. *J Clin Pathol*. 2019;72(9):622-629.
9. Bowen JL. Educational strategies to promote clinical diagnostic reasoning. *N Engl J Med*. 2006;355(21):2217-2225.
10. Coderre S, Mandin H, Harasym PH, Fick GH. Diagnostic reasoning strategies and diagnostic success. *Med Educ*. 2003;37(8):695-703.
11. Coderre S, Wright B, McLaughlin K. To think is good: querying an initial hypothesis reduces diagnostic error in medical students. *Acad Med*. 2010;85(7):1125-1129.
12. North American Nursing Diagnosis Association. Home page. Accessed October 23, 2019. www.nanda.org
13. Zaybak A, Özdemir H, Erol A, Ismailoğlu EG. An exploration of nursing students' clinical decision-making process. *Int J Nurs Knowl*. 2018;29(4):210-216.
14. Keenan G, Yakel E, Dunn Lopez K, Tschannen D, Ford YB. Challenges to nurses' efforts of retrieving, documenting, and communicating patient care information. *J Am Med Inform Assoc*. 2013;20(2):245-251.
15. Agarwal E, Ferguson M, Banks M, et al. Malnutrition and poor food intake are associated with prolonged hospital stay, frequent readmissions, and greater in-hospital mortality: results from the Nutrition Care Day Survey 2010. *Clin Nutr*. 2013;32(5):737-745.
16. White JV, Guenter P, Jensen G, Malone A, Schofield M. Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: characteristics recommended for the identification and documentation of adult malnutrition (undernutrition). *J Acad Nutr Diet*. 2012;112(5):730-738.
17. Baker JP, Detsky AS, Wesson DE, et al. Nutritional assessment: a comparison of clinical judgement and objective measurements. *N Engl J Med*. 1982;306:969-972. doi:10.1056/NEJM198204223061606
18. Detsky AS, McLaughlin JR, Baker JP, et al. What is subjective global assessment of nutritional status? *JPEN J Parenter Enteral Nutr*. 1987;11(1):8-13. doi:10.1177/014860718701100108
19. Da Silva Fink J, DeMello PD, de Mello ED. Subjective global assessment of nutritional status—a systematic review of the literature. *Clin Nutr*. 2015;34(5):785-792. doi:10.1016/j.clnu.2014.12.014

Index

Page numbers followed by *f* indicate figures, page number followed by *t* indicates tables, and page numbers followed by *b* indicate boxes.

abdomen
  examination, 105, 106*b*
  quadrants of, 90*f*
Academy of Nutrition and Dietetics, 8, 221, 222, 238
  Critical Illness Evidence-Based Nutrition Practice Guideline, 223
  Evidence Analysis Library, 26, 224, 225, 229
  Evidence-Based Nutrition Practice Guideline for Spinal Cord Injury, 68
  Measuring Resting Metabolic Rate in the Critically Ill Guideline, 224
  nutrition screening definition, 22, 23*b*
  nutrition screening position paper, 24
acceptable macronutrient distribution ranges, 240
access to food, 41*b*, 53
acid–base assessment, 149
acid–base disorders
  evaluation and treatment of, 150
  metabolic acidosis, 151*b*–152*b*
  metabolic alkalosis, 152*b*–153*b*
  respiratory acidosis, 154*b*–155*b*
  respiratory alkalosis, 155*b*–156*b*
  types of, 149
acute care
  collection of food and nutrient intake data, 44
  enteral/parenteral nutrition monitoring, 191, 192*b*–193*b*
  measurement of body composition in, 72
  nutrition screening tools for, 25
  retrieval of historical information in, 203
acute illness/injury
  clinical characteristics of malnutrition in, 14*t*
  interpretation of BMI in acutely ill patients, 64
acute-phase response, 112, 114, 161
Acute Physiologic Assessment and Chronic Health Evaluation (APACHE II), 113
ADA. See American Diabetes Association
adequate intake, 239
adjustable gastric banding, 209*b*
adolescents
  food and nutrient intake and history questions for, 48*b*
  HbA1c goals for, 127
AFA. *See* arm fat area
Agency for Healthcare Research and Quality (AHRQ), 203*b*
AHRQ. *See* Agency for Healthcare Research and Quality
alanine aminotransferase (ALT), 193*b*, 195*b*
albumin, 113, 114*b*, 159*b*, 187*b*, 194*b*, 195*b*

algorithms, 8*b*
alkaline phosphatase (ALP), 169*b*, 193*b*, 195*b*
ALP. *See* alkaline phosphatase
alpha-tocopherol, 170*b*
ALT. *See* alanine aminotransferase
aluminum, 188*b*
ambulatory care
  nutrition screening tools for, 25
  retrieval of historical information in, 203
American Association of Clinical Endocrinologists (AACE), 118*b*–119*b*, 122
American College of Endocrinology. *See* American Association of Clinical Endocrinologists (AACE)
American Diabetes Association (ADA), 117, 121
  diabetes screening criteria for asymptomatic adults, 118*b*–119*b*
American Society for Parenteral and Enteral Nutrition (ASPEN), 229
amiodarone, 210*b*
amlodipine, 211*b*
amputation, adjustments to IBW for, 69, 69*b*–70*b*
anemia. *See* nutritional anemias
anemia of chronic disease (ACD), 161, 161*b*–164*b*
angiotensin-converting enzyme inhibitors, 210*b*
anthropometric measurements, 57
  body composition, 70–79, 73*b*–74*b*, 75*t*–78*t*, 79*b*
  body mass index, 62–65, 63*b*
  height measurement/estimation, 57–60, 58*b*, 59*b*–60*b*, 61*t*
  ideal body weight, 65–69, 66*b*, 67*b*–68*b*, 69*b*–70*b*
  interpretation of body weight, 70, 71*b*
  weight measurement, 60, 62
antianxiety/sedative hypnotics, 210*b*
anticoagulants
  interaction with nutrients, 211*b*
  nutrition screening for, 36
antidepressants, 211*b*
APACHE II. *See* Acute Physiologic Assessment and Chronic Health Evaluation
appetite, 215*b*
arm fat area (AFA)
  interpretation of, 74
  mid-upper, 72, 73*b*–74*b*
  percentiles for females, 78*t*
  percentiles for males, 77*t*
  reflecting alterations in total body weight, 79*b*
arm muscle area (AMA), 72
  corrected, 73*b*
  interpretation of, 74
  percentiles for females, 76*t*
  percentiles for males, 75*t*
  reflecting alterations in total body weight, 79*b*
  uncorrected, 73*b*
arm span method, 59, 59*b*
ascorbic acid, 171*b*
aspartate aminotransferase (AST), 193*b*, 195*b*
AST. *See* aspartate aminotransferase
atomic absorption spectrophotometry, 183*b*
atorvastatin, 212*b*
auscultation techniques, 87, 88*b*–89*b*

bariatric surgery, 209*b*
beam and balance scales, 62
bed scales, 62
behaviors, nutrition, 41*b*, 53
benazepril, 210*b*
benzodiazepines, 211*b*
BIA. *See* bioelectrical impedance analysis
bicarbonate, 187*b*, 192*b*, 195*b*
bile acid sequestrants, 211*b*
bilirubin, 193*b*, 195*b*

bioelectrical impedance analysis (BIA), 64, 79
biotin, 178*b*
blood glucose, 192*b*, 194*b*, 195*b*
  diabetic ketoacidosis and hyperosmolar hyperglycemic state, 127, 127*b*–128*b*
  evaluation of, 123
  fasting, 191*b*
  monitoring long-term glucose control, 123, 126–127
  prediabetes and diabetes, 117–122, 118*b*–120*b*
blood pressure (BP), 191*b*
  assessment, 92*b*
blood urea nitrogen (BUN), 157, 158*b*, 192*b*, 194*b*, 195*b*
BMI. *See* body mass index
body composition, 70–71
  assessment tools, 79
  calculations, 72, 73*b*–74*b*
  derived parameters, 72
  interpretation of AMA and AFA, 74, 75*t*–78*t*, 79*b*
  measurement, indirect measures for, 72
body fluids, volume and electrolyte composition of, 233*t*
body frame size adjustments, and ideal body weight, 66
body mass index (BMI), 36, 62
  and body fat, 64
  classification, in adults, 63*b*
  data, in electronic health records, 64
  equations, 63, 63*b*
  ideal body weight based on, 65–66, 66*b*
  interpretation of, 63–65
  and morbidity/mortality, 65
body surface area method, for fluid needs estimation, 238*b*
bowel, auscultation of, 88*b*–89*b*
BP. *See* blood pressure
Bumex, 213*b*
BUN. *See* blood urea nitrogen
BUN-to-creatinine ratio, 158*b*
buspirone, 210*b*

calcium, 139, 187*b*, 194*b*, 195*b*, 196*b*
  hypercalcemia, 141, 142*b*
  hypocalcemia, 139, 140*b*–141*b*
  ionized, 192*b*
  loss, 216*b*
calcium-channel blockers, 211*b*
carbamazepine, 211*b*
caregivers of infants/children, food and nutrient intake and history questions for, 47*b*
CBC. *See* complete blood count
Centers for Disease Control and Prevention, 64, 203*b*
Centers for Medicare & Medicaid Services (CMS), 21
ceruloplasmin, 181*b*
chest
  anatomy of, 104*f*
  examination of, 104–105
chief complaint, 205*b*
chloride, 187*b*, 192*b*, 194*b*, 195*b*
chlorothiazide, 214*b*
chlorthalidone, 214*b*
cholestryamine, 211*b*
chromium, 182*b*
chronic illness, clinical characteristics of malnutrition in, 15*t*
chronic kidney disease (CKD), 187*b*–188*b*
chronological age method, for fluid needs estimation, 238*b*
cilostazol, 211*b*
ciprofloxacin, 212*b*
CKD. *See* chronic kidney disease
cleviprex, 213*b*
client history, 12, 202
  family medical/health history, 203–204, 207*b*
  medication history, 207*b*, 208, 210*b*–216*b*
  past medical history, 203–204, 205*b*–207*b*

personal history, 202–203
psychiatric history, 206*b*
social history, 217, 217*b*–218*b*
surgical history, 206*b*, 208, 208*b*–210*b*
clofibrate, 212*b*
clomipramine, 21*b*
Clostridium difficile toxin, 186*b*
CMS. *See* Centers for Medicare & Medicaid Services
cobalamin, 165*b*, 177*b*
colesevelam, 211*b*
colestipol, 211*b*
colon, 210*b*
colonic interposition, 208*b*
complementary/alternative medicine use, 41*b*, 51–52
complete blood count (CBC), 187*b*, 194*b*, 195*b*
with differential, 193*b*
computed tomography (CT), 79
constipation, 215*b*
copper, 181*b*
creatinine, 183*b*, 187*b*, 192*b*, 194*b*, 195*b*
CT. *See* computed tomography
cyclosporine, 212*b*

data collection, 6
food and nutrient intake, 44, 45*b*–46*b*, 46
types and amounts of data, 6–7
data evaluation, 6
dehydration, 108*b*, 157
desirable body weight. *See* ideal body weight (IBW)
DETERMINE Checklist, 25
Devine formula, 66, 67*b*
dexamethasone, 214*b*
diabetes mellitus, 117
gestational, 122, 123*b*
insulin therapy and blood glucose targets, 120–122
interpretation of glucose testing, 119*b*–120*b*
screening and diagnosis, 117, 118*b*–120*b*
diabetic ketoacidosis, 127, 127*b*–128*b*
diagnostic procedures, history of, 207*b*
diarrhea, 185*b*–186*b*, 215*b*
diazepam, 210*b*
Dietary Reference Intakes (DRIs), 239–240
dietary supplement use, history of, 207*b*
1,25-dihydroxyvitamin D, 169*b*
distal small bowel, 210*b*
documentation of diagnosis, 8–10, 9*b*
Donabedian, Avedis, 2
DRIs. *See* Dietary Reference Intakes
drug-induced nutritional and metabolic alterations, 215*b*–216*b*
drug-nutrient interactions, 210*b*–214*b*
dry mouth, 215*b*
dual-energy x-ray absorptiometry (DXA), 79, 196*b*
durable power of attorney, 54
DXA. *See* dual-energy x-ray absorptiometry

EFAD. *See* essential fatty acid deficiency
EGR-AC. *See* erythrocyte glutathione reductase activity coefficient
EHRs. *See* electronic health records
electrolyte assessment
calcium, 139, 140*b*–141*b*, 141, 142*b*
magnesium, 145–146, 146*b*–147*b*, 148, 148*b*
phosphorus, 143, 143*b*–144*b*, 145, 145*b*
potassium, 136, 136*b*–137*b*, 138, 138*b*–139*b*
sodium, 128–129, 130*b*–132*b*, 133–134, 134*b*–135*b*
electrolyte management, 232, 233*t*–235*t*, 235*b*–237*b*, 238, 238*b*

electronic health records (EHRs), 24, 35, 62, 64
electronic scales, 62
emesis, 215*b*
emission spectroscopy, 183*b*

enalapril, 210*b*
energy requirements
  for critically ill patients, 223–226, 224*b*, 227*b*–228*b*
  methods for determining, 220–222, 221*f*
  for noncritically ill patients, 222, 222*b*
enteral nutrition monitoring, 191
  in acute care settings, 191, 192*b*–193*b*
  home enteral nutrition, 194, 194*b*
erythrocyte copper, 181*b*
erythrocyte folate, 176*b*
erythrocyte glutathione reductase activity coefficient (EGR-AC), 173*b*
erythrocyte manganese, 183*b*
erythrocyte transketolase activity (ETKA), 172*b*
esophagus, resection/replacement of, 208*b*
essential fatty acid deficiency (EFAD), 190*b*
estimated average requirement, 239
euglycemia, 121
exhaustive thinking, 8*b*
extracellular fluid (ECF), 130*b*–131*b*, 134, 134*b*–135*b*, 141, 157
eye
  anatomy of, 99*f*
  examination, 98, 99*b*–100*b*

face, anatomy of, 102*f*
false-negative result, 21, 22*b*
false-positive result, 21, 22*b*
family medical/health history, 203–204, 207*b*
fasting lipid profile, 188*b*

fat
  body fat, and BMI, 64
  malabsorption, 186*b*, 216*b*
  metabolism, altered, 216*b*
fat-free mass (FFM), 70–71
fecal fat test, 186*b*
fecal leukocytes, 185*b*
fecal occult blood test, 186*b*
felodipine, 211*b*
fenofibrate, 212*b*
ferritin, 161*b*, 179*b*, 187*b*, 196*b*
FFM. *See* fat-free mass
fiber intake, 40–41
fibric acid derivatives, 212*b*
fidaxomicin, 186*b*
fluid balance method, 238*b*
fluid(s)
  deficit, calculation of, 237*b*
  dehydration, 108*b*
  intake, 40–42
  intravenous, electrolyte concentrations and osmolality of, 234*t*
  needs, estimation of, 238, 238*b*
  overhydration, 109*b*
  requirements, factors that affect, 235*t*
  volume and electrolyte composition of body fluids, 233*t*
fluoroquinolones, 212*b*
fluvastatin, 212*b*
FNRH. *See* food and nutrition-related history
folate-deficiency (megaloblastic) anemias, 164, 165*b*–166*b*
folate/folic acid, 175*b*–176*b*, 177*b*
  red blood cell, 166*b*, 176*b*
  serum, 166*b*, 176*b*
food and nutrient administration, 41*b*, 50, 51*b*
food and nutrient intake, 41*b*, 43–44
  data collection methods, 44, 45*b*–46*b*, 46
  questions for adolescents, 48*b*
  questions for caregivers of infants/children, 47*b*
  questions for older adults, 48*b*–49*b*
  questions for pregnant women, 49*b*–50*b*
Food and Nutrition Board, Institute of Medicine, 239

food and nutrition-related history (FNRH), 40
  access to food and food/nutrition-related supplies, 41*b*, *53*
  behaviors, 41*b*, *53*
  components of, 41*b*, 43–*54*
  food and nutrient administration, 41*b*, *50*, *51b*
  food and nutrient intake, 41*b*, 43–44, 44*b*–46*b*, 46, 47*b*–50*b*
  functional capacity and physical activity, 41*b*, *53*
  guidelines for conducting, 42–43
  knowledge/beliefs/attitudes, nutrition-related, 41*b*, *52*, *52b*
  medication and complementary/alternative medicine use, 41*b*, *51*–*52*
  nutrition-related patient/client-centered measures, 41*b*, *54*
  special circumstances, *54*
  using information for nutrition diagnosis, 40–42
  using information for nutrition monitoring/evaluation, 42
food diary/records, 45*b*–46*b*
food frequency questionnaire, 44, 45*b*
food/nutrition-related supplies, 41*b*, *53*
fosinopril, 210*b*
free-water deficit, 133
functional capacity, 41*b*, *53*

gamma-glutamyl transferase (GGT), 195*b*
gastric pull-up, 208*b*
gastrointestinal failure, *54*
GDM. *See* gestational diabetes mellitus
gemfibrozil, 212*b*
gestational diabetes mellitus (GDM), 122, 123*b*
GGT. *See* gamma-glutamyl transferase
glucose. *See* blood glucose
griseofulvin, 212*b*

hair examination, 96, 97*b*
Hamwi formula, 66, 67*b*
Harris-Benedict equation (HBE), 222*b*, 227-228*b*
Harvard School of Public Health, 203*b*
HbA1c. *See* hemoglobin A1c
HDL cholesterol, 190*b*
head examination, 97, 98*b*
health care processes, 2
health care proxy, *54*
health literacy resources, 203*b*
health outcomes, 2
heart, auscultation of, 89*b*
heart failure
  and fluid intake, 42
  high risk of readmission for, 36
height, *57*–*58*
  arm span method, *59*, *59b*
  estimation methods, *59*–60
  and ethnicity/gender, 61*t*
  knee height, *59*–60, 60*b*, 61*t*
  measurement methods, *58*–*59*
  recumbent length, *58*–*59*
  standing height, *58*, *58b*
hematocrit, 158*b*
hemoglobin, 187*b*
hemoglobin A1c (HbA1c), 117, 120*b*, 123
  and diagnosis of diabetes, 126
  goals, 126–127
  and MPG, correlations between, 126
  testing, frequency of, 126
hepatic transport protein assessment, 112
  acute-phase response, 112
  albumin, 113, 114*b*
  prealbumin, 116, 116*b*
  transferrin, 114–115, 115*b*
HMG CoA–reductase inhibitors, 212*b*
home enteral nutrition, monitoring of, 194, 194*b*
home parenteral nutrition (HPN)
  long-term, metabolic bone disease monitoring in patients on, 196*b*
  monitoring, 194–195, 195*b*–196*b*
homocysteine, 166*b*, 176*b*, 177*b*

HPN. *See* home parenteral nutrition
hydration, 156–157
  hypervolemia, 157
  hypovolemia, 157
  laboratory values associated with, 158*b*–160*b*
  status, 108, 108*b*–109*b*
hydrocholorothiazide, 214*b*
3-hydroxisovalerate acid, 178*b*
25-hydroxyvitamin D, 169*b*, 188*b*, 196*b*
hypercalcemia, 141, 142*b*
hyperglycemia, 120, 121, 123, 125*b*, 215*b*
hyperkalemia, 138, 138*b*–139*b*
hyperlipidemia, 216*b*
hypermagnesemia, 148, 148*b*
hypernatremia, 128, 133–134, 134*b*–135*b*
hyperosmolar hyperglycemic state, 127, 127*b*–128*b*
hyperosmolar hyponatremia, 132*b*
hyperphosphatemia, 145, 145*b*
hypervolemia, 157
hypervolemic hypotonic hyponatremia, 131*b*, 135*b*
hypoalbuminemia, 113
hypocalcemia, 139, 140*b*–141*b*, 146
hypoglycemia, 121, 123, 216*b*
  and HbA1c goals, 126–127
  potential causes and symptoms of, 124*b*
hypokalemia, 136, 136*b*–137*b*, 146
hypomagnesemia, 146, 146*b*–147*b*
hyponatremia, 128, 129, 130*b*–132*b*
hypophosphatemia, 143, 143*b*–144*b*, 189*b*
hypothetico-deductive reasoning, 8*b*
hypoventilation, 149
hypovolemia, 157
hypovolemic hypotonic hyponatremia, 130*b*, 134*b*

IBW. *See* ideal body weight
ICF. *See* intracellular fluid
ideal body weight (IBW), 65
  actuarial tables, 65
  adjustments for amputation, 69, 69*b*–70*b*
  adjustments for obesity, 68
  adjustments for spinal cord injury, 68–69
  based on BMI, 65–66, 66*b*
  Devine formula, 66, 67*b*
  Hamwi formula, 66, 67*b*
  Robinson formula, 66, 68*b*
immune function parameters, 117
immunosuppressants, 212*b*
indinavir, 214*b*
indirect calorimetry, 220, 223–225, 224*b*
inspection techniques, 87, 87*b*
Institute of Medicine, 239–240
insulin therapy, 120–122
interviews, patient, 42–43
intracellular fluid (ICF), 136, 157
iodine, 184*b*
iron, 162*b*, 196*b*
  deficiency, 114
  laboratory assessment of, 178*b*–179*b*
iron-deficiency anemia, 161, 161*b*–164*b*
iso-osmolar hyponatremia, 132*b*
isovolemic hypotonic hyponatremia, 130*b*–131*b*, 134*b*–135*b*
isradipine, 211*b*

knee height method, 59–60, 60*b*, 61*t*
knowledge/beliefs/attitudes, nutrition-related, 41*b*, 52, 52*b*

laboratory assessment
  disease-specific laboratory testing for adults, 184–185, 185*b*–191*b*
  and hydration, 158*b*–160*b*
  for nutritional anemias, 161*b*–164*b*, 165*b*–166*b*
  nutrition screening using, 33–34
  of vitamins, minerals, and trace elements, 167, 168*b*–184*b*
Lasix, 213*b*
leukocyte ascorbic acid, 171*b*

levodopa, 212*b*
levofloxacin, 212*b*
levothyroxine, 213*b*
lipid-based medications, 213*b*
lisinopril, 210*b*
long-term care, nutrition screening tools for, 25
loop diuretics, 213*b*
lovastatin, 212*b*
lower gastrointestinal surgery, nutritional consequences of, 210*b*
lungs, auscultation of, 89*b*

MAC. *See* midarm circumference
magnesium, 139, 145, 189*b*, 192*b*, 194*b*, 195*b*, 196*b*
  drug-induced alterations of, 216*b*
  hypermagnesemia, 148, 148*b*
  hypomagnesemia, 146, 146*b*–147*b*
  supplementation guidelines, 235*b*
malnutrition
  assessment characteristics, 16*b*
  case study, 17*b*–18*b*
  clinical characteristics of, 14*t*–15*t*
  diagnosis and treatment, 13–14, 16
  sample screening tools, 26–34
Malnutrition Screening Tool (MST), 26, 27*f*
Malnutrition Universal Screening Tool (MUST), 28, 29*b*
manganese, 183*b*
MCV. *See* mean corpuscular volume
MDS. *See* Minimum Data Set
mean corpuscular volume (MCV), 163*b*, 165*b*
mean plasma glucose (MPG), 123, 126
medical records, 42, 50, 87, 203
medical therapies, history of, 207*b*
medication(s)
  drug-induced nutritional and metabolic alterations, 215*b*–216*b*
  drug-nutrient interactions, 210*b*–214*b*
  history, 207*b*, 208, 210*b*–216*b*
  use, 41*b*, 51–52
MedlinePlus, 203*b*
megaloblastic anemia, 164, 165*b*–166*b*
metabolic acid-base disorders, 149
metabolic acidosis, 151*b*–152*b*
metabolic alkalosis, 152*b*–153*b*
metabolic bone disease, monitoring in patients on long-term HPN, 196*b*
metabolic compensation, 149, 150
metabolic syndrome, 185, 190*b*
metformin, 213*b*
methadone, 213*b*
methotrexate, 213*b*
methylmalonic acid (MMA), 165*b*, 177*b*
Metropolitan Life Insurance tables, 65, 68
midarm circumference (MAC), 72
midarm muscle circumference, 72
Mifflin-St Jeor equation, 221*f*, 222, 222*b*, 227–228*b*
mineral requirements, 239–240
Minimum Data Set (MDS), 25
Mini Nutritional Assessment-Short Form (MNA-SF), 32, 32*b*–33*b*
mL/kg method, 238*b*
MMA. *See* methylmalonic acid
moexipril, 210*b*
molybdenum, 183*b*
monoamine oxidase inhibitors (MAOIs), 213*b*
mouth
  anatomy, 102*f*
  examination, 101, 102*b*–103*b*
MPG. *See* mean plasma glucose
MST. *See* Malnutrition Screening Tool
musculoskeletal examination, 106, 107*b*

nail examination, 96, 97*b*
National Institutes of Health, 203*b*
nausea, 215*b*
NCPM. *See* Nutrition Care Process and Model
NCPT. *See* Nutrition Care Process Terminology
neck, examination, 104–105

neurological examination, 93, 94*b*
niacin, 174*b*
nifedipine, 211*b*
nimodipine, 211*b*
nisoldipine, 211*b*
nitrendipine, 211*b*
nitrogen balance, 230
North American Nursing Diagnosis Association (NANDA), 8
NRS-2002. *See* Nutrition Risk Score-2002
nutrient intake record (calorie count), 44, 46*b*
nutrient requirements, 220
  energy requirements for critically ill patients, 223–226, 224*b*, 227*b*–228*b*
  energy requirements for non-critically ill patients, 222, 222*b*
  fluid and electrolyte management, 232, 233*t*–235*t*, 235*b*–237*b*, 238, 238*b*
  hypocaloric, high-protein regimen, 229–230
  methods for determining energy requirements, 220–222
  protein requirements, 230–231, 231*b*–232*b*
  vitamins and minerals, 239–240
nutritional anemias, 160
  anemia of chronic disease, 161, 161*b*–164*b*
  folate-deficiency (megaloblastic) anemias, 164, 165*b*–166*b*
  iron-deficiency anemia, 161, 161*b*–164*b*
  vitamin B12-deficiency anemia, 164, 165*b*–166*b*
nutrition assessment, 5
  data collection, 6–7
  data evaluation, 6
  domains, 5–6
  following a positive nutrition screen, 34*b*
Nutrition Care Process (NCP)
  case study, 17*b*–18*b*
  health care processes and quality of care, 2
  malnutrition diagnosis and treatment, 13–14, 14*t*–15*t*, 16, 16*b*
  nutrition assessment, 5–7
  nutrition diagnosis, 7–10
  nutrition intervention, 11, 12*b*
  nutrition monitoring and evaluation, 12
  steps of, 2–3
Nutrition Care Process and Model (NCPM), 1, 2–3, 4*f*
Nutrition Care Process Terminology (NCPT), 3, 5, 14, 40, 202
  domains, 16*b*
nutrition diagnosis, 7
  documentation, 8–10, 9*b*
  following a positive nutrition screen, 34*b*
  thought process, 8*b*
  using food and nutrition-related history for, 40–42
nutrition intervention, 11, 12b
nutrition monitoring and evaluation, 12
  using food and nutrition-related history for, 42
nutrition reassessment, 12
nutrition-related patient/client-centered measures, 41*b*, 54
nutrition-related patient history, 205*b*
Nutrition Risk Score-2002 (NRS-2002), 30, 30*f*–31*f*, 32
nutrition screening, 5, 20–22
  for anticoagulant therapy, 36
  definition of, 22, 23*b*
  effective, characteristics of, 21*b*
  false-positive/false-negative results, 21, 22*b*
  for high risk of readmission for heart failure, 36
  key considerations, 23*b*
  location of, 23

for obesity, 36
people who perform, 24
positive, steps after, 34
for pressure injuries, 35
programs, tips for implementation of, 25–26
regulatory issues related to, 21*b*
sample malnutrition screening tools, 26–34
tools, selection and implementation of, 24–26
using laboratory data, 33–34

obesity
adjustments to IBW for, 68
hypocaloric, high-protein regimen for patients with, 229–230
nutrition screening for, 36
older adults, *55*
and dehydration, 133
food and nutrient intake and history questions for, 48*b*–49*b*
interpretation of BMI in, 65
oral health history, 207*b*
ova and parasites, 185*b*
overhydration, 109*b*

palpation techniques, 87, 88*b*
pancreatic-oduodenectomy, 209*b*
pantothenic acid, 174*b*
paralysis, 68–69
parathyroid hormone (PTH), 169*b*, 188*b*, 196*b*
parenteral nutrition monitoring, 191
in acute care settings, 191, 192*b*–193*b*
home parenteral nutrition, 194–195, 195*b*–196*b*
past medical history (PMH), 203–204, 205*b*–207*b*
pattern recognition, 8*b*
pediatric populations
HbA1c goals for, 127
interpretation of BMI in, 64
Penn State University (PSU) equation, 221*f*, 227*b*, 228*b*
percussion technique, 87, 90*b*
perindopril, 210*b*
personal history, 202–203
PES (problem, etiology, and signs and symptoms) statements, 8–9, 9*b*, 10, 10*b*–11*b*
phenytoin, 213*b*
phosphate, 169*b*
phosphorus, 187*b*, 189*b*, 192*b*, 194*b*, 195*b*, 196*b*
drug-induced alterations of, 216*b*
hyperphosphatemia, 145, 145*b*
hypophosphatemia, 143, 143*b*–144*b*
supplementation guidelines, 236*b*
phylloquinone, 171*b*
physical activity, 41*b*, *53*
physical examination, 83–84
abdomen, 105, 106*b*
areas of focus, 85, 85*b*–86*b*
auscultation techniques, 87, 88*b*–89*b*
eye, 98, 99*b*–100*b*
findings, interpretation of, 91
hair, 96, 97*b*
head, 97, 98*b*
hydration status, 108, 108*b*–109*b*
inspection techniques, 87, 87*b*
mouth, 101, 102*b*–103*b*
musculoskeletal examination, 106, 107*b*
nails, 96, 97*b*
neck and chest, 104–105
neurological examination, 93, 94*b*
nose, 100, 101*b*
palpation techniques, 87, 88*b*
percussion techniques, 87, 90*b*
quadrants of abdomen, 90*f*
responsibilities of clinicians, 84, 84*b*
signs of health, 91
skin, 94–95, 95*b*–96*b*
vital signs, 92, 92*b*–3*b*
platelet-aggregation inhibitors, 211*b*
PMH. *See* past medical history
POC. *See* point-of-care testing

point-of-care (POC) testing, 121–122
potassium, 136, 187*b*, 189*b*, 192*b*, 194*b*, 195*b*
  drug-induced alterations of, 216*b*
  hyperkalemia, 138, 138*b*–139*b*
  hypokalemia, 136, 136*b*–137*b*
  supplementation guidelines, 236*b*–237*b*
pravastatin, 212*b*
prealbumin, 116, 116*b*, 187*b*
prediabetes, 117, 119*b*–120*b*

predictive equations, 221–222, 221*f*, 226
  for energy requirement estimation in mechanically ventilated critically ill patients, 227*b*
  for RMR in critically ill patients, 227*b*–228*b*
prednisone, 214*b*
pregnant women
  food and nutrient intake and history questions for, 49*b*–50*b*
  gestational diabetes mellitus, 122, 123*b*
pressure injuries, nutrition screening for, 35
probiotics, 186*b*
propofol, 213*b*
protease inhibitors, 214*b*
protein(s)
  hypocaloric, high-protein regimen for obese patients, 229–230
  requirements, 230–231, 231*b*–232*b*
  serum, and nutrition screening, 33–34
prothrombin time (PT), 171*b*, 193*b*, 195*b*
proximal small bowel, 210*b*
psychiatric history, 206*b*
PT. *See* prothrombin time
PTH. *See* parathyroid hormone
pyridoxal 5′-phosphate, 175*b*
pyridoxine, 175*b*

QOL. See quality of life
quality, health care, 2
quality of life (QOL), 54
quinapril, 210*b*
quinidine gluconate, 214*b*

radial pulse assessment, 92*b*
ramipril, 210*b*
RDA. *See* Recommended Dietary Allowance
RDNs. *See* registered dietitian nutritionists
RDW. *See* red cell distribution width
Recommended Dietary Allowance (RDA), 238*b*, 239
recumbent length, 58–59
red blood cell folate, 166*b*, 176*b*
red cell distribution width (RDW), 163*b*
refeeding syndrome, 189*b*
registered dietitian nutritionists (RDNs), 1, 2, 24, 83, 167
  levels of practice, and data collection, 6
  patient interviews, 42–43
  relationship with patients/clients, 2
regulatory agencies, 1
reimbursement, 13, 36
respiration assessment, 93*b*
respiratory acid-base disorders, 149
respiratory acidosis, 150, 154*b*–155*b*
respiratory alkalosis, 155*b*–156*b*
respiratory quotient (RQ), 225
  interpretation of, 225–226
resting metabolic rate (RMR), 222
  interpretation of, 225–226
retinol, 168*b*
retinol-binding protein, 168*b*
riboflavin, 173*b*
RMR. *See* resting metabolic rate
Robinson formula, 66, 68*b*
rosuvastatin, 212*b*
Roux-en-Y gastric bypass, 209*b*
RQ. *See* respiratory quotient

saquinavir, 214*b*
screening. *See* nutrition screening
selenium, 182*b*
sertraline, 211*b*
serum lactate, 172*b*
serum osmolality, 129, 130*b*–132*b*, 133, 159*b*
SGA. *See* Subjective Global Assessment
Short Nutrition Assessment Questionnaire (SNAQ), 25, 27, 28*f*
sildenafil, 214*b*
simvastatin, 212*b*
sirolimus, 212*b*
Skin Condition Finder, 95
skin examination, 94–95, 95*b*–96*b*
SNAQ. *See* Short Nutrition Assessment Questionnaire
social/environmental circumstances, clinical characteristics of malnutrition in, 15*t*
social history, 217, 217*b*–218*b*
sodium, 159*b*, 187*b*, 192*b*, 194*b*, 195*b*
  drug-induced alterations of, 216*b*
  hypernatremia, 128, 133–134, 134*b*–135*b*
  hyponatremia, 128, 129, 130*b*–132*b*
  supplementation guidelines, 237*b*
soluble transferrin receptor, 164*b*
spinal cord injury, adjustments to IBW for, 68–69
spring scales, 62
stadiometer, 58
standing height, 58, 58*b*
steatorrhea, 186*b*
stool culture, 186*b*
stool studies, 185*b*–186*b*
Subjective Global Assessment (SGA), 14, 16
subtotal gastrectomy, 209*b*
Sudan stain test, 186*b*
surgical history, 206*b*, 208, 208*b*–210*b*
surrogates, for food and nutrition-related history, 54

TAA. *See* total upper arm area
tacrolimus, 212*b*
taste, altered, 215*b*
temperature assessment, 93*b*
tetracycline, 214*b*
TfR. *See* transferrin receptor
thiamin, 172*b*
thiazide-like diuretics, 214*b*
thiazides, 214*b*
third-party payers, 1, 13
TIBC. See total iron-binding capacity
tolerable upper intake level (UL), 240
total gastrectomy, 209*b*
total iron-binding capacity (TIBC), 162*b*
total upper arm area (TAA), 73*b*
trandolapril, 210*b*
transferrin, 114–115, 115*b*
transferrin receptor (TfR), 179*b*
transferrin saturation, 163*b*, 187*b*
transthyretin, 116
triazolam, 211*b*
triceps skinfold (TSF), 72
triene-to-tetraene ratio, 190*b*, 196*b*
triglycerides (TG), 190*b*, 193*b*, 195*b*
TSF. *See* triceps skinfold
24-hour recall, 44, 44*b*–45*b*
type 1 diabetes, 117, 121
type 2 diabetes, 117

UL. See tolerable upper intake level
ultrasound (US), 79
upper gastrointestinal surgery, nutritional consequences of, 208*b*–209*b*
urine osmolality, 160*b*
urine-specific gravity, 159*b*
US. *See* ultrasound

vagotomy, 209*b*
vancomycin, 186*b*
verapamil, 211*b*
vertical sleeve gastrectomy, 209*b*

vital signs, assessment of, 92, 92*b*–3*b*
vitamin A, 168*b*
vitamin B1, 172*b*
vitamin B2, 173*b*
vitamin B3, 174*b*
vitamin B5, 174*b*
vitamin B6, 175*b*
vitamin B12, 165*b*, 176*b*, 177*b*
vitamin B12-deficiency anemia, 164, 165*b*–166*b*
vitamin C, 171*b*
vitamin D, 169*b*
vitamin E, 170*b*
vitamin K, 170*b*–171*b*
vitamin K antagonist therapy, 36
vitamin requirements, 239–240

waist circumference (WC), 185, 190*b*
warfarin, 211*b*
WC. *See* waist circumference
weight
  change, percentage of, 71*b*
  ideal body weight, 65–69, 66*b*, 67*b*–68*b*, 69*b*–70*b*
  interpretation of, 70
  measurement of, 60, 62
  scales, calibration of, 62
  scales, types of, 62
Whipple procedure. See pancreaticoduodenectomy
World Health Organization, 59, 64

zinc, 180*b*
zinc superoxide dismutase, 181*b*