CONTENTS

Contributors, iv Preface, ix

PART I: Nutrition Assessment

1 Intake: Digestion, Absorption, Transport, and Excretion of Nutrients, 2

Kelly A. Tappenden, PhD, RDN, FASPEN

The Gastrointestinal Tract, 2

Brief Overview of Digestive and Absorptive

Processes, 3

The Small Intestine: Primary Site of Nutrient

Absorption, 8

The Large Intestine, 10

Useful Websites, 16

2 Intake: Energy, 17

Carol S. Ireton-Jones, PhD, RDN, LD, CNSC, FAND, FASPEN

Energy Requirements, 17

Components of Energy Expenditure, 17

Estimating Energy Requirements, 21

Calculating Food Energy, 25

Useful Websites/Apps, 26

3 Inflammation and the Pathophysiology of Chronic Disease, 28

Diana Noland, MPH, RD, CCN, LD

Epidemic of Chronic Disease, 28

Concepts of Chronic Disease Pathophysiology, 29

Inflammation: Common Denominator of Chronic

Disease, 30

Nutrient Modulators of Inflammation, 35

Reducing Inflammation in the Body, 39

Prolonged Inflammation Expression Specific to

Major Chronic Diseases, 44

Summary, 47

Useful Websites, 47

4 Intake: Analysis of the Diet, 52

Kathleen A. Hammond, MS, RN, BSN, BSHE, RDN, LD

L. Kathleen Mahan, RDN, MS, CD

Nutrition Screening, 52

Nutrition Assessment, 55

Analysis of Dietary Intake Data, 61

Useful Websites, 62

5 Clinical: Nutritional Genomics, 64

Ruth DeBusk, PhD, RDN

The Human Genome Project and the "Omic"

Disciplines, 65

Genotype and Nutrition Assessment, 67

Genetic Fundamentals, 67

Genetics and Nutrition Therapy, 76

Ethical, Legal, and Social Implications, 81

Summary, 82

Useful Websites, 83

6 Clinical: Water, Electrolytes, and Acid-Base Balance, 85

Mandy L. Corrigan, MPH, RD, CNSC, FAND

Body Water, 85

Electrolytes, 89

Acid-Base Balance, 93

Acid-Base Disorders, 95

Useful Websites, Tools/Calculators, and Apps, 96

7 Clinical: Biochemical, Physical, and Functional Assessment, 98

Mary Demarest Litchford, PhD, RDN, LDN

Biochemical Assessment of Nutrition Status, 98

Nutrition Interpretation of Routine Medical

Laboratory Tests, 100

Assessment of Hydration Status, 103

Assessment for Nutritional Anemias, 105

Fat-Soluble Vitamins, 107

Water-Soluble Vitamins and Trace Minerals, 108

Chronic Disease Risk Assessment, 109

Physical Assessments, 111

Nutrition-Focused Physical Assessment, 116

Useful Websites, 120

8 Clinical: Food-Drug Interactions, 122

Lisa L. Deal, PharmD, BCPS, BSN, RN

DeeAnna Wales VanReken, MS, RDN, CD

Pharmacologic Aspects of Food-Drug Interactions, 122

Risk Factors for Food-Drug Interactions, 124

Effects of Food on Drug Therapy, 126

Medication and Enteral Nutrition Interactions, 127

Effects of Drugs on Food and Nutrition, 128

Modification of Drug Action by Food and Nutrients, 130

Effects of Drugs on Nutrition Status, 132

Excipients and Food-Drug Interactions, 134

Medical Nutrition Therapy, 136

Useful Websites, 137

9 Behavioral-Environmental: The Individual in the Community, 139

Judith L. Dodd, MS, RDN, LDN, FAND

Cynthia Taft Bayerl, MS, RDN, LDN, FAND

Lisa Mays, MPH, RDN

Social Determinants of Health, 139

Nutrition Practice in the Community, 140

Needs Assessment for Community-Based Nutrition

Services, 141

National Nutrition Surveys, 142

National Nutrition Guidelines and Goals, 143

Food Assistance and Nutrition Programs, 145

Foodborne Illness, 145

Food and Water Safety, 151

Disaster Planning, 153

Healthy Food and Water Systems and Sustainability, 154

Summary: A Work in Progress, 154

Useful Websites, 154

PART II: Nutrition Diagnosis and Intervention

10 Overview of Nutrition Diagnosis and Intervention, 158

Pamela Charney, PhD, RD, CHTS-CP Alison Steiber, PhD, RDN

The Nutrition Care Process, 158

Documentation in the Nutrition Care Record, 164

Influences on Nutrition and Health Care, 167

Nutrition Interventions, 169

Nutrition for the Terminally Ill or Hospice

Patient, 171

Useful Websites, 172

11 Food and Nutrient Delivery: Diet Guidelines, Nutrient Standards, and Cultural Competence, 173

Martin M. Yadrick, MBI, MS, RDN, FAND

Determining Nutrient Needs, 173

Worldwide Guidelines, 173

Nutritional Status of Americans, 177

National Guidelines for Diet Planning, 183

Food and Nutrient Labeling, 184

Dietary Patterns and Counseling Tips, 187

Cultural Aspects of Dietary Planning, 188

Useful Websites, 190

12 Food and Nutrient Delivery: Complementary and Integrative Medicine and Dietary Supplementation, 191

Kelly Morrow, MS, RDN

Complementary and Integrative Medicine, 191

Use of Complementary and Integrative

Therapies, 191

Dietary Supplementation, 194

Dietary Supplement Regulation, 196

Assessment of Dietary Supplement

Use in Patients, 199

Useful Websites, 207

13 Food and Nutrient Delivery: Nutrition Support, 209

Carol S. Ireton-Jones, PhD, RDN, LD, CNSC, FAND, FASPEN

Mary Krystofiak Russell, MS, RDN, LDN, FAND

Rationale and Criteria for Appropriate Nutrition

Support, 209

Enteral Nutrition, 210

Enteral Nutrition Access, 210

Parenteral Nutrition, 217

Complications, 221

Refeeding Syndrome, 222

Transitional Feeding, 223

Nutrition Support in Long-Term and Home Care, 224

Useful Websites, 225

14 Education and Counseling: Behavioral Change, 227

Karen Chapman-Novakofski, PhD, RDN, LDN

Behavior Change, 227

Models for Behavior Change, 227

Models for Counseling Strategies, 228

Models for Educational Program Development, 229

Skills and Attributes of the Nutrition Educator or Counselor, 229

Assessment Results: Choosing Focus Areas, 231

Counseling Approaches after the Assessment, 232

Unsure-About-Change Counseling Sessions, 233

Resistance Behaviors and Strategies to

Modify them, 233

Ready-To-Change Counseling Sessions, 235

Evaluation of Effectiveness, 235

Summary, 236

Useful Websites, 236

PART III: Nutrition in the Life Cycle

15 Nutrition for Reproductive Health

and Lactation, 239

Jean T. Cox, MS, RD, LN

Virginia H. Carney, MPH, RDN, LDN, IBCLC, RLC, FILCA, FAND

Preconception and Fertility, 239

Conception, 243

Pregnancy, 243

Postpartum Period = Preconceptual Period, 280

Lactation, 281

Useful Websites, 295

16 Nutrition in Infancy, 300

Kelly N. McKean, MS, RDN, CSP, CD

Mari O. Mazon, MS, RDN, CD

Physiologic Development, 300

Nutrient Requirements, 301

Milk, 304

Food, 307

Feeding, 307

Useful Websites, 312

17 Nutrition in Childhood, 314

Beth Ogata, MS, RDN, CD, CSP

Sharon A. Feucht, MA, RDN, CD

Betty L. Lucas, MPH, RDN, CD

Growth and Development, 314

Nutrient Requirements, 316

Providing an Adequate Diet, 318

Nutritional Concerns, 324

Preventing Chronic Disease, 327

Useful Websites, 329

18 Nutrition in Adolescence, 331

Nicole Larson, PhD, MPH, RDN, LD

Jamie S. Stang, PhD, MPH, RDN

Tashara Leak, PhD, RDN

Growth and Development, 331

Nutrient Requirements, 334

Food Habits and Eating Behaviors, 338

Nutrition Screening, Assessment, and Counseling, 340

Special Concerns, 341

Useful Websites, 349

19 Nutrition in the Adult Years, 352

Judith L. Dodd, MS, RDN, LDN, FAND

Setting the Stage: Nutrition in the Adult Years, 352

Setting the Stage: Messages, 352

Information Sources, 354

Lifestyle Health Risk Factors, 357

Health Disparities and Access to Care, 357

Interventions, Nutrition, and Prevention, 359

Food Trends and Patterns, 359

Nutritional Supplementation, 360

Functional Foods, 360

Healthy Food and Water Systems

and Sustainability, 363

Adult Health Next Steps, 363

Useful Websites, 363

20 Nutrition in Aging, 367

Nancy S. Wellman, PhD, RDN, FAND

Barbara J. Kamp, MS, RDN

The Older Population, 367

Gerontology + **Geriatrics** = **The Spectrum of**

Aging, 368

Nutrition in Health Promotion and Disease

Prevention, 368

Theories on Aging, 369

Physiologic Changes, 369

Quality of Life, 372

Nutrition Screening and Assessment, 375

Nutrition Needs, 375

Medicare Benefits, 376

Nutrition Support Services, 377

Community and Residential Facilities for Older

Adults, 378

Useful Websites, 380

PART IV: Nutrition for Health and Fitness

21 Nutrition in Weight Management, 383

Lucinda K. Lysen, RDN, RN, BSN

Donna A. Israel, PhD, RDN, LPC, FADA, FAND

Body Weight Components, 383

Regulation of Body Weight, 385

Weight Imbalance: Overweight and Obesity, 387

Management of Obesity in Adults, 392

Common Problems in Obesity Treatment, 400

Weight Management in Children and Adolescents, 402

Weight Imbalance: Excessive Leanness or

Unintentional Weight Loss, 402

Useful Websites, 404

22 Nutrition in Eating Disorders, 407

Janet E. Schebendach, PhD, RDN

Justine Roth, MS, RDN

Clinical Characteristics and Medical

Complications, 410

Treatment Approach, 412

Psychologic Management, 413

Nutrition Management, 413

Medical Nutrition Therapy and Counseling, 417 Useful Websites, 424

23 Nutrition in Exercise and Sports Performance, 426

Lisa Dorfman, MS, RDN, CSSD, LMHC, FAND

An Integrative Approach to Working

with Athletes, 426

Bioenergetics of Physical Activity, 426

Fuels for Contracting Muscles, 428

Nutritional Requirements of Exercise, 429

Weight Management, 430

Weight Management and Aesthetics, 431

Macronutrients, 432

Carbohydrate, 432

Protein, 436

Fat, 437

Fluid, 437

Other Considerations, 440

Vitamins and Minerals, 440

Minerals, 443

Ergogenic Aids, 444

Ergogenic Aids for High Intensity Exercise, 446

Herbs, 448

Performance Enhancement Substances and Drugs

(PES/PED): Doping in Sport, 450

Useful Websites, 452

24 Nutrition and Bone Health, 456

Karen Chapman-Novakofski, PhD. RDN. LDN

Bone Structure and Bone Physiology, 456

Osteopenia and Osteoporosis, 459

Diagnosis and Monitoring, 461

Nutrition and Bone, 462

Prevention of Osteoporosis and Fractures, 465

Treatment of Osteoporosis, 465

Useful Websites, 466

25 Nutrition for Oral and Dental Health, 468

Diane Rigassio Radler, PhD, RDN

Nutrition for Tooth Development, 468

Dental Caries, 468

Early Childhood Caries, 473

Caries Prevention, 473

Tooth Loss and Dentures, 473

Other Oral Disorders, 474

Periodontal Disease, 475

Oral Manifestations of Systemic Disease, 475

Useful Websites, 477

PART V: Medical Nutrition Therapy

26 Medical Nutrition Therapy for Adverse Reactions to Food: Allergies and Intolerances, 479

L. Kathleen Mahan, MS, RDN, CD

Kathie Madonna Swift, MS, RDN, LDN, FAND

Consultant Reviewer: Janice M. Joneja, PhD, RD

Definitions, 479

Etiology, 481

Pathophysiology, 484

Food Intolerances, 487

Assessment, 491

Medical Nutrition Therapy, 493

Emerging Therapies, 503

Preventing Food Allergy, 503

Useful Websites and Apps, 506

27 Medical Nutrition Therapy for Upper Gastrointestinal Tract Disorders, 508

Gail Cresci, PhD, RDN, LD, CNSC

Arlene Escuro, MS, RDN, CNSC

Assessment Parameters, 508

The Esophagus, 508

The Stomach, 515

Gastroparesis, 522

Useful Websites, 524

28 Medical Nutrition Therapy for Lower Gastrointestinal Tract Disorders, 525

Gail Cresci, PhD, RD, LD, CNSC

Arlene Escuro, MS, RDN, CNSC

Common Intestinal Problems, 525

Diseases of the Small Intestine, 532

Intestinal Brush-Border Enzyme Deficiencies, 539

Inflammatory Bowel Diseases, 541

Nutritional Consequences of Intestinal Surgery, 549

Useful Websites, 556

29 Medical Nutrition Therapy for Hepatobiliary and Pancreatic Disorders, 560

Jeanette M. Hasse, PhD, RDN, LD, CNSC, FADA

Laura E. Matarese, PhD, RDN, LDN, CNSC, FADA, FASPEN, FAND

Physiology and Functions of the Liver, 560

Diseases of the Liver, 562

Complications of ESLD: Cause and Nutrition

Treatment, 568

Nutrition Issues Related to End-Stage Liver

Disease, 570

Nutrient Requirements for Cirrhosis, 573

Herbal Supplements and Liver Disease, 574

Liver Resection and Transplantation, 575

Physiology and Functions of the Gallbladder, 575

Diseases of the Gallbladder, 576

Complementary and Integrative Medicine, 579

Physiology and Functions of the Exocrine

Pancreas, 579

Diseases of the Exocrine Pancreas, 580

Complementary and Integrative Medicine, 583

Pancreatic Surgery, 583

Useful Websites, 584

30 Medical Nutrition Therapy for Diabetes Mellitus and Hypoglycemia of Nondiabetic Origin, 586

Marion J. Franz, MS, RDN, LD, CDE

Alison B. Evert, MS, RDN, CDE

Incidence and Prevalence, 586

Categories of Glucose Intolerance, 587

Screening and Diagnostic Criteria, 591

Management of Prediabetes, 592

Management of Diabetes, 592

Implementing the Nutrition Care Process, 603

Acute Complications, 611

Long-Term Complications, 613

Hypoglycemia of Nondiabetic Origin, 614

Useful Websites, 617

31 Medical Nutrition Therapy for Thyroid, Adrenal, and Other Endocrine Disorders, 619

Sheila Dean, DSc, RDN, LD, CCN, CDE

Thyroid Physiology, 619

Assessment in Thyroid Disorders, 621

Hypothyroidism, 622

Polycystic Ovary Syndrome, 626

Hyperthyroidism, 627

Managing Imbalances of the Hypothalamus-

Pituitary-Thyroid Axis, 628

Adrenal Disorders, 628

Useful Websites, 630

32 Medical Nutrition Therapy for Anemia, 631

Tracy Stopler, MS, RDN

Susan Weiner, MS, RDN, CDE

Iron-Related Blood Disorders, 631

Iron Overload, 636

Megaloblastic Anemias, 637

Other Nutritional Anemias, 642

Nonnutritional Anemias, 643

Useful Websites, 645

33 Medical Nutrition Therapy for Cardiovascular Disease, 646

Janice L. Raymond, MS, RDN, CD, CSG

Sarah C. Couch, PhD, RDN

Atherosclerosis and Coronary Heart Disease, 646

Genetic Hyperlipidemias, 650

Hypertension, 659

Heart Failure, 668

Cardiac Transplantation, 676

Useful Websites, 678

34 Medical Nutrition Therapy for Pulmonary Disease, 681

Sameera H. Khan, RDN, PA-C, MBA

Ashok M. Karnik, MD, FACP, FCCP, FRCP

The Pulmonary System, 681

Chronic Pulmonary Disease, 683

Asthma, 687

Chronic Obstructive Pulmonary Disease, 688

Tuberculosis, 692

Lung Cancer, 693

Obesity Hypoventilation Syndrome, 694

Chylothorax, 694

Acute Respiratory Distress Syndrome, 694

Pneumonia, 695

Bronchopulmonary Dysplasia, 696

Useful Websites, 697

35 Medical Nutrition Therapy for Renal Disorders, 700

Katy G. Wilkens, MS, RDN

Veena Juneia, MScRD, RDN

Elizabeth Shanaman, RDN

Physiology and Function of the Kidneys, 700

Renal Diseases, 701

Acute Kidney Injury (Acute Renal Failure), 708

Diseases of the Tubules and Interstitium, 710

Glomerular Diseases, 711 Chronic Kidney Disease, 711 End-Stage Renal Disease, 713

Useful Websites, 727

36 Medical Nutrition Therapy for Cancer Prevention, Treatment, and Survivorship, 729

Kathryn K. Hamilton, MA, RDN, CSO, CDN, FAND Barbara L. Grant, MS, RDN, CSO, LD, FAND

Pathophysiology, 730

Nutrition and Carcinogenesis, 731

Chemoprevention, 734

Medical Diagnosis and Staging of Cancer, 737

Medical Treatment, 738

Medical Nutrition Therapy, 738

Nutritional Impact of Cancer Treatments, 743

Nutrition Monitoring and Evaluation, 749

Pediatric Cancer, 750

Nutrition Recommendations for Cancer Survivors, 750

Integrative Oncology, 750

Useful Websites and Resources, 754

37 Medical Nutrition Therapy for HIV and AIDS, 757

Kimberly R. Dong, MS, RDN Cindy Mari Imai, PhD, RDN

Epidemiology and Trends, 758

Pathophysiology and Classification, 758

Medical Management, 760

Medical Nutrition Therapy, 761

Special Considerations, 769

HIV in Women, 771

HIV in Children, 772

Complementary and Integrative Therapies, 772

Useful Websites, 773

38 Medical Nutrition Therapy in Critical Care, 775

Marion F. Winkler, PhD, RD, LDN, CNSC, FASPEN Ainsley M. Malone, MS, RD, CNSC, FAND, FASPEN

Metabolic Response to Stress, 775

Hormonal and Cell-Mediated Response, 776

Starvation Versus Stress, 777

Systemic Inflammatory Response Syndrome (SIRS) and Multiple Organ Dysfunction Syndrome (MODS), 777

Malnutrition: The Etiology-Based Definition, 779

Trauma and the Open Abdomen, 783

Major Burns, 784

Surgery, 787

Useful Websites, 789

39 Medical Nutrition Therapy for Rheumatic Disease, 790

F. Enrique Gómez, PhD

Martha Kaufer-Horwitz, DSc, NC

Gabriela E. Mancera-Chávez, MSc. NC

Etiology, 790

Pathophysiology and Inflammation, 791

Medical Diagnosis and Treatment, 792

Pharmacotherapy, 793

Antiinflammatory Diet, 796

Complementary or Integrative Therapies, 796

Microbiota and Arthritis, 797

Osteoarthritis, 797

Rheumatoid Arthritis, 800

Sjögren Syndrome (SS), 805

Temporomandibular Disorders, 805

Gout, 806

Scleroderma, 808

Systemic Lupus Erythematosus, 808

Spondylarthritides, 809

Useful Websites, 811

40 Medical Nutrition Therapy for Neurologic Disorders, 813

Beth Zupec-Kania, RDN

Therese O'Flaherty, MS, RDN

The Central Nervous System, 813

Issues Complicating Nutrition Therapy, 816

Dysphagia, 819

Neurologic Diseases of Nutritional Origin, 822

Neurologic Disorders from Trauma, 822

Head Trauma or Neurotrauma, 824

Spine Trauma and Spinal Cord Injury, 826

Neurologic Diseases, 827

Useful Websites, 837

41 MNT in Psychiatric and Cognitive Disorders, 839

Jacob Teitelbaum, MD; Alan Weiss, MD

Geri Brewster, MPH, RDN, CDN

Ruth Leyse-Wallace, PhD

The Enteric Nervous System (ENS), 841

Blood Glucose Regulation, 841

Food Allergies and Sensitivities, 841

The Role of Nutrients in Mental Function, 841

Addiction and Substance Abuse, 849

Anxiety, 851

Bipolar Disorder, 852

Dementia and Alzheimer's Disease (AD), 853

Depression, 856

Fatigue, Chronic Fatigue Syndrome (CFS), and

Fibromyalgia Syndrome (FMS), 858

Schizophrenia, 861

PART VI: Pediatric Specialties

42 Medical Nutrition Therapy for Low-Birth-Weight Infants. 868

Diane M. Anderson, PhD, RDN, FADA

Infant Mortality and Statistics, 868

Physiologic Development, 868

Nutrition Requirements: Parenteral Feeding, 870

Transition From Parenteral to Enteral Feeding, 875

Nutrition Requirements: Enteral Feeding, 875

Feeding Methods, 878

Selection of Enteral Feeding, 879

Nutrition Assessment and Growth, 882

Discharge Care, 884

Neurodevelopmental Outcome, 886

Useful Websites, 887

43 Medical Nutrition Therapy for Genetic Metabolic Disorders, 890

Beth N. Ogata, MS, RDN, CD, CSP Cristine M. Trahms, MS, RDN, FADA

Newborn Screening, 890
Disorders of Amino Acid Metabolism, 894
Phenylketonuria, 894
Disorders of Organic Acid Metabolism, 902
Disorders of Urea Cycle Metabolism, 902
Disorders of Carbohydrate Metabolism, 904
Disorders of Fatty Acid Oxidation, 906
Role of the Nutritionist in Genetic Metabolic
Disorders, 906
Useful Websites, 908

44 Medical Nutrition Therapy for Intellectual and Developmental Disabilities, 909

Harriet Cloud, MS, RDN, FAND

Medical Nutrition Therapy, 909 Chromosomal Aberrations, 915 Neurologic Disorders, 919 Fetal Alcohol Syndrome, 927 Controversial Nutrition Therapy, 927 Community Resources, 928 Useful Websites, 929

Appendices, 931 Index, 1089