Nutrition and Diagnosis-Related Care

SYLVIA ESCOTT-STUMP

SEVENTH EDITION

Wolters Kluwer health | Lippincott Williams & Wilkins

Nutrition and Diagnosis-Related Care

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FOREWORD

This book is a valuable resource for registered dietitians, dietetic interns and students, and other health care professionals involved or interested in medical nutrition therapy. Given the increasing time demands confronting health care professionals, efficient time management is essential for delivering high-quality patient care. The ever-changing health care environment necessitates that registered dietitians efficiently and effectively maintain their high level of practice skills. Thus, this book remains a key resource for prioritizing patient care and appropriately planning nutrition therapy. The guidance provided by *Nutrition and Diagnosis-Related Care* is of immense value in charting the clinical course for each patient, especially for clinical conditions that the practitioner does not routinely treat. This book continues to present an extensive, succinct compilation of nutrition information. The most impressive attribute is that the germane information required by dietitians is presented in a single resource. This greatly simplifies the development of nutrition care plans. Thus, this book provides dietetic practitioners with superb guidance they can use to maintain outstanding practice skills. This book is a resource that can help achieve excellence in dietetic practice.

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PREFACE

Health care professionals must identify all elements of patient care capable of affecting nutritional status and outcomes. The registered dietitian must provide nutritional care in a practical, efficient, timely, and effective manner regardless of setting. Various environments provide unique and special considerations. The astute dietitian is sensitive to the patient/client's current status in the continuum of care, meticulously adapting the nutritional care plan. Communication between staff of different facilities will save time for screenings and assessments and will promote the implementation of strategic interventions. With electronic health records, data and summary reports can be shared from one practitioner to the next while maintaining confidentiality.

Nutrition and Diagnosis-Related Care has evolved since 1985 to supplement other texts and references and to quickly assimilate and implement medical nutrition therapy (MNT.) This guide can be used to help write protocols, to establish priorities in nutrition care, to demonstrate cost-effective therapies, and to categorize disorders in which nutrition interventions can decrease complications, further morbidity, mortality, or lengthy hospital stays. Adequate nutritional intervention often results in financial savings for the patient, the family, and the health care system. Indeed, current knowledge solidifies the role of nutrition as therapy, and not just adjunctive support.

The seventh edition updates guidance in MNT, adding commentary about nutritional genetics and nutrition care process concepts for each condition. The format of the book continues to promote easy navigation for quick retrieval of information. Appendix A summarizes the nutrients and their major food sources and functions. Appendix B promotes use of the Nutrition Care Process approved for the profession of dietetics. Sample forms are included, including language related to the critical thinking involved with A-D-I (assessment, nutrition diagnosis, interventions) and M-E (monitoring and evaluation) as follow-up documentation. The Nutritional Acuity Level Ranking for dietitian services is found in Appendix C. Content previously in appendices D and E has been moved into the text.

Using evidence-based practice guides from the American Dietetic Association, and use of this manual can improve nutrition therapy in any setting. The profession of dietetics continues to evolve and develop a deeper understanding of the prominence of nutrition in health promotion and disease management.

ASSUMPTIONS ABOUT THE READER

For this text, the following assumptions have been made:

1. The reader has an adequate background in nutrition sciences, physiology, pathophysiology, medical terminology, biochemistry, basic pharmacotherapy, and interpretation of biochemical data to understand the abbreviations, objectives, and interventions in this book.
2. An individualized drug history review is essential, as only a few medications are listed in this manual.
3. Herbs, botanicals, and dietary supplements are included because they are often used without prior consultation with a dietitian or a physician; they have side effects as well as perceived or real benefits.
4. For patient education, the reader must provide appropriate handouts, printed materials and teaching tools to prepare the patient for independent functioning. The nutrition counselor must share relevant information, as deemed appropriate, with the patient and significant other(s). The educator must identify teachable moments and share what is needed at the time. Follow-up interventions are highly recommended to assess successful behavioral changes by the patient/client.
5. Providers must prioritize key nutritional diagnoses that can be managed within the given time frame. With roles in ambulatory centers, extended care facilities, subacute or rehabilitative centers, private practices, grocery stores, Web-based practices, rehabilitation facilities, and home care, the "seamless" continuum affords registered dietitians the possibility of lifelong patient relationships, a reality that promotes more effective monitoring, follow-up, and evaluation.
6. The Clinical Indicators section for each condition lists tests, disease markers, and common biochemical evaluations reviewed by physicians or dietitians for that condition. Because few laboratory tests are available in nonhospital settings for monitoring nutritional status, appetite and weight changes are the most viable screening factors. Physical changes and signs of malnutrition are important for assessment and should be identified.
7. A current diet manual and MNT text should be used to acquire diet modification lists; comprehensive lists are not included with this book.
8. Use of evidence-based guides from American Dietetic Association must be used to provide predictable types of interventions over multiple visits, especially for reimbursement. Use the www.eatright.org Web site to select current guidelines for practice.
9. Except where specifically noted for children, nutrition therapy plans are for individuals over the age of 18.
10. Vitamin and mineral supplements are needed in cases of a documented or likely deficiency. However, in large doses, they may cause food–drug interactions. Plan meals and nourishments carefully to avoid the need for individual supplements.
11. Use of a general multivitamin–mineral supplement may be beneficial for many adults; monitor intakes judiciously from all food and supplemental sources. Athletes, women, elderly individuals, and vegetarians tend to take vitamin and mineral supplements more often than other individuals and may be at risk for overdoses if not carefully monitored.

12. Most evidence points to the benefits of whole foods to acquire phytochemicals and yet unknown substances. Healthy persons should obtain nutrients from a balanced diet as much as possible. The use of functional food ingredients, such as antioxidant foods, is highly recommended. A well-balanced, varied diet uses the US Department of Agriculture (USDA) MyPyramid Food Guidance System and various ethnic, vegetarian, pediatric, geriatric, or diabetes food guides for menu planning and design.
13. Ethics, cultural sensitivity, and a concern for patient rights should be considered and practiced at all times. When available, the wishes and advanced directives of the patient are to be followed. This may preclude aggressive use of artificial nutrition.
14. Interesting and varied Web sites have been included for the reader for additional insights into various diseases, conditions, and nutritional interventions.

ACKNOWLEDGMENTS

Thanks to all reviewers who made valuable suggestions for changes.

I wish to thank John Larkin, Samir Roy and Shelley Opremcak, RD, LDN and other colleagues for their valuable suggestions, insights, and edits. This book is dedicated to my family and to my students, interns and colleagues.

Sylvia Escott-Stump, MA, RD, LDN

COMMON ABBREVIATIONS

AA	amino acid
abd	abdomen, abdominal
ABW	average body weight
ACE	angiotensin-converting enzyme
ACTH	adrenocorticotropic hormone
ADA	American Dietetic Association
Alb	albumin
Alk phos	alkaline phosphatase
ALT	alanine aminotransferase
amts	amounts
ARF	acute renal failure
ASHD	atherosclerotic heart disease
AST	aspartate aminotransferase
ATP	adenosine triphosphate
BCAAs	branched-chain amino acids
BEE	basal energy expenditure
BF	breastfeeding
BMR	basal metabolic rate
BP	blood pressure
BS	blood sugar
BSA	body surface area
BUN	blood urea nitrogen
BW	body weight
bx	biopsy
C	cup(s)
C	coffee
CA	cancer
Ca^{++}	calcium
CABG	coronary artery bypass grafting
CBC	complete blood count
CF	cystic fibrosis
CHD	cardiac heart disease
CHF	congestive heart failure
CHI	creatinine-height index
CHO	carbohydrate
Chol	cholesterol
Cl^{-}	chloride
CNS	central nervous system
CO_2	carbon dioxide
CPK	creatine phosphokinase
CPR	cardiopulmonary resuscitation
CrCl	creatine clearance
CRP	C-reactive protein
CT	computed tomography
Cu	copper
CVA	cerebrovascular accident
DAT	diet as tolerated
dec	decreased
decaf	decaffeinated
def	deficiency
DJD	degenerative joint disease
dL	deciliter
DM	diabetes mellitus
DNA	deoxyribonucleic acid
DOB	date of birth
DRI	dietary reference intakes
DV	daily value
Dx	diagnosis
D5W	5% dextrose solution in water
EAA	essential amino acid
ECG, EKG	electrocardiogram
EEG	electroencephalogram
EFAs	essential fatty acids
Elec	electrolytes
EN	enteral nutrition
ESRD	end-stage renal disease
ETOH	ethanol/ethyl alcohol
Fe^{++}	iron
F & V	fruits and vegetables
FSH	follicle-stimulating hormone
FTT	failure to thrive
FUO	fever of unknown origin
G, g	gram(s)
GA	gestational age
GBD	gallbladder disease
GE	gastroenteritis
gest	gestational
GFR	glomerular filtration rate
GI	gastrointestinal
Gluc	glucose
GN	glomerular nephritis
GTT	glucose tolerance test
H & H	hemoglobin and hematocrit
HbA_{1c}	hemoglobin A_{1c} test (glucose)
HBV	high biological value
HBW	healthy body weight
HCl	hydrochloric acid
Hct	hematocrit
HDL	high-density lipoprotein
HLP	hyperlipoproteinemia or hyperlipidemia
HPN, HTN	hypertension
ht	height
Hx	history
I	infant
I & O	intake and output
IBD	inflammatory bowel disease
IBS	irritable bowel syndrome
IBW	ideal body weight
IEM	inborn error of metabolism
INR	international normalized ratio
IU	international units
IUD	intrauterine device
IV	intravenous
K^{+}	potassium
kcal	food kilocalories
kg	kilogram(s)
L	liter(s)
lb	pound(s)
LBM	lean body mass
LBV	low biological value
LBW	low birth weight
LCT	long-chain triglycerides

LDH	lactate dehydrogenase
LDL	low-density lipoproteins
LE	lupus erythematosus
LGA	large for gestational age
LH	luteinizing hormone
lytes	electrolytes
M	milk
MAC	midarm circumference
MAMC	midarm muscle circumference
MAO	monoamine oxidase
MBF	meat-base formula
MCH	mean cell hemoglobin
MCT	medium-chain triglycerides
MCV	mean cell volume
Mg^{++}	magnesium
mg	milligram(s)
μg	micrograms
MI	myocardial infarction
mm	millimeter(s)
MODS	multiple organ dysfunction syndrome
MSG	monosodium glutamate
MUFA	monounsaturated fatty acids
N&V	nausea and vomiting
N	nitrogen
Na	sodium
NCEP	National Cholesterol Education Program
NCP	Nutrition Care Process
NEC	necrotizing enterocolitis
NG	nasogastric
NPO	nil per os (nothing by mouth)
NSI	Nutrition Screening Initiative
O_2	oxygen
OP	outpatient
OT	occupational therapist
oz	ounce(s)
P	phosphorus
PCM	protein—calorie malnutrition
pCO_2	partial pressure of carbon dioxide
PG	pregnant, pregnancy
PKU	phenylketonuria
PN	parenteral nutrition
pO_2	partial pressure of oxygen
prn	pro re nata (as needed)
Prot	protein
PT	prothrombin time or physical therapy
PTH	parathormone
PUFA(s)	polyunsaturated fatty acid(s)
PVD	peripheral vascular disease
RAST	radioallergosorbent test
RBC	red blood cell count
RDA	recommended dietary allowance (specific)
RDS	respiratory distress syndrome
REE	resting energy expenditure
RQ	respiratory quotient
Rx	treatment
SFA	saturated fatty acids
SGA	small for gestational age
SI	small intestine
SIADH	syndrome of inappropriate antidiuretic hormone
SIDS	sudden infant death syndrome
SOB	shortness of breath
Sub	substitute
Sx	symptoms
t	teaspoon(s)
T	tablespoon
TB	tuberculosis
TF	tube feeding; tube fed
TG	triglycerides
TIBC	total iron-binding capacity
TLC	total lymphocyte count
TPN	total parenteral nutrition
TSF	triceps skinfold
UA	uric acid
UTI	urinary tract infection
UUN	urinary urea nitrogen
VMA	vanillylmandelic acid
VO_{2max}	maximum oxygen intake
WBC	white blood cell count
WNL	within normal limits
Zn	zinc

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SECTION 1

Normal Life Stages

CHIEF NUTRITION SCREENING AND ASSESSMENT FACTORS

Public health measures are established to promote wellness and reduce disease for all ages; Table 1-1.

- Priority Factors: Unintentional Weight Loss with Appetite Changes in Adults, Protein-Energy Deficiency, or Growth Retardation in Children
- Body Fat and Muscle Mass: Weight, Height, Body Mass Index (BMI), Percentage of Healthy Body Weight (HBW) for Height, Loss of Lean Body Mass (LBM), Previous Weight Percentile or Curve, Weight Changes, Waist Circumference, Skinfold Measurements, Visceral Proteins, Estimated Basal Energy Expenditure, Nitrogen Balance
- Illiteracy or Low Educational Level: Low Socioeconomic Status, Food Insecurity
- Hair or Nails: Changes, Rashes, Itching, Lesions, Turgor, Petechiae, Pallor
- Eyes: Glasses, Blurred Vision, Glaucoma, Cataracts, or Macular Degeneration
- Ears, Nose: Hearing Loss, Chronic Otitis Media, Altered Sense of Smell, Nasal Obstruction, Sinusitis
- Dental and Mouth: Ill-fitting Dentures, Loose or Missing Teeth, Caries, Bleeding Gums, Severe Gum Disease, Poor Oral Hygiene, Taste Alterations, Dysphagia
- Neurological: Headache, Seizures, Convulsions, Altered Speech, Paralysis, Altered Gait, Anxiety, Memory Loss, Altered Sleep Patterns, Depression, Substance Abuse, Low Motivation, Fatigue, Weakness, Fever or Chills, Excessive Sweating, Tremors
- Heart: Chest Pain, Dyspnea, Wheezing, Cough, Hemoptysis, Ventilator Support, Altered Blood Gas Levels, Abnormal Blood Pressure, Electrolyte Imbalance, Cyanosis, Edema, Ascites, Low Cardiac Output
- Blood: Anemias, Altered Heart Rate, Arrhythmias, Blood Loss
- Gastrointestinal (GI): Cachexia, Anorexia, Nausea, Diarrhea, Vomiting, Jaundice, Constipation, Indigestion, Ulcers, Hemorrhoids, Melena, Altered Stool Characteristics, Gluten Intolerance, Lactase Insufficiency
- Therapies: Radiation, Chemotherapy, Physical Therapy, Dialysis, Recent Surgery or Hospitalizations
  - Urinary and Renal: Hematuria, Fluid Requirements, Specific Gravity, Urinary Tract Infections, Renal Disease or Stones
  - Hormonal Balance: Altered Blood Glucose, Hyper or Hypothyroidism, Goiter, Glucose Intolerance or Metabolic Syndrome

TABLE 1-1 Public Health: Ten Achievements and Ten Essential Services

10 Public Health Achievements in the 20th Century

- Development of vaccines
- Increased motor vehicle safety
- Safer workplaces
- Control of infectious diseases
- Decline in deaths from coronary artery disease and stroke
- Safer and healthier foods
- Healthier mothers and babies
- Better family planning
- Fluoridation of drinking water
- Recognition of tobacco as a health hazard

10 Essential Public Health Services

- Monitor health status to identify community health problems.
- Diagnose and investigate health problems and hazards in the community.
- Inform, educate, and empower people about health issues.
- Mobilize community partnerships to identify and solve health problems.
- Develop policies and plans that support individual and community health efforts.
- Enforce laws and regulations that protect health and ensure safety.
- Link people to needed personal health services and assure the provision of health care when otherwise unavailable.
- Assure competent public health and personal health care workforce.
- Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
- Research for new insights and innovative solutions to health problems.

Adapted from: Centers for Disease Control and Prevention, http://www.cdc.gov/mmwr/preview/mmwrhtml/00056796.htm and American Public Health Association, http://www.health.gov/phfunctions/public.htm; accessed January 11, 2009.

- Immunity: Food Allergy or Intolerances, Sensitivities, Cellular Immunity, HIV or Other Chronic Infections, Inflammation
- Musculoskeletal System: Pain, Arthritis, Numbness, Amputations, Limited Range of Motion or Muscular Strength
- Phenotype or Genotype (see the adult nutrition content in this section)
- Nutrition: Any Special Diets or Nutrition Support, Dietary Pattern, Typical Intake of Food and Alcohol, Use of Vitamin/Minerals/Herbs/Botanicals/Supplements, Over-the-Counter and Prescribed Medications, Knowledge of Food and Nutrition

Life Stage–Specific Assessments

- Pregnancy: Vegan or disordered eating pattern; presence of diabetes, hepatitis B, hypothyroidism, obesity, AIDS or HIV infection, phenylketonuria (PKU), sexually transmitted disorders; use of accutane, alcohol, anticoagulant, or antiepileptic medications; poor foliate intake; lack of rubella immunity; and smoking habits (March of Dimes, 2009)
- Lactating Women: Mother's Intake and Breastfeeding Practices; Extent to Which Infant Is Breastfeeding; Composition of Milk Variable with Use of Medications
- Infants: Breast Milk; Formula Intake; Mixed Feedings with Other Foods; Disordered Eating Patterns Including Supplemented with Nutrients or Foods
- Preschool Children: Variable Intakes; Food Jags; Anemia
- School Children: Limited Ability to Recall Foods Eaten; Limited Attention Span; Use of Any Medications or Special Therapies; Anemia; Exposure to Lead
- Adolescents: Intakes Altered by Growth Spurts; Meal Skipping; Dieting; Fasting; Disordered Eating; Abuse of Drugs, Alcohol, Diuretics, Prescription Drugs, Laxatives
- Adults: Illiteracy; Biased or False Reporting; Failure to Report Use of Herbs, Alcohol, Supplements; Unusual Work Patterns such as Shift Work; Vegan or Disordered Eating Pattern
- Older Adults: Limited Dietary Recall; Limitations in Hearing or Sight; Chronic Illness that Affects Intake; Polypharmacy; Monotonous or Limited Intake

For More Information on MyPyramid and Food Guidance Systems, See the Dietary Guidelines in Table 1-2

- American Dietetic Association Fact Sheets
  http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition_350_ENU_HTML.htm
- Food and Nutrition Information Center (FNIC)
  http://www.nal.usda.gov/fnic/about.shtml
- FNIC—Dietary guidance
  http://grande.nal.usda.gov/nal_display/index.php?tax_level=1&info_center=4&tax_subject=256
- MyPyramid Food Guidance System Tools
  http://www.mypyramid.gov/

TABLE 1-2 Dietary Guideline Systems

The Food and Agriculture Organization (FAO) and the World Health Organization (WHO) have frequently brought together scientists and experts in agriculture to address nutrition and malnutrition. Dietary guidelines offer dietary advice for the population to promote overall nutritional wellbeing. As a result, many countries have established food-based dietary guidelines. Several principles and guidelines are included here.

Source: http://www.fao.org/docrep/v7700t/v7700t02.htm

Energy

- Nutritional guidelines should aim to prevent the consequences of either energy deficit or excess.
- Food-based dietary guidelines should promote appropriate energy intakes by encouraging adequate food choices from a balance of foods containing carbohydrates, fats, proteins, vitamins, and minerals.
- The role of physical activity in the energy balance equation should be addressed.

Protein

- For high-quality proteins, requirements for most people are met by providing 8–10% of total energy as protein.
- For predominantly vegetable-based, mixed diets, which are common in developing country settings, 10–12% is suggested to account for lower digestibility and increased incidence of diarrheal disease.
- In the case of the elderly, where energy intake is low, protein should represent 12–14% of total energy.

Fat

- In general, adults should obtain at least 15% of their energy intake from dietary fats and oils.
- Women of childbearing age should obtain at least 20% to better ensure an adequate intake of essential fatty acids needed for fetal and infant brain development.
- Active individuals who are not obese may consume up to 35% fat energy as long as saturated fatty acids do not exceed 10% of energy intake.
- Sedentary individuals should limit fat to not more than 30% of energy intake.
- Saturated fatty acids should be limited to less than 10% of intake.

Carbohydrate

- Carbohydrates are the main source of energy in the diet (>50%) for most people.
- Grain products, tubers, roots, and some fruits are rich in complex carbohydrates. Generally, they need to be cooked before they are fully digestible.
- Sugars usually increase the acceptability and energy density of the diet. Total sugar intake is often inversely related to total fat intake. Moderate intakes of sugar are compatible with a varied and nutritious diet, and no specific limit for sugar consumption is proposed in the report.

Micronutrients

- Vitamins and minerals include compounds with widely divergent metabolic activities and are essential for normal growth and development and optimal health.
- Micronutrients may help to prevent infectious and chronic diseases. Epidemiological, clinical, and experimental studies define the role of specific foods and nutrients in disease development and prevention.

American Dietary Guidelines

An evidence-based, scientific approach is used for updates to the Dietary Guidelines for Americans (Nicklas et al, 2005). The guidelines are updated every 5 years. In 2010, the guidelines were enhanced to describe the need for a Total Diet approach. There is no single "American" or "Western" diet. According to the National Health and Nutrition Examination Survey (NHANES), Americans eat too many calories and too much solid fats, added sugars, refined grains, and sodium. Americans also eat too little dietary fiber, vitamin D, calcium, potassium, and unsaturated fatty acids (specifically omega-3s), and other important nutrients that are mostly found in vegetables, fruits, whole grains, low-fat milk and milk products, and seafood. See the website at http://www.cnpp.usda.gov/DGAs2010-DGACReport.htm for the evidence-based recommendations.

Balance Nutrients With Calories

Eat a variety of nutrient-dense foods and beverages within and among the basic food groups.

Choose foods that limit the intake of saturated and trans fats, cholesterol, added sugars, salt, and alcohol.

Meet recommended intakes within energy needs by adopting a balanced eating pattern, such as the U.S. Department of Agriculture (USDA) Food Guide or the Dietary Approaches to Stop Hypertension (DASH) Eating Plan.

Manage Weight

To maintain body weight in a healthy range, balance calories from foods and beverages with calories expended.

To prevent gradual weight gain over time, make small decreases in food and beverage calories and increase physical activity.

Maintain Physical Activity

Engage in regular physical activity and reduce sedentary activities to promote health, psychological well-being, and a healthy body weight.

To reduce the risk of chronic disease in adulthood, engage in at least 30 minutes of moderate-intensity physical activity, above usual activity, at work or home on most days of the week. For most people, greater health benefits can be obtained by engaging in physical activity of more vigorous intensity or longer duration.

To help manage body weight and prevent gradual, unhealthy body weight gain in adulthood, engage in approximately 60 minutes of moderate- to vigorous-intensity activity on most days of the week, while not exceeding caloric intake requirements.

(continued)

TABLE 1-2 Dietary Guideline Systems *(continued)*

To sustain weight loss in adulthood, participate in at least 60–90 minutes of daily physical activity.

Achieve physical fitness by including cardiovascular conditioning, stretching exercises for flexibility, and resistance exercises or calisthenics for muscle strength and endurance.

Food Groups to Emphasize

Consume nine 1/2-cup servings of fruits and vegetables daily (2 cups of fruit and 2½ cups of vegetables for reference 2000-calorie intake).

Choose a variety of fruits and vegetables each day. In particular, select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.

Consume ≥3-oz equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products; half the grains should come from whole grains.

Consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.

Eat the Right Fats

Aim for 20–35% of total calories from fats, mostly from polyunsaturated and monounsaturated sources, such as fish, nuts, and vegetable oils.

Consume less than 10% of calories from saturated fatty acids and less than 300 mg/d of cholesterol, and keep trans fatty acid consumption as low as possible.

When selecting and preparing meat, poultry, dry beans, and milk or milk products, make choices that are lean, low fat, or fat free.

Carbohydrates Do Matter

Choose fiber-rich fruits, vegetables, and whole grains.

Choose and prepare foods and beverages with little added sugars or caloric sweeteners, such as amounts suggested by the USDA Food Guide and the DASH Eating Plan.

Consuming sugar- and starch-containing foods and beverages less frequently for good oral hygiene.

Less Sodium and More Potassium

Consume less than 2300 mg (approximately 1 teaspoon of salt) of sodium per day. Choose and prepare foods with little salt. Eat more potassium-rich foods, such as fruits and vegetables.

Take It Easy on Alcoholic Beverages

Those who choose to drink alcoholic beverages should limit to one drink per day for women and up to two drinks per day for men.

Alcoholic beverages should not be consumed by individuals who cannot restrict their alcohol intake, women of childbearing age who could become pregnant, pregnant and lactating women, children and adolescents, individuals taking medications that can interact with alcohol, and those with specific medical conditions.

Alcoholic beverages should be avoided by individuals engaging in activities that require attention, skill, or coordination, such as driving or operating machinery.

Keep Food Safe

Wash hands, food contact surfaces, and fruits and vegetables. Meat and poultry should not be washed or rinsed.

Separate raw, cooked, and ready-to-eat foods while shopping, preparing, or storing foods.

Cook foods to a safe temperature to kill micro-organisms.

Chill (refrigerate) perishable food promptly and defrost foods properly.

Avoid raw (unpasteurized) milk or any products made from unpasteurized milk, raw or partially cooked eggs or foods containing raw eggs, raw or undercooked meat and poultry, unpasteurized juices, and raw sprouts.

Sources: Dietary guidelines http://www.health.gov/DietaryGuidelines/; Kris-Etherton PM, Weber JA. Dietary Guidelines 2005: contributions of registered dietitians to the evolution and dissemination of the guidelines. *J Am Diet Assoc.* 105:1362, 2005; and Nicklas TA, et al. The 2005 Dietary Guidelines Advisory Committee: developing a key message. *J Am Diet Assoc.* 105:1418, 2005. Dietary Guidelines 2010: http://www.cnpp.usda.gov/DGAs2010-DGACReport.htm.

Canada's Food Guide to Healthy Eating

- Provide energy consistent with the maintenance of body weight within the recommended range.
- Include essential nutrients in amounts specified in the Recommended Nutrient Intakes.
- Include no more than 30% of energy as fat (33 g/1000 kcal or 39 g/5000 kJ) and no more than 10% as saturated fat (11 g/1000 kcal or 13 g/5000 kJ).
- Provide 55% of energy as carbohydrate (138 g/1000 kcal or 165 g/5000 kJ) from a variety of sources.
- Reduce sodium content.
- Include no more than 5% of total energy as alcohol, or 2 drinks daily, whichever is less.
- Contain no more caffeine than the equivalent of 4 cups of regular coffee per day.
- Use community water supplies that are fluoridated.

Source: Health Canada, http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php

Chinese Nutrition Society—Balance Dietary Pagoda

- Eat a variety of foods, with grains as the staple food.
- Eat more vegetables, fruits, and tubers.
- Eat milk and legumes, and their products, every day.
- Increase appropriately the consumption of fish, poultry, egg, and/or lean, meat, and decrease the consumption of fat meat and/or animal fat.
- Balance the amount of food consumed with physical activity to maintain a healthy body weight.
- Eat a diet with less fat/oil and salt.

(continued)

TABLE 1-2 Dietary Guideline Systems *(continued)*

- For those who consume alcohol, be moderate.
- Do not eat putrid and deteriorated foods.

Source: Chinese Nutrition Society, http://www.cnsoc.org/asp-bin/EN/?page=8&class=92&id=144

South African Dietary Guidelines

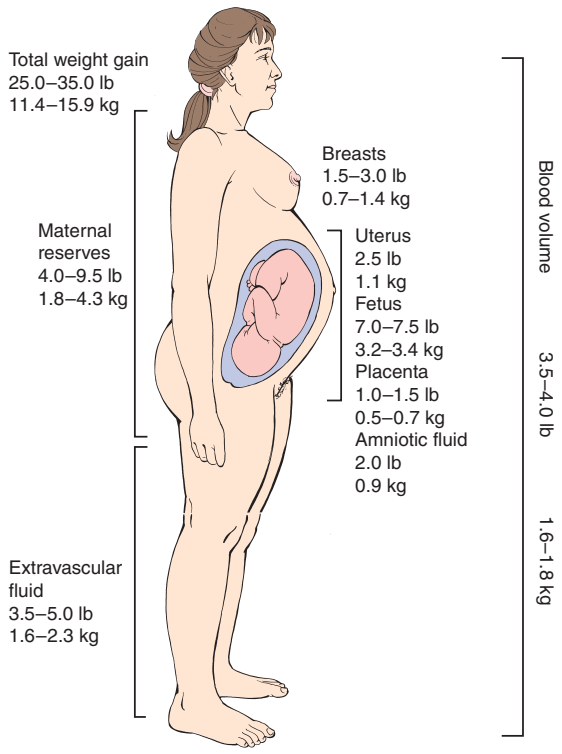
- Enjoy a variety of foods; this is difficult but necessary in developing countries.
- Be active.
- Make starchy foods the basis of most meals.
- Eat plenty of vegetables and fruits every day.
- Eat more legumes for better overall health.
- Foods from animals can be eaten every day.
- Eat fats sparingly—implications for health and disease.
- Eat salt sparingly—sprinkle, do not shake!
- Drink water—the neglected nutrient.
- If you drink alcohol, drink sensibly.

Source: http://www.sahealthinfo.org/nutrition/safoodbased.htm

Pregnancy and Lactation

PREGNANCY

NUTRITIONAL ACUITY RANKING: LEVEL 1 (UNCOMPLICATED); LEVEL 3 (HIGH RISK)



Reprinted with permission from: Weber J RN, EdD and Kelley J RN, PhD. *Health Assessment in Nursing,* 2nd ed. Philadelphia: Lippincott Williams & Wilkins, 2003.

DEFINITIONS AND BACKGROUND

Women who are interested in becoming pregnant need a "preconception risk assessment" (March of Dimes, 2009). They should be aware of their personal genetic biomarkers that could cause problems with infertility, pregnancy, childbirth, or chronic diseases.

Pregnancy is an anabolic state that affects maternal tissues using hormones synthesized to support successful pregnancy. Progesterone induces fat deposition to insulate the baby, supports energy reserves, and relaxes smooth muscle, which will cause a decrease in intestinal motility for greater nutrient absorption. Estrogen increases tremendously during pregnancy for growth promotion, uterine function, and water retention. Progesterone and estrogen secreted during pregnancy in combination also help prepare for successful lactation.

Adequate weight gain is needed to ensure optimal fetal outcome. Underweight is associated with small for gestational age (SGA) or preterm deliveries. Energy costs of pregnancy vary by the BMI of the mother (Butte et al, 2004). Tissue growth in pregnancy is approximately: breast, 0.5 kg; placenta, 0.6 kg; fetus, 3–3.5 kg; amniotic fluid, 1 kg; uterus, 1 kg; increase in blood volume, 1.5 kg; and extracellular fluid, 1.5 kg. Rapid weight losses or gains are not desirable during pregnancy.

Higher maternal weight before pregnancy increases the risk of late fetal death, although it protects against the delivery of an SGA infant. Obesity increases risk of first trimester

or recurrent miscarriages and the need for caesarean delivery; obesity should be corrected before pregnancy whenever possible (Rasmussen and Yaktine, 2009). Some obese women will seek bariatric surgery to enhance fertility. Women who have had bariatric surgery usually have a positive outcome (Maggard et al, 2008).

A short span between pregnancies or an early pregnancy within 2 years of menarche increases the risk for preterm or growth-retarded infants. Maternal nutrient depletion of energy and protein leads to poor nutritional status at conception and may alter pregnancy outcomes. Poor maternal iron and folate intakes have been associated with preterm births and intrauterine growth retardation, two outcomes for which women with early or closely spaced pregnancies are at high risk.

Brain development starts during pregnancy and continues into adulthood. Deficiency of various micronutrients has long-term implication for cognitive development (Benton, 2008). Major diseases including heart disease, hypertension, and type 2 diabetes may originate from impaired intrauterine growth and development as consequences of an insult at a critical, sensitive time. People who are small or disproportionate (thin or short) at birth may later have CHD, high BP, high cholesterol concentrations, and abnormal glucose–insulin metabolism, independent of length of gestation (Godfrey and Barker, 2000).

Nutritional deficits are serious during pregnancy. Living with marginal food security has been found to correlate with greater weight gain, more complications, and gestational diabetes (Laraia et al, 2010). Planned pregnancies usually have the most favorable outcomes. Continuous dietary monitoring of pregnant women and pregnant teens is essential, especially for calcium, iron, folate, vitamins A, C, B_6, and B_{12} (ACOG, 2009). Other nutrients of importance include magnesium, fiber, zinc, vitamin D, and biotin (Zempleni et al, 2008). Table 1-3 lists risk assessments and indicators of potentially poor maternal or fetal outcomes.

Many cardiac defects may be prevented by maternal use of multivitamins during the periconceptual period. To prevent SGA births, a mother is encouraged not to smoke, to manage any cardiac disease or conditions such as elevated blood pressure (BP), and to gain sufficient weight. Women who are HIV positive may experience undesirable weight loss (Villamore, 2004). Bulimia nervosa during pregnancy can lead to miscarriage, inappropriate weight gain (excessive or inadequate), complicated delivery, low birth weight (LBW), prematurity, infant malformation, low Apgar scores, and other problems. Women with unmanaged PKU may also have poor reproductive outcomes. Prevention requires initiation of the low Phe diet before conception or early in pregnancy, with metabolic control and sufficient intake of energy and proteins.

For twin and multiple pregnancies, twice-monthly visits, sufficient energy intake, multimineral supplementation, and patient education may reduce complications such as LBW and neonatal morbidity (Luke et al, 2003). The American Dietetic Association suggests at least three visits for medical nutrition therapy in high-risk pregnancies. The individual may require more visits if there are complex or multiple risk factors, such as diabetes and celiac disease.

TABLE 1-3 Prenatal Risk Assessments and Indicators of Potentially Poor Outcomes

Prepregnancy
• Adolescence (poor eating habits, greater needs for growth of teen and fetus).
• History of three or more pregnancies in past 2 years, especially miscarriages.
• History of poor obstetrical/fetal performance.
• Overweight and obesity, which can cause a higher risk for gestational diabetes, preeclampsia, eclampsia, C-section, and/or delivery of infant with macrosomia.
Prepregnancy or During Pregnancy
• Economic deprivation.
• Food faddist; smoker; user of drugs/alcohol; practice of pica with related iron or zinc deficiencies; anorexia nervosa or bulimia.
• Modified diet for chronic systemic diseases, such as diabetes, celiac disease, PKU.
• Prepartum weight of less than 85% or more than 120% of desirable BMI for height and age; these may reflect inability to attain proper weight or poor dietary habits.
• Deficient Hgb (<11 g) or hematocrit (Hct) (<33%) with medical diagnosis of anemia.
• Weight loss during PG or gain <2 lb/month in the last two trimesters; dehydration; hyperemesis.
• Risk of toxemia (2-lb weight gain per week or more).
• Poorly managed vegetarian diet, especially vegan diet without supplementation.
• Poor nutrient or energy intakes over the duration of the pregnancy.
• Poor intake of magnesium, zinc, calcium, iron, folate, vitamins A and C, and other key nutrients.

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial. Epigenetics involves inherited changes in chromatin and DNA that affect human pathologies, including inflammatory disorders and cancers, and nutritional factors can have a profound effect on gene expression (Wilson, 2008).

Clinical/History

- Gravida (number of pregnancies)
- Para (number of births)
- Abortus (number of abortions)
- Height
- Prepregnancy weight (% standard)
- Weight grid or prenatal BMI (19.8–20.0)
- Present weight for gestational age
- Desired weight at term
- BP
- Multiple gestation?
- Diabetes or other chronic disease?
- Hx of births with neural tube defects, preterm delivery, multiple births
- Uterine or cervical abnormalities
- Diet history, including use of alcohol
- Smoking habits, herbs, botanicals, and drug use
- Exposure to accutane, diethylstilbestrol (DES), anticoagulants, antiepilepsy drugs
- Nausea or vomiting (frequency, duration, impact on intake)
- Pica, harmful beliefs, or disordered eating patterns

Lab Work

- Hemoglobin and hematocrit (H & H)
- Serum Fe
- Urea N
- Glucose (by 24–28 weeks)
- Ca^{++}, Mg^{++}
- Albumin (Alb)
- Transferrin
- Ceruloplasmin
- T3, T4, TSH
- Blood urea nitrogen (BUN)
- Creatinine
- Homocysteine
- Cholesterol (may be increased)
- Alkaline phosphatase (alk phos) (may be increased)
- Total iron-binding capacity (TIBC) (often increased in late pregnancy)

SAMPLE NUTRITION CARE PROCESS STEPS

Inadequate Protein Intake for Multiple Gestation

Assessment Data: Dietary recall indicating low use of protein-rich foods; labs such as albumin, BUN, and H & H; insufficient rate of weight gain on prenatal grid.

Nutrition Diagnosis (PES): Inadequate protein intake related to needs for twin pregnancy as evidenced by dietary intake records (60% of goal) and slow growth on prenatal growth grid.

Intervention: Education on protein and protein-sparing kilocalories during pregnancy for twins. Counseling for individual needs, snack habits, recipes, tips for reducing nausea, physical activity.

Monitoring and Evaluation: Changes in dietary intake, improved lab values, improved weight gain on prenatal growth grid, successful pregnancy outcomes.

Rapid Weight Gain in Pregnancy

Assessment Data: Dietary history reflects high-caloric food intake; patient statements reflect misinformation; weights and rate of weight gain exceed recommended rate.

Nutrition Diagnosis (PES): Excessive energy intake related to misinformation about nutrition needs during pregnancy as evidenced by dietary recall showing daily intake of high-calorie foods, 3-lb body weight gain per week during the second trimester, and 20-lb weight gain by the middle of the second trimester.

Intervention: Education on food and nutrient needs during pregnancy. Referral to Women-Infants-Children Program (WIC) if eligible financially and medically.

Monitoring and Evaluation: Monthly appointment; include diet history and rate/amount of weight gain.

INTERVENTION

OBJECTIVES

- Maintain adequate gestational duration; avoid preterm delivery.
- Provide adequate amount of weight gain during the pregnancy; prevent delivery of LBW infants. Underweight women (BMI <18.5) should gain 28–40 lb. Normal weight women (BMI = 19–24.9) should gain 25–35 lb total. Overweight women (BMI = 25–29.9) should gain 15–25 lb. Obese women (BMI >30) should gain 11–20 lb, as obesity is a risk for undesirable consequences, including neural tube defects (Rasmussen and Yaktine, 2009; Scialli, 2006).
- Encourage proper rate of weight gain: 2–4 lb first trimester, 10–11 lb second trimester, and 12–13 lb third trimester. More weight should be gained if patient is below ideal weight range before pregnancy, especially in younger women. Adolescents are at high risk of gaining an excessive amount of weight during pregnancy and should be closely monitored.
- Provide additional nutrients and energy (net cost of pregnancy varies from 20,000–80,000 kcal total). Women carrying more than one fetus must add extra kilocalories to support multiple births.
- Prevent or correct hypoglycemia and ketosis.
- Provide adequate amino acids to meet fetal and placental growth. Approximately 950 g of protein are synthesized for the fetus and placenta. Low protein intake may lead to a smaller infant head circumference.
- Promote development of an adequate fetal immune system.
- Prevent or correct deficiencies of iron, which are common in 50–75% of pregnancies. Iron deficiency may cause low infant birth weight and premature birth (Luke, 2005).

- Folate deficiency and elevated homocysteine levels may lead to miscarriage, club foot, structural heart disease, anencephaly and neural tube defects (Wilson et al, 2008). A woman with a history of spontaneous abortion in her immediate prior pregnancy and short interpregnancy interval is especially vulnerable. L-methylfolate is the natural, active form of folate used for DNA reproduction and regulation of homocysteine levels. Women with altered genetic alleles may not have sufficient methyl-tetrahydrofolate (MTHFR) enzymes to use folic acid properly; these women may benefit from using special prenatal supplements, such as Neevo®. Vitamins B_6 and B_{12} will also be needed if homocysteine levels are elevated.
- Vitamin A deficiency is strongly associated with depressed immune system and higher morbidity and mortality due to infectious diseases such as measles, diarrhea, respiratory infections. On the other hand, doses of 10,000–30,000 IU vitamin A/d may cause birth defects.
- Avoid zinc, vitamin D, or calcium deficiencies.
- Supply sufficient iodine (250 μg) to prevent cretinism with mental and physical retardation (Angermayr and Clar, 2004). Systematic provision of iodine supplementation is recommended, especially if women are cutting back on intake of iodized salt (Glinoer, 2007).
- Limit caffeinated beverage intake to two cups daily.
- Avoid alcohol. Mothers who drink relatively high levels of alcohol around the time of conception increase the risk for orofacial clefts and spina bifida.
- Support the individual patient; pregnant women who are fatigued, stressed, and anxious tend to consume more macronutrients and decreased amounts of micronutrients (Hurley et al, 2005).
- Develop or improve good eating habits to prevent or delay onset of chronic health problems postnatally. The interaction between genes, nutrition, and environmental stimuli has been found to cause permanent changes in metabolism; these Developmental Origins of Health And Disease (DHOaD) are just beginning to be understood (Waterland and Michaels, 2007).
- Discuss the importance of a high-quality prenatal diet. Fetal under-nutrition can predispose to hypercholesterolemia and program food preferences that are more atherogenic (Lussana et al, 2007).
- Women should drink plenty of fluids to remain adequately hydrated (Klein, 2005).
- Multiple gestation creates new challenges and magnified nutritional requirements (Luke, 2005). There are more risks for adverse outcomes, including diabetes, hypertension, eclampsia, delivery of a premature or LBW infant (Klein, 2005; Luke, 2005). For twins, weight gain should reflect the period of gestation and prepartum BMI; 35–45 lb is often recommended with twins, and 50 lb overall is recommended for triplets.
- Monitor BP and blood glucose regularly to prevent or to identify complications such as preeclampsia or gestational diabetes.
- Monitor or treat other complications, such as nausea and vomiting of pregnancy (NVP) and hyperemesis gravidarum. See appropriate disorder entries.

FOOD AND NUTRITION

- Include in diet: 1 g protein/kg body weight daily (or 10–15 g above recommended dietary allowances for age). Young teens: 11–14 years (1.7 g/kg); 15–18 years (1.5 g/kg); over 19 years of age (1.7 g/kg); high risk (2 g/kg).
- Energy: In women of normal weight, energy requirements increase minimally in the first trimester, by 350 kcal/d in the second trimester, and by 500 kcal/d in the third trimester (Butte et al, 2004). Add more or less, depending on level of physical activity. Evaluate teens individually according to age and prepregnancy weight. With twins, dietary prescription of 3000 to 4000 kcal/d may be needed (Luke et al, 2003). See nutrient chart.

Recommendations for Pregnant Women

Nutrient	Age 18 Years or Under	Ages 19–30 Years	Ages 31–50 Years
Energy	1st tri = +0 kcal/d; 2nd tri = +340 kcal/d; 3rd tri = +452 kcal/d	1st tri = +0 kcal/d; 2nd tri = +340 kcal/d; 3rd tri = +452 kcal/d	1st tri = +0 kcal/d; 2nd tri = +340 kcal/d; 3rd tri = +452 kcal/d
Protein	71 g/d	71 g/d	71 g/d
Calcium	1300 mg/d	1000 mg/d	1000 mg/d
Iron	27 mg/d	27 mg/d	27 mg/d
Folate	600 μg/d	600 μg/d	600 μg/d
Phosphorus	1250 mg/d	700 mg/d	700 mg/d
Vitamin A	750 μg	770 μg	770 μg
Vitamin C	80 mg/d	85 mg/d	85 mg/d
Thiamin	1.4 mg/d	1.4 mg/d	1.4 mg/d
Riboflavin	1.4 mg/d	1.4 mg/d	1.4 mg/d
Niacin	18 mg/d	18 mg/d	18 mg/d

Data from: Food and Nutrition Board, Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients)*. Washington, DC: National Academy Press, 2002.

- The diet and supplement should include 27 mg of ferrous iron and a 5-mg increase in intake of zinc, easily obtained from meat or milk.
- Encourage use of vitamin C foods with iron-rich foods or an iron sulfate supplement.
- Use adequate vitamins A and D to match DRIs for age; avoid hypervitaminosis, which may lead to fetal damage. Monitor use of dietary supplements and fortified foods carefully.
- Be sure to use iodized salt, but avoid salt intake greater than that recommended for healthy adults.
- Desired pattern of food intake: Two to three servings of milk–yogurt–cheese group (for calcium, protein); 6 oz of meat or protein substitute (protein, iron, zinc); 3 fruits and 4 vegetables, including citrus (vitamin C) and rich sources of vitamin A and folacin; 9 servings of grains and breads, 3 of which are whole-grain or enriched breads/substitutes (iron, energy); 3 servings of fat.
- Omit alcohol. Reduce caffeine intake to the equivalent of two cups of coffee or less per day; this includes intake from colas, chocolate, and tea.
- Use cereal grains, nuts, black beans, green vegetables, and seafood for magnesium. Magnesium plays a role in preventing or correcting high BP; follow the Dietary Approaches to Stop Hypertension (DASH) diet whenever possible.
- Essential fatty acids (EFAs) from fats, such as corn oil or safflower oil and walnuts, should equal 1–2% of daily calories. Arachidonic acid and docosahexaenoic acid (DHA) are essential for brain growth and cognitive development; supplementation supports higher IQ in young children (Helland et al, 2008). Fish and seafood (e.g., tuna, mackerel, salmon) can be encouraged for their omega-3 fatty acids twice weekly, if allergies and cautions about mercury intake have been considered.
- Extra vitamin B_6 and copper are readily obtained from a planned diet and a prenatal supplement.
- See Table 1-4 for a description of special problems in pregnancy.

Common Drugs Used and Potential Side Effects

- After the fourth month, encourage use of a basic vitamin-mineral supplement between meals (with liquids other than milk, coffee, or tea) for better utilization. Supplements vary greatly; read labels carefully. Discuss the relevance of tolerable upper intake levels (ULs) from the latest dietary reference intakes of the National Academy of Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements.
- Iron is the only nutrient that cannot be met from diet alone (30 mg needed after the first trimester). Avoid taking iron supplements with antacids; bedtime is often the best time.
- Avoid taking isotretinoin (Accutane,) 13-*cis*-retinoic acid (CRA) or vitamin A as 10,000 IU or more, especially in the first trimester, as birth defects may result.
- Insulin may be needed with consistently high blood glucose levels over 120 mg/dL; monitor and avoid overfeeding.
- Antiemetic agents may be used to control NVP and include ondansetron (Zofran), cyclizine (Marezine), buclizine (Bucladin-S), metoclopramide (Reglan), meclizine (Antivert), prochlorperazine (Compazine), promethazine (Phenergan), or antihistamines such as Benadryl. Side effects vary but may include sedation, dizziness, changes in BP, and/or tachycardia.
- Women who have chronic diseases such as epilepsy, thyroid disorders, diabetes and cardiac disorders will need to manage all medications with careful medical supervision.
- Women who develop preterm labor are often treated with one of several drugs (tocolytics) to stop premature labor. Drugs include calcium channel blockers, terbutaline, ritodrine, magnesium sulfate, indomethacin, ketorolac, and sulindac. Use is short term, and side effects are not significant.
- Neevo® contains 1.13 mg L-methylfolate Calcium (as Metafolin®). It may be used for women who have MTHFR alleles.

Herbs, Botanicals, and Supplements

- Pregnant women should not use herbs, botanical supplements, and herbals teas. There are no rigorous scientific studies of the safety of dietary supplements during pregnancy. The Teratology Society has stated that it should not be assumed that they are safe for the embryo or fetus (Marcus and Snodgrass, 2005). Women who are using such supplements should stop immediately when they discover they are pregnant.
- Pregnant women should avoid supplements containing aloe, apricot kernel, black cohosh, borage, calendula, chaparral, chasteberry, comfrey, dong quai, ephedra, euphorbia, feverfew, foxglove, gentian, ginseng, golden seal, hawthorne, horehound, horseradish, juniper, licorice root, nettle, plantain, pokeroot, prickly ash, red clover, rhubarb, sassafras, saw palmetto, senna, skullcap, St. John's wort, tansy, wild carrot, willow, wormwood, yarrow, or yohimbe (American Dietetic Association, 2008). Willow bark, which contains salicilin, may cause stillbirth, prolonged gestation, and LBW.
- Ginger may be an effective treatment for nausea and vomiting in pregnancy (Borrelli et al, 2005). Sips of ginger ale or use of small amounts of ginger in cooking may be useful. However, when taking blood thinners or preparing for surgery, discontinue use.

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Describe adequate patterns and rates of weight gain in pregnancy; explain the rationale. Individualize according to goals (e.g., shorter women at lower range of gain). Excess equals more than 6.5 lb gained monthly after 20 weeks. Inadequate intake is 2 lb or less gained monthly after the first trimester.
- Encourage adequate calcium intake. If needed, discuss what to do for milk allergy/intolerance and lactose intolerance.
- Discourage trendy diets, pica, fads, and the habit of skipping breakfast. Discuss ketosis related to low glucose levels and its undesirable effect on fetal brain development.

TABLE 1-4 Special Issues in Pregnancy

Issue	Considerations
Allergies, personal or family history	Avoidance of common food allergens during pregnancy does not prevent allergies in offspring (Kramer and Kakuma, 2003). Women may wish to take probiotics to stimulate health-producing microbes in their fetuses and to delay onset of eczema and allergies (Kukkonen et al, 2007; Wickens et al, 2008).
Hyperemesis (intractable, dehydrating vomiting)	This affects 20% of pregnancies in the first trimester. Half of these patients have some liver dysfunction (Hay, 2008). Early hospitalization with tube feeding may be needed (Paauw et al, 2005; Quinla and Hill, 2003). Metoclopramide (Reglan) may help. When eating orally, liquids taken between meals, extra B-complex vitamins and vitamin C, and limited fat may be beneficial. Low birth weight and greater length of hospital stay are common (Paauw et al, 2005). Avoid electrolyte imbalances.
Liver dysfunction such as viral hepatitis, gallstones or intrahepatic cholestasis in pregnancy	With pruritus, elevated bile acids in the second half of pregnancy, high levels of aminotransferases and mild jaundice, immediate delivery may be needed (Hay, 2008).
Multiple gestation	Energy regimen of 20% protein, 40% carbohydrate, and 40% fat may be particularly useful (Luke, 2005). Supplement with calcium, magnesium, and zinc, as well as multivitamins and essential fatty acids (Luke, 2005).
Nausea and vomiting of pregnancy (NVP)	Initial treatment of nausea and vomiting should be conservative with dietary changes, emotional support, and perhaps use of ginger (Quinla and Hill, 2003). NVP affects 80% of pregnancies. It is reasonable to suspect *H. pylori* (Goldberg et al, 2007). Frequent, small meals should be consumed separately from fluids. Offer high-protein snacks, such as cheese or lean meat. Avoid lying down immediately after meals and suggest not skipping meals. Do not force eating; suck on ice chips or other frozen items and make up lost calories later. Eat meals and snacks in a well-ventilated area, free of odors; avoid strong spices and aromas. Eat and drink slowly and rest after meals. Try lemonade and potato chips or saltines. Avoid large meals, very sweet, spicy or high-fat foods if not tolerated. Eat dry crackers before rising in the morning. If necessary, drink fluids between meals rather than with meals. Multivitamin-mineral supplements may also trigger NVP; it may be helpful to try a different brand. Minimize offensive odors. Rehydration may be essential. NVP often abates by 17 weeks of pregnancy.
Pica (intake of nonnutritive substances)	Intake of ice, freezer frost, baking soda, baking powder, cornstarch, laundry starch, baby powder, clay, or dirt. As pica practices are associated with significantly lower hemoglobin levels at delivery, WIC and prenatal counselors must be aware. Discussion of practices should be nonjudgmental because pica may have strong cultural implications. Food cravings and aversions usually subside after pregnancy.
Severe gastrointestinal problems	Consider total parenteral nutrition with adequate lipids (10–20% of energy) for the fetus, as well as protein and carbohydrate. Check blood sugar regularly. Use adequate fluid according to estimated needs. Complications may include bacteremia, decreased renal function with preexisting disease, neonatal hypoglycemia, or subclavian vein thrombosis.
Vegan vegetarians	Vitamin B_{12}, zinc, calcium, and vitamin D supplements may be needed.
Women with high levels of inflammatory cytokines	Reduced placental perfusion and a tendency toward preeclampsia (LaMarca et al, 2007). New tests and treatments are being identified.
Women who have previously given birth to an infant with neural tube defect or anencephaly	Test for folic acid alleles; consider use of Neevo® or 600 μg folate daily throughout PG.
Women with preeclampsia	Test for folic acid alleles; consider use of Neevo® or 600 μg folate daily throughout pregnancy (Klein, 2005).

- Encourage intake of high-density nutrients, especially among women with pregravid obesity, as their diets tend to be poorer quality (Laraia et al, 2007).
- Encourage pleasant meal times and a healthy appetite. Stress has negative effects on nitrogen and calcium.
- Encourage breastfeeding. Explain the reasons for doing so (e.g., immunological benefits, bonding, and weight stabilization). Mothers who are HIV-positive should consider HAART, which can drastically reduce the risk of transmission of HIV; infant prophylaxis can also reduce the transmission rate (Slater et al, 2010).
- For excessive weight gain, the goal should be to restore eating patterns to match a normal growth curve. Severe calorie restriction should be avoided. At least 175 g of CHO will be needed.
- A balanced intake of fluoride and iodine from water, table salt, and seafood is needed. Avoid excesses.
- Discuss effects of tobacco and drug use (cocaine, alcohol, and marijuana), such as decreased birth weight and congenital malformations.
- Eligible women should be referred to the WIC Program, especially to prevent LBW. Many barriers hinder participation in nutrition education programs, including lack of transportation or child care. Facilitated discussions, support groups, cooking classes, and websites may be useful.

TABLE 1-5 March of Dimes Campaign to Reduce Preterm Births

- Consume a multivitamin containing 400 μg of the B vitamin folic acid before and in the early months of pregnancy. Women who need L-methylfolate should receive that special formulation.
- Stop smoking, drinking and/or using illicit drugs; avoid prescription or over-the-counter drugs (including herbal preparations) unless prescribed by a doctor who is aware of the pregnancy.
- Once pregnant, get early regular prenatal care, eat a balanced diet with enough calories (about 300 more than a woman normally eats), and gain enough weight (usually 25–35 lb).
- Talk to a doctor about signs of premature labor and what to do if warning signs are evident.

Source: http://www.marchofdimes.com/pnhec/240_48590.asp; accessed January 2, 2009.

- For constipation, suggest extra fiber, activity, and fluid (35–40 cc/kg); avoid laxatives.
- For swelling of ankles, hands, and legs, become more physically active. Avoid excessive salt at the table but do not restrict salt severely.
- For heartburn, eat smaller meals more frequently, eat slowly, and cut down on spicy or high-fat foods. Avoid antacids unless approved by the physician.
- All infections are cause for concern among pregnant women because they pose a risk to the health of the baby. Prostaglandins may stimulate early labor and cause delivery of an LBW infant. Women should have a periodontal evaluation to rule out gum disease and to eliminate infection.
- Discuss postpartum issues, including physical activity, breastfeeding, anemia, and control of hyperglycemia. Adherence to dietary guidelines may be limited in low-income women because of neglect of self-care, weight-related distress, negative body image, stress, and depressive symptoms (George et al, 2005). Attention to psychosocial needs may help to improve dietary intakes.
- The March of Dimes has launched a campaign to reduce rates of preterm birth; see Table 1-5.

Patient Education—Food Safety

- *Helicobacter pylori* should be suspected as one possible cause of nausea and vomiting (Goldberg et al, 2007). Hepatitis A, *Salmonella*, *Shigella*, *Escherichia coli*, and *Cryptosporidium* are common causes of diarrhea during pregnancy (American Dietetic Association, 2008). Careful hand washing is recommended.
- Avoid soft cheeses such as feta, brie, camembert, Roquefort, and Mexican soft cheese; they may have been contaminated with *Listeria*, which can cause fetal death or premature labor.
- Avoid raw or undercooked eggs, fish or shellfish, and meats because of potential foodborne illnesses.
- Do not eat or drink raw (unpasteurized) milk or products made from it.
- Avoid eating unpasteurized juices and raw sprouts.
- Pregnant women should not eat shark, swordfish, king mackerel, and tilefish. These long-lived larger fish contain the highest levels of methyl mercury, which may harm an unborn baby's developing nervous system. Pregnant women should select a variety of other kinds of fish, such as shellfish, canned fish, smaller ocean fish, and farm-raised fish. They can safely eat 12 oz of cooked fish per week, with a typical serving size being 3–6 oz. Keep fish and shellfish refrigerated or frozen until ready to use.

For More Information

- American Association of Birth Centers
  http://www.birthcenters.org/
- American College of Nurse-Midwives (ACNM)
  http://www.midwife.org
- American Academy of Periodontology in pregnancy
  http://www.perio.org/consumer/mbc.baby.htm
- Centers for Disease Control and Prevention—Geriatrics
  http://www.cdc.gov/ncbddd/pregnancy_gateway/default.htm
- Farmers' Markets, Agricultural Marketing Service of USDA
  http://www.ams.usda.gov/farmersmarkets/
- Institute of Medicine, Weight Gain During Pregnancy
  http://www.nap.edu/catalog/12584.html
- My Pyramid for Pregnant Moms
  http://www.mypyramid.gov/mypyramidmoms/
- National Healthy Mothers, Healthy Babies Coalition
  http://www.hmhb.org/
- National Center for Education in Maternal-Child Health
  http://www.ncemch.org/
- National Foundation—March of Dimes
  http://www.modimes.org/
- National Women's Health Information Center
  www.4woman.gov
- WIC Program—Supplemental Food Programs Division
  http://www.fns.usda.gov/wic/

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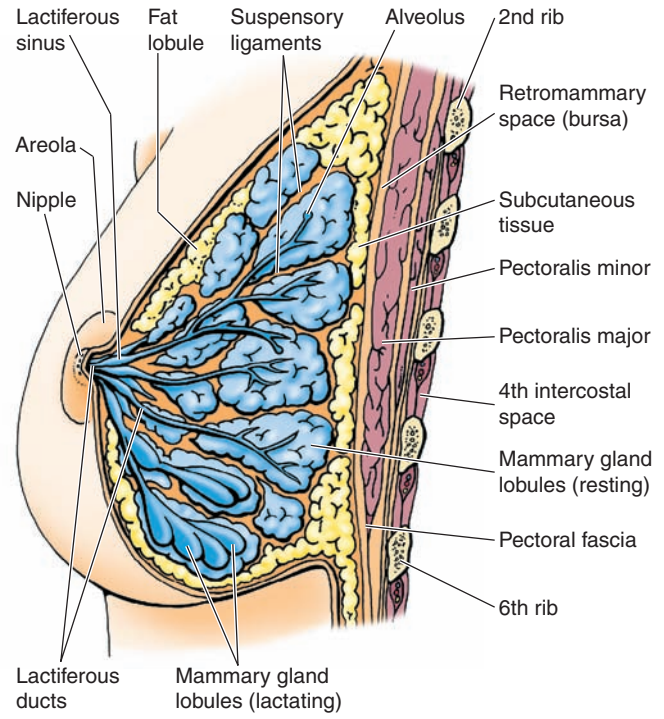
LACTATION

NUTRITIONAL ACUITY RANKING: LEVEL 1



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DEFINITIONS AND BACKGROUND

Breastfeeding should be supported and encouraged because of its immunological, physiological, economic, social, and hygienic effects on mother and infant. Exclusive breastfeeding for the first 6 months of life provides the best form of nutrition (James et al, 2005). Because maternal intake and breastfeeding practices vary over the duration of lactation, assess regularly and determine whether or not the infant needs supplemental foods or nutrients. Only rarely is supplementation needed. In fact, adding formula or solids to the diet of the exclusively breastfed infant almost guarantees lactation failure. Unless mom is severely malnourished, she can keep making good milk.

Breastfeeding is an anabolic state, requiring extra energy. The composition of breast milk varies over time. Colostrum contains mainly immunological factors (days 1–4); a short transition occurs (days 5–9); breast milk secreted between days 9 and 28 is primarily nutritional; and breast milk content is equally valuable for immunity and nutrition thereafter.

Human milk is better digested and absorbed by infants than other forms of milk; it has more DHA and arachidonic acid for normal cognitive and visual development, and carnitine for mitochondrial oxidation of these long-chain fatty acids. It also has less sodium and a proper protein ratio. Levels of DHA and arachidonic acid are lower in women who have diabetes; insulin resistance is higher among their infants (Min et al, 2005).

Breast milk has 1.5 times as much lactose as cow's milk; consequently, protein is absorbed better. The whey to casein ratio of 80:20 is more desirable than that of many formulas. In comparison, cow's milk has twice as much protein and mineral content. The composition of breast milk changes to meet the developing baby's needs (i.e., the fat content decreases over time). In many cases where a mother cannot breastfeed, the use of banked human milk may be a better option than cow's milk formulas (Wojcik et al, 2009). See Table 1-6 for the nutrient content of human milk.

TABLE 1-6 Nutrient Content of Mature Human Milk

Nutrients	Units	1 Cup/ 240 g
Proximates		
Water	g	215.25
Energy	kcal	171.125
Protein (casein, IgA, IgG, lactalbumin, lactoferrin, albumin, B-lactoglobulin)	g	2.53
Total lipid (fat)	g	10.775
Carbohydrate (lactose, oligosaccharides)	g	16.95
Fiber, total dietary	g	0.00
Amino acids		
Tryptophan	g	0.042
Threonine	g	0.113
Isoleucine	g	0.138
Leucine	g	0.234
Lysine	g	0.167
Methionine	g	0.052
Cystine	g	0.047
Phenylalanine	g	0.113
Tyrosine	g	0.130
Valine	g	0.155
Arginine	g	0.106
Histidine	g	0.057
Alanine	g	0.089
Aspartic acid	g	0.202
Glutamic acid	g	0.413
Glycine	g	0.064
Proline	g	0.202
Serine	g	0.106

Nutrients	Units	1 Cup/ 240 g
Vitamins		
Vitamin C	mg	12.300
Thiamin	mg	0.034
Riboflavin	mg	0.089
Niacin	mg	0.435
Pantothenic acid	mg	0.549
Vitamin B_6	mg	0.027
Folate	µg	12.792
Vitamin B_{12}	µg	0.111
Vitamin A, IU	IU	592.860
Vitamin A, RE	µg	157.440
Vitamin D	IU	9.840
Vitamin E	mg	2.214
Lipids		
Fatty acids, saturated	g	4.942
Fatty acids, monounsaturated	g	4.079
Fatty acids, polyunsaturated	g	1.223
Cholesterol	mg	34.194
Minerals		
Calcium, Ca	mg	79.212
Iron, Fe	mg	0.074
Magnesium, Mg	mg	8.364
Phosphorus, P	mg	33.702
Potassium, K	mg	125.952
Sodium, Na	mg	41.574
Zinc, Zn	mg	0.418
Copper, Cu	mg	0.128
Manganese, Mn	mg	0.064
Selenium, Se	µg	4.428

Other

Antimicrobial Factors
- Secretory IgA, IgM, IgG
- Lactoferrin
- Lysozyme
- Complement C3
- Leucocytes
- Bifidus factor
- Lipids and fatty acids
- Antiviral mucins, GAGs
- Oligosaccharides

Cytokines and Anti-inflammatory Factors
- Tumor necrosis factor; interleukins; interferon-γ; prostaglandins; acetyl hydrolase; α_1-antichymotrypsin; platelet-activating factor

Growth Factors
- Epidermal (EGF)
- Nerve (NGF)
- Insulin-like (IGF)
- Transforming (TGF)
- Taurine
- Polyamines

Digestive Enzymes
- Amylase
- Bile acid-stimulating esterase
- Bile acid-stimulating lipases
- Lipoprotein lipase

Potentially Harmful Substances
- Viruses (e.g., HIV)
- Aflatoxins
- *Trans*-fatty acids
- Nicotine, caffeine
- Food allergens
- PCBs, DDT, dioxins
- Radioisotopes
- Drugs

Hormones
- Feedback inhibitor of lactation (FIL)
- Insulin
- Prolactin
- Thyroid hormones
- Corticosteroids, ACTH
- Oxytocin
- Calcitonin
- Parathyroid hormone
- Erythropoietin

Sources: U.S. Department of Agriculture, November 1999; Jensen RG, ed. *Handbook of milk composition*. New York: Academic Press, 1995; Scrimshaw NS. *Food Nutr Bull.* 17(4), 1996.

Food allergies are less frequent in infants who are exclusively breastfed, even more so if maternal diets are higher in omega-3 fatty acids. Compared with cow's milk formulas, breast milk has more antibodies and over 45 bioactive factors such as digestive enzymes, hormones, immune factors, and growth factors. The promotion of breastfeeding has played an important role in improving child health by providing optimum nutrition and protection against common childhood infections and by promoting child spacing.

Breast milk is a living fluid. Infants receive beneficial nucleotides, macrophages, leukocytes, lymphocytes, and neutrophils from human milk, which protect against diarrhea, allergies, ear infections, necrotizing enterocolitis, urinary tract infection, and pneumonia. Bacterial flora of breastfed infants are generally *Lactobacillus*, not *Escherichia coli* like those of formula-fed infants. Formula-fed infants may be more prone to wheezing, Gastroesophageal (GE) reflux, urinary tract infection, influenza, sepsis, and *Giardia;* therefore, exclusive breastfeeding for 6 months or longer is highly recommended.

If the mother uses alcohol or illicit drugs, is receiving chemotherapy or has HIV infection, or if the infant has galactosemia, breastfeeding is not recommended unless HAART therapy is given (Slater et al, 2010). Women must be fully informed about the risks of breastfeeding transmission of HIV versus the expense and availability of obtaining formula.

Women should be encouraged to breastfeed until the child is 1 year of age or as long as mutually desirable. In developing countries, mothers may be encouraged to increase the breastfeeding time to 2 years, but mothers should not deprive themselves. The volume of milk decreases in a poorly nourished mother (American Dietetic Association, 2009).

New mothers who are breastfeeding should try not to lose weight rapidly. Women who are obese before pregnancy need extra encouragement to breastfeed. Prolonged breastfeeding helps to lower postpartum weight, although this benefit may slow in older mothers.

The long-term effects of breastfeeding an infant include lower incidences of type 2 diabetes, Crohn's disease, some types of cancer, allergies, and neurological disabilities. The relation of vitamin D insufficiency in the fetus or neonate to long-term outcomes such as type 1 diabetes and other chronic diseases needs to be investigated (Kovacs, 2008). Several minerals and peptides found in milk have a BP lowering effect, which may be protective later in life. Exclusive and prolonged breastfeeding is also associated with higher cognitive development than formula feeding, likely from long-chain fatty acids Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA) (Kramer et al, 2008).

Breastfeeding reduces the risk of breast and ovarian cancers, protects bone density in the mother, improves glucose profiles in gestational diabetes, and saves money not spent on formula (James et al, 2005). While it has been proposed that breastfeeding helps adults maintain a desirable BMI, this needs further evaluation (Owen et al, 2005). A recent study found that breastfeeding did not reduce adiposity at age of 6.5 years (Kramer et al, 2009).

There is an essential role for dietetics professionals in promoting and supporting breastfeeding by providing up-to-date, practical information to pregnant and postpartum women, involving family and friends in breastfeeding education and counseling, removing institutional barriers to breastfeeding, collaborating with community organizations that promote and support breastfeeding, and advocating for policies that position breastfeeding as the norm (James et al, 2005). Because prenatal WIC participation is associated with a greater likelihood of providing babies infant formula rather than breastmilk after birth, it is critical to educate these women about the health risks of introducing cow's milk complementary foods too early (Ziol-Guest and Hernandez, 2010).

The nutrition counselor should encourage mothers to continue breastfeeding for 6–12 months, and somewhat longer in developing countries. The Ten Steps to Successful Breastfeeding (WHO/UNICEF) provide an evidence-based standard used to assess individual hospitals and their support for mothers to breastfeed (Grizzard et al, 2006). Billions of dollars would be saved if breastfeeding were increased to 6 months or longer to reduce otitis media, gastroenteritis, and necrotizing enterocolitis.

In a survey of physicians about their breastfeeding promotion practices, over half indicated that they had had little or no education about breastfeeding; more education for solving common problems is desired (Krogstrand and Parr, 2005). See Table 1-7 for common problems that occur during breastfeeding and guidance to support the mother.

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Mothers with galactosemia should not breastfeed.

Clinical/History

- BP
- Smoking
- Height
- Current weight
- Weight history
- Prepregnancy weight
- Healthy body weight (HBW) range for height
- Date of birth (DOB) for infant
- Goal for return to usual body weight
- Diet history

Lab Work

- Glucose
- Albumin (Alb) or transthyretin (if needed)
- H & H, serum Fe
- Alk phos
- Protime or INR
- Chol
- Triglycerides (Trig)
- Homocysteine
- Ca^{++}
- Serum phosphorus
- Serum 25-hydroxyvitamin D [25(OH)D]

INTERVENTION

OBJECTIVES

- Support adequate lactation (usual secretion, 750–800 mL/d). Human milk provides 67 kcal/dL. Good energy intake improves milk production, especially in undernourished women.

TABLE 1-7 Common Problems in Breastfeeding and Reasons Why Women Discontinue Breastfeeding

Birth Control Pills: High estrogen-types are not recommended as they can decrease milk supply. A progestin-only pill is usually recommended by a physician.

Colic and Fussiness: A randomized, controlled trial of a low-allergen maternal diet was conducted among exclusively breastfed infants presenting with colic; when mothers excluded cow's milk, eggs, peanuts, tree nuts, wheat, soy, and fish from their diet, crying/fuss duration was reduced by a substantially greater amount in the low-allergen group (Hill et al, 2005).

Engorgement: The best way to prevent engorgement is to begin breastfeeding as soon as possible after birth followed by nursing regularly throughout the day. Rapid filling of the breasts and blocked mammary ducts may cause a painful engorgement. Frequent nursing, breast massage or warm shower before feedings, use of cold packs shortly after nursing, wearing a firm bra that is not too tight, and avoiding the use of nipple shields can help alleviate this condition.

Inadequate Milk Supply: Poor milk supply can be a cause of failure to thrive in breastfeeding infants. Maternal causes of poor milk supply are hypothyroidism, excessive antihistamine use, smoking, oral contraceptive use, illness, inadequate intake after gastric bypass surgery, poor diet, decreased fluid intake, infrequent nursing, or fatigue. Correction of any of these causes may improve milk supply. Increasing frequency of nursing is the best way to increase milk supply.

Jaundice: Breast milk jaundice occurs in about 1% of the population of breastfeeding newborns, is caused by the presence of a substance that alters liver function, and may cause red cell hemolysis. Mothers should breastfeed 10–12 times per day to correct elevated serum bilirubin levels.

Latching On: For problems with baby latching on, the trick is to have the baby open his or her mouth wide. Brush baby's lips with the nipple to encourage him or her to open wide, as if yawning. Once baby's mouth is open wide, quickly pull the baby onto the breast by pulling the baby toward mom with the arm that is holding him or her (not moving mom towards the baby). Baby's gums should cover an inch of the aerola behind the nipple. Be sure the baby's lips are everted and not inverted (turned in). Almost the entire areola should be in the baby's mouth.

Mastitis: Breast infection causes fever, chills, redness, flu-like symptoms, and breast sensitivity. A clogged mammary duct, maternal anemia, stress, or an infection carried from the baby may cause mastitis. The primary goal is emptying the infected breast; frequent nursing (every 1–3 hours during the day and 2–3 hours at night) is encouraged. The physician should be notified so that antibiotics or pain relievers can be prescribed. Application of heat to the breast, drinking plenty of fluids, and adequate rest are useful measures for treatment.

Nipple Confusion: Infants who are breastfeed may refuse to take a bottle as the weaning of breastfeeding occurs. Mothers should be encouraged to continue attempts at breastfeeding.

Sore Nipples: Frequent, short nursing, repositioning the infant at the breast, applying cold packs or heat to breasts, avoiding irritating soaps or lotions on nipples, air-drying nipples after nursing, exposing nipples to direct sunlight or 60-watt bulb for 15 minutes several times per day, applying vitamin E squeezed from capsules or ointment such as vitamin A and D or pure lanolin cream to nipples, and avoiding the use of nipple shields may help ease the pain. Occasionally, sore nipples are caused by *Candida albicans*; the breasts may not appear to have a fungal infection, but cultures of nipple surfaces will be positive for Candida albicans.

Reasons Why Women Discontinue Lactation

Acute infections in the mother

Employer attitudes toward breastfeeding mothers; lack of private space with a locking door, adequate time to express milk, inadequate refrigeration (Stewart-Glenn, 2008)

Hospital practices that do not support breastfeeding (Grizzard et al, 2006) including physician and nurse apathy or misinformation

Infant's inability to nurse due to weakness or oral anomalies

Lack of information and support and/or inadequate preparation

Lack of part-time jobs, flexible scheduling, and convenient day care for mothers who must work

Maternal depression

Mother's chronic illness (e.g., tuberculosis, severe anemia, chronic fevers, cardiovascular or renal disease) and/or use of medications

Mother's inability to provide 50% of the infant's needs

Mother's return to work by 12 weeks postpartum (Taveras et al, 2003)

Obesity: poor infant feeding behavior and reduced hormonal responses in the early postpartum period result in delayed lactogenesis and early cessation of breastfeeding (Lovelady, 2005)

- Breast milk can meet nutrient needs during the first 6 months, with possible exception of vitamin D and iron in certain populations.
- Exclusive breastfeeding for 6 months has many nutritional benefits. Have the mother continue breastfeeding for up to 1 year when possible. Exclusive breastfeeding should be encouraged for at least 4–6 months in infants at risk of atopy (Friedman and Zeigler, 2005).
- Decrease nutritional risks from use of alcohol, stimulants, and medications while mother is breastfeeding. Alcohol intake inhibits the letdown reflex from oxytocin. Discourage excessive use of stimulants, including caffeine from coffee (limit to 2 cups daily) and from tea, colas, and chocolate.
- Omit known food allergens while breastfeeding if infant shows signs of colic (Hill et al, 2005). Eliminate cow's milk, eggs, peanuts, tree nuts, wheat, soy, and fish, especially if members of the immediate family have allergies.
- Promote adequate infant growth and development, including bone mineralization. Lactation increases the normal daily loss of calcium for the mother, yet is generally beneficial for protecting bone health.
- Normalize body composition gradually so that the mother returns to ideal weight. Promote gradual weight

SAMPLE NUTRITION CARE PROCESS STEPS

Harmful Beliefs about Food and Nutrition

Assessment Data: Food records; signs of infant GI distress or excessive sleep.

Nutrition Diagnosis (PES): Harmful beliefs/attitudes about food or nutrition-related topics related to consumption of 4 beers daily while breastfeeding as evidenced by food diary, discussion with mom about "beer making more breastmilk," and reports that the infant is lethargic during daytime.

Intervention: Education about appropriate dietary and substance intake for pregnancy. Counseling about dangers of consuming alcohol.

Monitoring and Evaluation: Omission of alcohol intake while breastfeeding. Infant weight and infant growth charts; reports about infant sleep and GI patterns.

loss even in obese women. Weight loss by the mother of 0.5 kg per week after delivery does not affect the growth of breastfed infants (Lovelady, 2005).

- Support brain health and visual acuity by including fatty acids in the mother's diet (Anderson et al, 2005; Lauritezen et al, 2005). Both EPA and DHA should be included.

FOOD AND NUTRITION

- In the first 6 months, increase the mother's energy by 330 kcal over RDA for age. In the next 6 months, increase energy by 400 kcal over RDA for age. Recommendations may vary because individuals vary in prepregnancy weights, activity levels, and rates of weight gain.
- Consider the special needs of adolescents or women older than 35 years of age. Energy and nutrient requirements will change accordingly.
- Increase the mother's intake of protein (approximately 65 g daily), especially sources of high-quality protein.

Recommendations for Lactation

Nutrient	Age 18 Years or Under	Ages 19–30 Years	Ages 31–50 Years
Energy, 1st 6 months	+330 kcal/d	+330 kcal/d	+330 kcal/d
Energy, 2nd 6 months	400 kcal/d	400 kcal/d	400 kcal/d
Protein	61 g/d or 1.1 g/kg/d	61 g/d or 1.1 g/kg/d	61 g/d or 1.1 g/kg/d
Calcium	1200 mg/d	1300 mg/d	1300 mg/d
Iron	10 mg/d	9 mg/d	9 mg/d
Folate	500 μg/d	500 μg/d	500 μg/d
Phosphorus	1250 mg/d	700 mg/d	700 mg/d
Vitamin A	1200 μg	1300 μg	1300 μg
Vitamin C	115 mg/d	120 mg/d	120 mg/d
Thiamin	1.4 mg/d	1.4 mg/d	1.4 mg/d
Riboflavin	1.6 mg/d	1.6 mg/d	1.6 mg/d
Niacin	17 mg/d	17 mg/d	17 mg/d

Data from: Food and Nutrition Board, Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients)*. Washington, DC: National Academy Press, 2002.

- Encourage intake of usual sources of vitamins and minerals. Intake of calcium should be 1200–1300 mg/d. Increases of B-complex vitamins, vitamins A and C should be included. Supplementation may be needed for women with poor dietary intakes or chronic illnesses.
- Adequate vitamin D is needed for the infant if maternal intake is poor, if infant receives little sunshine exposure or has high levels of skin pigmentation. Daily vitamin D supplements of 400 IU/L will keep serum 25(OH)D concentrations higher than 50 nmol/L and prevent rickets in infants and young children (Greer, 2008).
- Levels of both iron and copper decrease with progression of lactation; there is no evident need for supplementation in the first 6 months.
- Increase intake of fluids. Omit alcohol unless permitted by a physician.
- After 3 months of lactation, mothers should increase energy intake if weight loss has been excessive.
- Women who follow vegan diets may need zinc, calcium, vitamin D, or vitamin B_{12} supplementation. These diets also may be low in carnitine.
- If tube feeding is needed using breast milk, some fat losses can occur. Formula enhancers may be added if long-term use is required.
- Breastfeeding by adolescent mothers is associated with greater bone mineral density (BMD) during young adulthood; lactation may be protective to their bone health.

Common Drugs Used and Potential Side Effects

- Discuss the relevance of tolerable ULs from the latest dietary reference intakes of the National Academy of Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements. Lactating mothers should be especially aware of what they are consuming between diet and supplements to avoid hypervitaminosis A and D. Read food and supplement labels carefully.
- Alcohol and nicotine are transmitted through breast milk to infants; discourage use. Cigarette smoking reduces the amount of milk produced.
- Moderate amounts of caffeine are acceptable in the equivalent of 2 cups of coffee.
- Cimetidine, Prozac, lithium, cyclosporine, cold medicines, and some other drugs may be contraindicated. Otherwise, prescribed medications are used only under supervision of the doctor.
- Drugs that may be used during breastfeeding include acetaminophen, some antibiotics and antihistamines, codeine, decongestants, insulin, quinine, ibuprofen, and thyroid medications.
- Parlodel (bromocriptine mesylate) inhibits secretion of prolactin and decreases lactation; it is used for women who do not wish to breastfeed. Constipation or anorexia may result.

Herbs, Botanicals, and Supplements

- Herbs and botanical supplements should not be used without first discussing with the physician. In general, these supplements have not been proven to be safe for breastfeeding mothers and their infants. Fenugreek, anise, fennel, garlic, and echinacea have been suggested for breastfeeding but have not been studied in this population for side effects. Lactating women should not take kava, chasteberry, dong quai, Asian ginseng, licorice root, or saw palmetto.
- IgM-, IgA-, and IgG-secreting cells are higher in infants who are breastfed exclusively for at least for 3 months and supplemented with probiotics compared with breastfed infants receiving placebo; use of probiotics during breastfeeding may positively influence gut immunity (Rinne et al, 2005).

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- "Best practice" counseling includes one prenatal and one postpartum home contact and telephone consultation by a lactation consultant (Bonuck et al, 2005). Explain the composition of breast milk, the benefits of breastfeeding, nipple care, and what to do during illness or infection.
- Self-esteem is crucial. Help mom believe that she can do it; give positive feedback and help her handle negative comments from others. Promotion of self-efficacy is useful. To prevent early discontinuation, lay support (peer counseling) is effective (Chung et al, 2008). Primary care physicians should support breastfeeding efforts during early, routine visits (Labarere et al, 2005).
- Help mom address barriers, such as short maternity leave, lack of private places to pump, coworker comments, minor health barriers, lack of support from doctor or nurses, and old wives' tales (e.g., breastfeeding spoils the baby, restrictive diet).
- Women with delayed onset of lactation need additional support during the first week postpartum; recommend frequent nursing.
- To ensure baby receives enough milk, mom should nurse at least eight times in each 24-hour period, no longer than one hour at a time. Baby should be able to rest for about 2 hours between feedings.
- Breastfed infants should have at least five wet diapers in each 24 hours. Stools of breastfed babies differ from formula-fed infants by being more loose. By day 4, there should be three stools a day, yellowish in hue.
- Explain the meaning of a balanced diet. Stress food sources of nutrients often limited in their diets: calcium, zinc, folate, and vitamins E, D, and B_6.
- Breastfed infants may be deficient in vitamin B_{12}, especially after 6 months (Hay et al, 2008). Vegetarian women may need supplemental vitamin B_{12} and vitamin D.
- Amounts of food antigens in breast milk may be controlled by modifying the maternal diet (Hill et al, 2005). Infants fed formulas of intact cow's milk or soy protein compared with breast milk have a higher incidence of type 1 diabetes autoantibodies, atopic dermatitis and wheezing in early childhood; exclusive breastfeeding should be encouraged (Friedman and Zeigler, 2005; Kull et al, 2005).
- Encourage the mother to normalize weight after delivery, but not start a weight loss program while she is nursing. Other than postpartum diuresis, average loss is 0.67 kg/month. Total weight gained during pregnancy affects weight loss afterwards. Mothers should try to maintain their postpartum weight during lactation. Weight loss should not be initiated until breastfeeding is discontinued, with no more than 1 lb/wk.
- Moderate exercise has no adverse effects on breastfeeding among healthy mothers. However, extra energy intake is needed with vigorous exercise (Lovelady, 2004).
- Exercise alone is not always sufficient to promote the desired level of weight reduction. Once lactation is established, overweight women can reduce energy intake by 500 kcal per day to allow gradual weight loss of 0.5 kg/wk (Lovelady, 2004).
- Lactating women are at high risk for energy and nutrient inadequacies, especially in low-income communities. Strategies must ensure adequate intakes. For example, in 2009, the WIC food package changed to use lower fat milk, whole grains, canned beans, salmon and tuna, a fruit/vegetable cash voucher. The program now offers the formula/BF option to encourage breastfeeding.
- Depressive symptoms in postpartum mothers should be identified and addressed (Hatton et al, 2005).
- Exposure to pesticides and polychlorinated biphenyls (PCBs) is undesirable. Some exposure occurs from breastmilk, with similar content in both colostrum and mature milk (Yu et al, 2007).
- Discuss issues related to safe handling of breast milk (see the following Food Safety recommendations).

Patient Education—Food Safety

- Avoid soft cheeses such as feta, brie, camembert, Roquefort, and Mexican soft cheese; they may have been contaminated with *Listeria*, which can cause fetal death or premature labor. If they are used, cook until boiling first.
- Avoid raw eggs, raw fish, and raw and undercooked meats because of potential viral and bacterial foodborne illnesses. *Helicobacter pylori* should be suspected as one possible cause of nausea or vomiting; careful hand washing is recommended.
- Nursing mothers should not eat shark, swordfish, king mackerel, and tilefish. These long-lived larger fish contain the highest levels of methyl mercury, which may harm a baby's developing nervous system. Nursing women should select a variety of other kinds of fish, such as shellfish, canned fish, smaller ocean fish, or farm-raised fish. They can safely eat 12 oz of cooked fish per week, with a typical serving size being 3–6 oz.
- After expressing milk, it should be stored in a clean, tightly enclosed container. An opaque container may help to protect riboflavin more than a clear container if there is any exposure to light.
- Human milk can be stored safely if refrigerated but not at room temperature because bacterial growth and lipolysis are rapid. Milk to be used within 48 hours can be refrigerated; if milk is to be used after 48 hours, try freezing (up to 6 months) immediately.

For More Information

- Academy of Breastfeeding Medicine
  http://www.bfmed.org/Default.aspx
- American Academy of Pediatrics
  http://www.aap.org/
- American Academy of Pediatrics Nutrition Resources
  http://www.medicalhomeinfo.org/Publications/Nutrition.html
- Benefits of breastfeeding
  http://www.4woman.gov/Breastfeeding/index.cfm?page=227
- Breastfeeding a Cleft-Lip/Palate Baby
  http://www.cleft.org/breastfeeding.htm
- Breastfeeding Basics Course
  http://www.breastfeedingbasics.org/
- Breastfeeding Promotion Committee
  Healthy Mothers, Healthy Babies National Coalition
  http://www.hmhb.org/
- CDC Breastfeeding topics
  http://www.cdc.gov/breastfeeding/
- Center for Breastfeeding Information
- La Leche International
  http://www.lalecheleague.org/
- Consumer Tips
  http://www.breastfeeding.com/helpme/consumer_friendly%20_bftips.html
- Got Mom: Breastfeeding Resources
  http://www.gotmom.org/
- Human Milk Banking Association of North America
  http://www.hmbana.org/
- International Lactation Consultant Association Directory
  http://www.breastfeeding.com/directory/lcdirectory.html
- Keep Kids Healthy
  http://www.keepkidshealthy.com/breastfeeding/
- Medline Plus
  http://www.nlm.nih.gov/medlineplus/ency/article/002452.htm
- Mother's Best
  http://www.breastfeeding.com/
- My Pyramid: Tips for Breastfeeding Moms
  http://www.nal.usda.gov/wicworks/Topics/BreastfeedingFactSheet.pdf
- National Women's Health Information Center
  http://www.4woman.gov/Breastfeeding/
- Storage Guidelines for Human Milk
  http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=11225&nbr=5872

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INFANCY, CHILDHOOD, AND ADOLESCENCE

INFANT, NORMAL (0–6 MONTHS)

NUTRITIONAL ACUITY RANKING: LEVEL 1

DEFINITIONS AND BACKGROUND

Normal gestation is 40 weeks. The average birth weight of an infant ranges between 5.5 and 10 lb; the average is approximately 7–7.5 lb. Healthy, full-term infants lose some weight in the first days after birth but tend to regain it within the first week. Infants often double their birth weight by 4–6 months and triple it within 1 year. For assessment of an infant, monitoring growth is the best way to evaluate intake. Head circumference increases about 40% during the first year, and brain weight should almost double.

Breastfeeding takes longer than cup or bottle feeding but has more benefits and is the preferred method. (American Dietetic Association, 2009). When breastfeeding is not possible or not desired, formula feeding is used. For formula feedings in infants with oral or developmental problems, administration times, amounts ingested, and physiological stability of infants are similar when newborn infants are fed using a bottle or a cup. Section 3 describes conditions where alternative feeding methods may be needed.

Infants are composed of approximately 75–80% water, whereas adults are composed of 60–65% water. Infants may become dehydrated easily, especially in hot weather or after bouts of diarrhea.

When infants are ill, special techniques (doubly labeled water studies or test weighing) may be used to determine intakes of breast milk.

Mineral status should be carefully assessed. Infants are born with a 4- to 6-month supply of iron if maternal stores were adequate during gestation. Anemia from severe iron deficiency (ID) is the most prevalent and widespread nutrition-related health problem in infants and young children in low-income countries (Lutter, 2008). Correcting ID anemia may prevent developmental and behavioral delays.

Calcium is another important mineral during infancy to set the stage for healthy bones. Zinc and copper may also be nutrients that are insufficient, especially in low-income populations (Schneider et al, 2007). Infants of vegan mothers may require calcium, zinc, and vitamin B_{12} supplementation (American Dietetic Association and Dietitians of Canada, 2003; Weiss et al, 2004). Another common problem in infancy is low vitamin D intake in breast milk, leading to growth failure, lethargy, irritability and rickets (Hollis and Wagner, 2004). Excesses of vitamin D should also be avoided.

The American Academy of Pediatrics supports the following practices during infancy (American Academy of Pediatrics, 2009):

- Breastfeed exclusively for the first 6 months. Supplement with vitamin D from birth and use iron supplementation as ferrous sulfate drops or iron-fortified cereal after 4 months of age. Fluoride supplementation may be required after 6 months of age, depending on the fluoride content of the city water. Feeding of iron-fortified commercial infant formula may be done for the first year as an alternative to breastfeeding.
- Delay the use of whole cow milk until after 1 year of age. Early introduction of whole cow milk protein during infancy may contribute to ID anemia by increasing gastrointestinal (GI) blood loss. Whole cow milk has an increased renal solute load compared to infant formulas.
- Reduced-fat milks should be delayed until after the second year of life. Adequate fat intake is important for the developing brain, and milk is usually the primary source of fat for infants and toddlers.
- Delay the introduction of semisolid foods until 4–6 months of age or until the infant demonstrates signs of developmental readiness, such as head control and ability to sit with support.

CLINICAL INDICATORS

Clinical/History

- Birth weight
- Birth length
- Present weight for gestational age
- Height-weight percentile
- Head circumference
- Feeding pattern
- Appetite changes
- No. of wet diapers in 24 hours
- No. of dirty diapers in 24 hours
- BP
- Pink, firm gums
- Use of vitamins, herbs, supplements

Lab Work

- H & H, serum ferritin
- Glucose
- Cholesterol
- Other labs as indicated by medical exam or family history

INTERVENTION

OBJECTIVES

- Promote normal growth and development: assess sleeping, eating, and attentiveness habits. Compare infant's growth to the chart of normal growth patterns. Weight for length (height) is the most meaningful measurement. Use updated Centers for Disease Control and Prevention

SAMPLE NUTRITION CARE PROCESS STEPS

Inadequate Iron Intake

Assessment Data: Food records; lab reports for H & H, serum ferritin.

Nutrition Diagnoses (PES): Inadequate mineral intake related to intake of insufficient amounts of iron-fortified formula as evidenced by mother's report of diluting formula with cow's milk for infant at 3 months of age to save money.

Intervention: Education about appropriate preparation and use of formula for infants. Referral to WIC program if eligible.

Monitoring and Evaluation: Lab reports for H & H, serum ferritin; dietary history indicating proper use of iron-fortified formula.

(CDC) growth charts and monitor growth trends, not a singular value. Chronic malnutrition results in decreased weight, then height, and then head circumference.
- Overcome any nutritional risk factors or complications, such as otitis media or dehydration.
- Evaluate use and discourage early introduction of cow's milk and solids, including gluten-containing cereals. Follow recommended guidelines for timing of introduction of new foods.
- Encourage the mother to use breast milk as the infant's main source of nutrition for the first 6 months, introducing solids and juices slowly beginning at approximately 4 months of age.
- If the infant is breastfed, assess the mother's prepregnancy nutritional status and risk factors, weight gain pattern, food allergies, and medical history (such as preeclampsia, chronic illnesses, or anemia). Discuss any current conditions that may affect lactation (e.g., smoking, use of alcohol, family history of allergies).
- If the infant is formula fed, the mother should learn about early childhood caries (ECC) prevention and about potential overfeeding problems.
- Promote growth and development through adequate fatty acid intake, especially for visual acuity.
- Effects of soy formulas on the thyroid must be monitored in infants with hypothyroidism. Iodine has been added to most infant formulas; check labels. Iodized salt has been found to be beneficial for maintaining desirable infants, especially in developing countries (Zimmerman, 2007).

FOOD AND NUTRITION

- Fluid requirements may include the following: 60–80 mL/kg water in newborns; 80–100 mL/kg by 3 days of age; 125–150 mL/kg up to 6 months of age. Assess individual needs according to status.
- Energy needs are estimated to decrease between birth and 6 months; this can be met in about 28–32 oz of human milk or infant formula.
- Protein requirement is generally 1.52 g/kg, or about 9.1 g/d. Sick infants may need a higher ratio. Use the nutrient recommendation chart (see below).

Nutrient	Recommendation for Infants Ages 0–6 Months
Energy	570 kcal/d males; 520 kcal/d females
Protein	9.1 g/d or 1.52 g/kg/d
Calcium	210 mg/d
Iron	0.27 mg/d
Folate	65 mg/d
Phosphorus	100 mg/d
Vitamin A	400 μg
Vitamin C	40 mg
Thiamin	0.2 mg/d
Riboflavin	0.3 mg/d
Niacin	2 mg/d

Data from: Food and Nutrition Board, Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients)*. Washington, DC: National Academy Press, 2002.

- *Breastfed infants:* discourage the mother from using drugs and alcohol; limit caffeine intake to the equivalent of 2 cups of coffee per day. Breast milk yields an 80:20 whey to casein ratio and approximately 20 kcal/oz. These infants will need information on vitamin D (Casey et al, 2010), fluoride, and sometimes iron supplements (at about 3 months of age). Mothers of infants predisposed to allergies should avoid fish, cow's milk, and nuts. Teach parents about use of diluted fruit juice (perhaps apple) at 4 months of age. Introduce cow's milk only after 12 months of age.
- *Formula-fed infants*: Review type of formula, such as milk-based, soy; significant ingredients; and volume for 24 hours. No sweetened beverage or calorie-containing formula should be given in between meals or at bedtime. Warm bottles carefully because folic acid and vitamin C may be destroyed by heat. Iron-fortified formula can be used after 2–3 months (American Academy of Pediatrics, 2009). Discourage use of evaporated milk formula, which is low in vitamin C and high in protein, sodium, and potassium. Standard formulas have a 60:40 whey to casein ratio, which is desirable; they provide 20 kcal/oz. Standard formulas include Enfamil, Similac, Gerber Formula, Good Start, and other products. Fluoride supplements are needed only if the water supply provides less than 0.3 ppm, or if unfluoridated bottled water is used to prepare formula.
- Soy formulas are available for cow's milk allergies; they are fortified with zinc, iron, and carnitine. Nutramigen, Alimentum, or Pregestimil are used for complex GI problems. Nutramigen may also be used for allergies to both soy and cow's milk protein. Alimentum and Pregestimil are for malabsorption with inclusion of medium-chain triglycerides (MCT).
- Ensure that the daily requirements are being met for all nutrients for each stage of growth. When in doubt, a liquid multivitamin–mineral supplement is advisable.
- For tube-feeding, several products are available. Formula should contain 10–20% protein, 30–40% fat, and 40–60% carbohydrates.
- An elemental diet may be needed for severe protein intolerance or cow's milk allergy. Monitor carefully for hydration; do not modify nutrients because of altered osmolality. Breast milk has an osmolality of 285 mOsm/kg; formulas vary from 150 to 380 mOsm/kg. Formulas with over 400 mOsm/kg can cause diarrhea or vomiting.
- Minimal enteral feeding (MEF) protects against necrotizing entercolitis and other infection and should be started early.
- TPN may be used when the infant cannot tolerate oral or tube feedings. Include 1–2% EFAs (linoleic and linolenic acids) to prevent outcomes of deficiency, such as inadequate wound healing, growth, immunocompetence, and platelet formation.
- *Introduction of solids:* At 4–6 months, introduce plain (not mixed, sweetened, or spiced) strained or pureed baby cereals, then nonallergenic vegetables (such as carrots or green beans), and then fruits. Start with 1–2 teaspoons, and progress as appetite indicates. Try a single new item for 7–10 days to detect any signs of food allergy. The intake of solids should not decrease breast milk or formula intake to less than 32 oz daily. Avoid giving too much juice; 4–6 oz daily is sufficient.

Herbs, Botanicals, and Supplements

- Infants and children may be highly susceptible to some of the adverse effects and toxicity of herbs and botanical products because of their physiology, immature metabolic enzyme systems, and different doses for body weights.
- Most topical preparations are benign; however, garlic poultices can cause burns. Internal use of herbs containing saturated pyrrolizidine alkaloids (comfrey) should be avoided.
- Discuss the relevance of tolerable ULs from the latest dietary reference intakes of the National Academy of Sciences. These levels were set to protect adults from receiving too much of any nutrient from diet and dietary supplements; infants are especially at risk for toxicities.

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Explain the proper timing and sequence of feeding. Discuss successful feeding as trusting and responding to cues from the infant about timing, pace, and eating capacity.
- Explain growth patterns (e.g., an infant who is 4–6 months of age should double his or her birth weight). Discuss problems related to inadequate growth.
- Emphasize the importance of adequate bonding between mother and child.
- Explain the proper care of infant's teeth, including risks of early childhood caries. Ad lib nocturnal feeding should be discontinued after the first teeth erupt. Bottle-fed infants should not be put to sleep with the bottle.
- Explain the proper timing and sequence of solid food introduction. Avoid use of stringy foods or foods such as peanut butter that are hard to swallow. Hard candies, grapes, and similar foods may increase the risk of aspiration.
- Discuss the rationale for delaying introduction of cow's milk (risks for allergy, GI bleeding).
- Discuss why fluid intake is essential; explain that infant needs are much greater (as a percentage of total body weight) than for adults. Breastfed infants usually have 4–6 soft stools each day. After the first month, they will tend to have fewer bowel movements than before; by 2 months, they have even fewer. However, a doctor should be consulted if the baby has not had a bowel movement in 3 days, or whenever diarrhea occurs.
- For resolution of special feeding problems, see Table 1-8.

Patient Education—Food Safety

- Hand washing with soap and hot water is recommended before breastfeeding or before formula preparation. Use clean utensils and containers for mixing formula. Wash the top of cans before opening.
- Before using tap water for formula preparation or to give as a beverage, let cold tap water run for 2 minutes to remove any lead that may be in the pipes.
- Well water should not be used since it may contain bacteria.
- Follow the 2-hour rule: discard any formula that has been left at room temperature for 2 hours or longer. Do not reuse.
- Avoid honey to decrease potential exposure to botulism in infancy.
- Avoid using raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Avoid using raw (unpasteurized) milk or products made from it.
- Avoid using unpasteurized juices and raw sprouts.

TABLE 1-8 Special Problems in Infant Feeding[a]

Allergy. Dietary exposures in pregnancy and the early postnatal period can modify gene expression and disease susceptibility. Avoidance of food allergens in infancy has provided no clear evidence in allergy prevention and is no longer recommended; focus is on their role in tolerance induction (West et al, 2010.)

Colic. Check for hunger, food allergy, incorrect formula temperature, stress, or other underlying problems. Give small, frequent feedings and parental encouragement. Colic is equally common in breastfed or formula-fed infants. If breastfed, continue to breastfeed. Rarely, removal of cow's milk products from the mother's diet is useful. If formula fed, discontinue expensive elemental formulas if symptoms do not improve. Curved bottles allow infants to be fed while they are held upright. Collapsable bags decrease swallowing of air. Infants should be burped regularly during feedings.

Constipation. The doctor will make a careful assessment and may suggest adding 1 teaspoon of a carbohydrate source to 4 oz of water or formula, one to two times daily. Avoid use of honey and corn syrup to prevent infant botulism.

Diarrhea. Replace fluids and electrolytes (e.g., Pedialyte) as directed by the doctor. After an extended period of time, have the doctor rule out allergy. Monitor weight loss and fluid intake carefully. FDA approved a vaccine (RotaTeq) to prevent rotavirus, which causes severe diarrhea and fever and dehydration in infants and results in many hospitalizations each year (Glass and Parashar, 2006).

Regurgitation. Position the infant in an upright, 40–60° position after feeding for approximately 30 minutes; have the doctor rule out other problems. Use smaller, more frequent feedings to avoid overfeeding. Use prethickened formulas if the doctor thinks it is necessary.

Pale, oily stools. Check for fat malabsorption. Use a formula containing medium-chain triglycerides if necessary.

Spitting Up or Reflux. If there is no weight loss concern, just offer encouragement that the problem will resolve in a few months. Positioning is an important consideration during feeding. Feed more slowly and burp often. Use feeding volumes and a schedule that is set. Avoid exposure to second-hand smoke. Offer parental reassurance.

[a]See also: American Dietetic Association *Pediatric manual of clinical dietetics* and *Children with special health care needs: NutritionCare handbook.*

For More Information

- Abbott Laboratories (products for infants)
  http://abbottnutrition.com/
- American Academy of Pediatrics
  http://www.aap.org/
- Bright Futures–Babies
  http://www.nal.usda.gov/wicworks/Learning_Center/BF_babies.pdf
- Centers for Disease Control and Prevention—Infants and Toddlers
  http://www.cdc.gov/LifeStages/infants_toddlers.html
- Complementary Foods
  http://www.nal.usda.gov/wicworks/Topics/infant_nut_solids.html
- Feeding Kids Newsletter
  http://www.nutritionforkids.com/Feeding_Kids.htm
- Gerber—Start Healthy, Stay Healthy
  http://www.gerber.com/Nutrition_Feeding/SHSH_Nutriton_101.aspx
- Growth Charts
  http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm
- Heinz Baby Foods
  http://www.heinzbaby.com/
- Infant Nutrition
  http://www.nal.usda.gov/fnic/etext/000106.html
- Kids Health
  http://www.kidshealth.org/
- National Perinatal Association
  http://www.nationalperinatal.org/
- National Center for Maternal and Child Health
  http://www.healthystartassoc.org/
- Nestle Very Best Kids
  http://www.verybestkids.com/
- Pediatric Nutrition Practice Group
  http://www.pediatricnutrition.org/
- Sudden Infant Death Syndrome
  http://www.sidscenter.org/
- USDA/ARS Children's Nutrition Research Center
  http://www.bcm.tmc.edu/cnrc/
- WIC Topics A-Z
  http://www.nal.usda.gov/wicworks/Topics/Infant_Nutrition.html
- World Health Organization
  http://www.who.int/child-adolescent-health/NUTRITION/infant.htm

INFANT, NORMAL (0–6 MONTHS)—CITED REFERENCES

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INFANT, NORMAL (6–12 MONTHS)

NUTRITIONAL ACUITY RANKING: LEVEL 1–2

DEFINITIONS AND BACKGROUND

Infants older than 6 months of age are beginning the developmental stages that will lead to walking and talking. Many of the same principles associated with infant feeding during the first 6 months will continue with the greater use of solids. The growth pattern of breastfed and formula-fed infants differs in the first 12 months of life. The new CDC growth charts were developed with a larger proportion of breastfed infants.

Timing of the introduction of complementary foods (solids) is an important consideration. The Feeding Infants and Toddlers Study (FITS) evaluated the introduction of complementary foods into the diets of young children, and the findings show that healthcare professionals play an important role in improving feeding practices (Stang, 2006). Early introduction is considered to be at 3–4 months of age, and late introduction is considered to be at 6 months of age. Many foods that are introduced are of low nutritional value, including sweetened beverages, cookies, processed meats, cakes, and pies (Stang, 2006).

Introduction of cow's milk at 12 months of age brings new problems and risks related to EFA deficiency if low-fat or skim milks are used. Long-chain fatty acids are useful in normal growth and development of infants and young children. It is not necessary to alter the diets of infants to prevent heart disease or to lower cholesterol. Breastfed and formula-fed infants maintain a characteristic serum cholesterol ester fatty acid pattern after age 7 months even after they begin to receive solid food; breastfed infants have higher levels of arachidonic acid and DHA with better cognitive development (Daniels et al, 2004).

Growth and development at this stage are affected by underlying or acute illnesses, nutritional intake, and related factors. Breast-fed infants have a strong prevalence of bifidobacteria and lactobacilli, which stimulate formation of oligosaccharides with a protective prebiotic effect (Coppa et al, 2004). Infants who are breastfed for four months or longer also have stronger lung function (Ogbuanu et al, 2009).

Sodium and chloride intakes may be higher than desirable in infants and toddlers; delaying the introduction of

cows' milk, limiting the amount of salt used in food processing and preparation, and increasing intake of fruits and vegetables are reasonable measures that can be applied (Heird et al, 2006). Overall, interventions for improving the diets of young children should focus on breastfeeding and the whole continuum of diet in order to promote healthy guidelines (Couch and Falciglia, 2006).

Lead poisoning should be monitored in growing children, especially children who live in older homes or spend time in older buildings or day care centers. Toddlers may eat lead-based paint that is chipping away from walls. Lead depletes iron and replaces calcium in the bone; deposition may be seen in x-rays of the knee, ankle, or wrist.

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial.

Clinical/History

- Length
- Current weight
- Birth length/weight
- Percentile weight/length
- Diet/intake history
- Age in months
- Head circumference
- Developmental stage
- Tooth development
- Physical handicaps
- Appetite
- Hydration status
- Intake and output (I & O)
- Persistent vomiting
- Diarrhea

Lab Work

- Glucose
- Cholesterol
- H & H, serum ferritin

SAMPLE NUTRITION CARE PROCESS STEPS

Inadequate Energy Intake

Assessment Data: Food records; weight loss or failure to thrive on growth charts.

Nutrition Diagnoses (PES): Inadequate energy intake related to mother's withholding of formula and infant cereal when infant cries "excessively" as evidenced by intake diary and perceptions of colic.

Intervention: Education about appropriate dietary intake for age of infant. Counseling about desired foods for a healthy growth; tips for introducing new foods to the diet and for handling an infant with colic.

Monitoring and Evaluation: Weight and growth charts; successful growth for child; lab reports for H & H, serum ferritin; dietary history indicating improved variety of food choices.

INTERVENTION

OBJECTIVES

- Continue to promote normal growth and development during this second stage of very rapid growth. Use updated CDC growth charts. Monitor trends in growth, not a singular value.
- Prevent significant weight losses from illness or inadequate feeding. Malnutrition results in decreased weight, then height, and then head circumference.
- Avoid dehydration.
- Prevent or correct such complications as diarrhea, constipation, and otitis media.
- Begin to encourage greater physical activity; prepare for walking by ensuring adequate energy intake.
- Continue to emphasize the role of good nutrition in the development of healthy teeth.
- Delay food allergens until 12 months of age (e.g., citrus, egg white, cow's milk, corn, peanut and nut butters.)
- Use of follow-up formulas with higher percentage of kilocalories from protein and carbohydrates (CHO) and less from fat have questionable benefits at this time.
- Prevent nutrient deficiencies upon weaning (e.g., zinc, iron). Iron supplementation, even during breastfeeding, may be beneficial.
- Support feeding skills and introduce solids, at appropriate periods of time, singly.

FOOD AND NUTRITION

Start Healthy Feeding Guidelines for Infants and Toddlers (Butte et al, 2004; http://www.bcm.edu/cnrc/consumer/nyc/vol_2004_3/guidelines_ADA.pdf)

- Repeated exposure to a particular food is usually necessary before it is accepted by the infant or toddler; up to 10–15 exposures may be necessary. Introduction of a variety of flavors in the first 2 years of life may lead to acceptance of a wider variety of flavors in later childhood.
- After 6 months, most breastfed infants need complementary foods to meet current recommendations (DRI) for energy, manganese, iron, fluoride, vitamin D, vitamin B_6, niacin, zinc, vitamin E, magnesium, phosphorus, biotin, and thiamin; amounts needed from complementary foods will vary depending upon the intake of human milk or formula.
- Although iron-fortified infant formula provides the recommended intakes of energy and nutrients until about 1 year of age depending on intake, all infants need complementary foods for exposure to flavors and textures as well as to master eating skills. Complementary foods such as meats and fortified cereals contribute significant amounts of iron; this is helpful in preventing deficiency, which is common in toddlers under the age of 2 years; see Table 1-9 for additional tips on feeding infants.
- Because rickets due to vitamin D deficiency has been observed recently in dark-skinned, breastfed infants and other infants without adequate sun exposure, 200 IU of vitamin D_3 is recommended as a supplement for breastfed infants and infants receiving less than 500 mL of formula

TABLE 1-9 Feeding Babies in the First Year of Life

Foods	Birth 1 2 3	4 5 6	7 8	9 10	11	12 Months
Breast milk or iron-fortified formula	Breast milk or formula	Continue breast milk or iron fortified formula				Start whole cow's milk from cup
Cereals and grain products		Iron-fortified plain infant cereal (no fruit flavor or mixed grains). Start with rice, then oatmeal or barley	Teething biscuits	Mixed grain cereals. Noodles, rice. Bread and toast strips		
Vegetables		Strained, single vegetables		Cooked vegetables, mashed or chopped	Sliced cooked vegetables for finger-feeding	
Fruit and fruit juices		Strained, single fruits	Unsweetened fruit juices	Cooked, canned, or soft fresh fruits, mashed or chopped	Sliced soft fruit for finger feeding	
Meat and other protein foods		Strained single meats. Pureed dried beans, peas. Plain yogurt		Same foods, chopped or mashed. Cottage cheese, mashed egg yolk	Same foods, bite-sized pieces for finger feeding. Creamy peanut butter	
Egg white and fish					Egg white. Tender, flaked boneless fish	

The infant's developmental readiness, age, appetite, and growth rate are factors that help determine when to feed solid foods.

Before feeding solid foods, the baby should be able to swallow and digest solid foods, sit with support and have neck and head control, and close their lips over a spoon. Semisolid foods and juices are a significant change and should not be started until 4–6 months.

Introduce single-ingredient foods one at a time; wait 5–7 days before introducing a new food. This process helps identify any food sensitivities the child might have. Offer new food when baby is in a good mood, not too tired and not too hungry. Serve solids after the baby has had a little breast milk or formula. Hold the baby on the lap or use an infant seat or feeding chair if the baby can sit. Use a baby spoon and place a small amount (about 1/2 teaspoon) of food on the baby's tongue. Give the baby time to learn to swallow these foods and get used to the new tastes.

The sequence of new foods is not critical, but rice cereal mixed with breast-milk or formula is a good first choice. Add vegetables, fruits, and meats to the infant's diet one at a time. Serving mixed foods is not recommended in the beginning.

Introduce juices when the baby can drink from a cup, around 6–9 months. Dilute adult juices half and half with water or strain them before giving to a baby. Avoid sweet drinks; they can promote tooth decay. In addition, avoid sweetened foods because they also can promote tooth decay and may cause a preference for sweets. Do not offer fruit desserts that contain unnecessary sugar.

Food can be homemade or commercially prepared Choose plain, strained fruit such as applesauce, peaches or mashed ripe bananas. Boil fruits until tender; cool; blend until there are no lumps. If it is too thick, add breast milk, baby formula or a little water. Use the same process for vegetables.

Feed the baby when he or she is hungry, but do not overfeed. Make meal time a happy time. Never force a child to finish bottles or food; watch for cues that he or she is full.

Delay introduction of the major food allergens, such as eggs, milk, wheat, soy, peanuts, tree nuts, fish, and shellfish, until well after the first year of life. Foods that are associated with lifelong sensitization (e.g., peanuts, tree nuts, and shellfish) should not be introduced until even later years.

Combination foods (instead of single-ingredient foods) may be given to older infants after tolerance for the individual components has been established.

Hungry toddlers may point at foods or beverages, ask for foods or beverages, or reach for foods. Full toddlers may slow the pace of eating, become distracted or notice surroundings more, play with food, throw food, want to leave the table or chair, and/or not eat everything on the plate. To help avoid underfeeding or overfeeding, parents and caregivers must be sensitive to the hunger and satiety cues of the healthy infant and young child.

Avoid raw carrots, nuts, seeds, raisins, grapes, popcorn, and pieces of hot dogs during baby's first year as they may cause choking.

Age-appropriate, daily physical activity in a safe, nurturing environment may help promote physical development and movement skills and teach the healthy habit of activity. Encourage parents and caregivers to promote enjoyment of movement and motor skill confidence at an early age. Fundamental motor skills (e.g., walking, running, jumping, etc.) begin to develop. When activity is encouraged, these skills can further develop into advanced patterns of motor coordination.

Television viewing should be discouraged for children under 2 years of age.

[a]Start Healthy Feeding Guidelines for Infants and Toddlers (Butte et al, 2004).

per day. Intakes of EFAs may require emphasis once breast milk or formula is replaced with cow's milk.
- Children often eat small frequent meals and snacks throughout the day, generally three regular meals and two to three appropriate, healthy snacks. Portions should provide essential nutrients but not exceed energy requirements for the child.
- Occasional picky eating, a normal stage of development, is not associated with changes in nutrient intake or height and weight. Consuming a single food or foods for extended periods of time (food jag) may require monitoring of growth more frequently if it persists for a long time.

OTHER GUIDELINES

- For energy needs, the current DRI recommends about 743 kcal/d for males and 676 kcal/d for females. Monitor according to the CDC growth charts, and identify problems early.
- Continue to provide breast milk or iron-fortified formula during this stage. The presence of DHA and arachidonic acid (ARA) in human milk, along with reports of higher IQ in individuals who were breastfed versus formula fed as infants, suggest that exogenous DHA and ARA are essential for optimal development (Heird and Lapillone, 2005).
- Special milk substitutes are not necessary unless there is an allergy to soy protein or cow's milk.
- Fluid requirements may include approximately 125–150 mL/kg up to 1 year of age. Fluid needs may begin to decline slightly during this stage.
- Protein requirement for a 6-month-old infant is generally 1.5 g/kg and changes as the infant grows; this equals about 13.5 g/d. By 12 months, the need is only 1.1 g/kg. See nutrient recommendations chart:

Nutrient	Recommendation for Infants Ages 6 Months to 1 Year
Energy	743 kcal/d males; 676 kcal/d females
Protein	13.5 g/d
Calcium	270 mg/d
Iron	11 mg/d
Folate	80 mg/d
Phosphorus	275 mg/d
Vitamin A	500 μg
Vitamin C	50 mg/d
Thiamin	0.3 mg/d
Riboflavin	0.4 mg/d
Niacin	4 mg/d

Data from: Food and Nutrition Board, Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients)*. Washington, DC: National Academy Press, 2002.

- Avoid raw vegetables and fruits (other than ripe banana or soft, peeled apple). Beware of foods that may cause choking (e.g., hot dogs, popcorn, nuts, grapes, seeds) because toddlers do not have molars for proper chewing (Morley et al, 2004).
- As tolerated, introduce coarsely ground table foods by 10–12 months of age.
- Introduce cow's milk at 12 months of age, ensuring that intake does not go above 1 quart daily to prevent anemia. Use whole milk to include sufficient access to fatty acids.
- Begin to offer fluids by cup at approximately 9–12 months of age; weaning often occurs by about 1 year of age. Avoid sweetened beverages at this age whenever possible.
- Spicy foods often are not liked or not tolerated. Taste buds are very acute at this stage. This is also affected by culture and the seasoning of foods that are introduced.
- Continue use of iron-fortified baby cereal after 12 months of age to ensure adequate intake. Approximately 10 mg of iron is required. WIC-approved cereals are iron fortified. Adult cereals often are inappropriate for infants and children younger than 4 years of age.
- Discourage use of low-density, high-energy foods such as carbonated beverages, French fries, candy, and other sweets.
- Generally, healthy infants and toddlers can achieve recommended levels of intake from food alone; use foods rather than supplements as the primary source of nutrients for children (Briefel et al, 2006). When indicated, vitamin-mineral supplements can help infants and toddlers with special nutrient needs or marginal intakes. However, avoid excessive intakes of vitamin A, zinc, and folate, which are commonly fortified in the food supply (Briefel et al, 2006).
- Children who require tube feeding require specialty care. If the infant needs a tube feeding (e.g., for poor weight gain, low volitional intake, 5th percentile or lower for weight for height and age, slow and prolonged feeding times over 4–6 hours because of oral/motor problems), a standard isotonic tube feeding formula that provides 30 kcal/oz of intact proteins may be used. If necessary, lactose-free and gluten-free formulas are available. Added fiber and a mix of long- and medium-chain fatty acids may be useful. Osmolality of 260–650 mOsm/kg is common; monitor tolerances regularly. Be sure to use sufficient water. The infant may tolerate bolus feedings in the day and continuous feedings at night.

Common Drugs Used and Potential Side Effects

- Drugs and medications used for infants should be prescribed only by a physician.

Herbs, Botanicals, and Supplements

- Infants and children may be even more susceptible to some of the adverse effects and toxicity of these products because of differences in physiology, immature metabolic enzyme systems, and dose per body weight.
- Herbs and botanical supplements should not be used without discussing with the physician. In general, these types of supplements have not been proven to be safe for infants.
- Discuss the relevance of tolerable ULs from the latest dietary reference intakes of the National Academy of Sciences. These levels were set to protect adults from receiving

too much of any nutrient from diet and dietary supplements; infants are even more at risk for toxicities.

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Early childhood is a critical time for development of appropriate food choices and eating habits, which are complex processes for parents to understand (Stang, 2006).
- Discuss adequate weight pattern: infants generally double or triple birth weight by 12 months of age; body length increases by about 55%; head circumference increases by about 40%; and brain weight doubles.
- Discuss the healthy guidelines that are available.
- For lunches at home, parents will need suggestions about appropriate and easy to serve foods, homemade or commercial, for toddler lunches and snacks (Ziegler et al, 2006).
- Special attention should be given to counsel mothers who are single, whose child is in day care, whose education or literacy is limited, or who are enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (Hendricks et al, 2006).
- Assure parents and caregivers that, while infants and toddlers have an innate ability to regulate energy intake, there is potential for environmental cues to diminish natural hunger-driven eating behaviors, even among young toddlers (Fox et al, 2006). Overfeeding may result if children are not taught to recognize their natural cues about hunger and satiety.
- Encourage consumption of milk at home and other locations, such as restaurants and friends' homes, in place of fruit-flavored drinks or other sweetened beverages (Ziegler et al, 2006).
- All day care providers should be encouraged to use menu planning aids, such as those available from the U.S. Department of Agriculture (Ziegler et al, 2006).
- Discuss iron intake, fluid intake, and other nutritional factors related to normal growth and development, including calcium for bone health.
- Plan toddler snacks to complement meals by including additional fruits, vegetables, and whole grains that are culturally appropriate rather than fruit drinks, cookies, and crackers; this will increase fiber intake and limit fat and sugar intakes (Ziegler et al, 2006).
- To develop healthful eating patterns, introduce toddlers to foods 8 to 10 times to increase food acceptance and the likelihood of establishing healthful eating patterns (Ziegler et al, 2006).
- Discuss the role of fat-soluble vitamins, their presence in whole milk, and the role of EFAs in normal growth and development of the nervous system.
- Bottled waters are not a substitute for formula. Hyponatremia may result.
- Fluoridated water is recommended; check the community status. Fluoride supplements are not needed when the water supply is fluoridated and the infant receives adequate water from this source. Note that well water and most bottled waters are not fluoridated; supplementation should be discussed with the physician.
- When brushing teeth, be carefully not to use a large amount of fluoridated toothpaste. A very small amount suffices.
- For planning vegan diets in infancy, breast milk should be the sole food, with soy-based formula as an alternative. Breastfed vegan infants may need supplements of vitamin B_{12}, zinc, and vitamin D. Protein sources for older vegan infants may include tofu and dried beans.
- Intensive nutrition education can help mothers provide more effective feeding practices. This is especially important in developing countries where inappropriate feeding, poor hygiene, and poor health often lead infants to a malnourished state (Roy et al, 2007).

Patient Education—Food Safety

- Hand washing with soap and hot water is recommended before breastfeeding or before formula preparation. Use clean utensils and containers for mixing formula. Wash the top of the can before opening.
- Before using tap water for formula preparation or to give as a beverage, let cold tap water run for 2 minutes to remove any lead that may be in the pipes.
- Well water should not be used since it may contain bacteria.
- Follow the 2-hour rule: discard any formula, beverage, or food that has been left at room temperature for 2 hours or longer. Do not reuse.
- Do not use honey in the diets of infants to decrease potential exposure to botulism.
- Avoid using raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Do not use raw (unpasteurized) milk or products made from it.
- Avoid using unpasteurized juices and raw sprouts.
- For hospital preparation of infant formula, use available guidelines.

For More Information

- Abbott Laboratories (products for infants)
  http://abbottnutrition.com/
- American Academy of Pediatrics
  http://www.aap.org/
- Bright Futures–Babies
  http://www.nal.usda.gov/wicworks/Learning_Center/BF_babies.pdf
- Centers for Disease Control and Prevention—Infants and Toddlers
  http://www.cdc.gov/LifeStages/infants_toddlers.html
- Complementary Foods
  http://www.nal.usda.gov/wicworks/Topics/infant_nut_solids.html
- Feeding Kids Newsletter
  http://www.nutritionforkids.com/Feeding_Kids.htm
- Gerber—Start Healthy, Stay Healthy
  http://www.gerber.com/Nutrition_Feeding/SHSH_Nutriton_101.aspx
- Growth Charts
  http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm
- Heinz Baby Foods
  http://www.heinzbaby.com/
- Infant Nutrition
  http://www.nal.usda.gov/fnic/etext/000106.html
- Kids Health
  http://www.kidshealth.org/
- Medline Plus
  http://www.nlm.nih.gov/medlineplus/infantandtoddlernutrition.html

- National Center for Maternal and Child Health
  http://www.healthystartassoc.org/
- Nestle Very Best Kids
  http://www.verybestkids.com/
- Pediatric Nutrition Practice Group
  http://www.pediatricnutrition.org/
- USDA/ARS Children's Nutrition Research Center
  http://www.bcm.tmc.edu/cnrc/
- WIC Topics A-Z
  http://www.nal.usda.gov/wicworks/Topics/Infant_Nutrition.html
- World Health Organization
  http://www.who.int/child-adolescent-health/NUTRITION/infant.htm

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Roy SK, et al. Prevention of malnutrition among young children in rural Bangladesh by a food-health-care educational intervention: a randomized, controlled trial. *Food Nutr Bull.* 28:375, 2007.

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CHILDHOOD

NUTRITIONAL ACUITY RANKING: LEVEL 1–2

DEFINITIONS AND BACKGROUND

The American Dietetic Association (2008) has taken the position that children between the ages of 2 and 11 years should have appropriate eating habits so they can achieve optimal physical and cognitive development, a healthy weight, enjoyment of their meals, and reduction of the risk for chronic disease.

While children are not "little adults" and should be treated individually, conversation with an adult is usually required to discuss actual food intake by a child. The ability to recall by children is often limited because of vocabulary and attention span. Children benefit from training, such as with pictures, food models and cups.

Growth during this stage involves changes in appetite, physical activity, and frequency of illnesses. The CDC growth charts provide a guideline for monitoring successful growth related to weight, height, and age. Body mass index (BMI) calculations are now available for use with children, and calculations may be used to identify underweight, potential stunting, or obesity. Prevalence of low height for age (stunting) low weight for age (wasting) and health issues can be higher than desirable.

During the early years of life, eating occurs primarily as a result of hunger and satiety cues. Evidence suggests that, by the time children are 3 or 4 years of age, eating is no longer driven by real hunger but is influenced by a variety of environmental factors, including presentation of larger portions (Rolls et al, 2000) and parenting behaviors. Girls with mothers who are dieting have more ideas about dieting than girls with moms who do not diet (Abramovitz and Birch, 2000).

Children from underserved population groups may have increased risk for obesity, increased serum lipids, and poor dietary consumption patterns of dairy products, fruits, and vegetables. In the past few decades, children's dietary intakes have changed dramatically, and children are eating more meals away from home (Nicklas et al, 2004). Children are becoming more overweight and less active, often from physical inactivity and intake of energy-rich, nutrient-poor foods (American Dietetic Association, 2008). Intake of foods that are less healthful than desired (such as sugar-sweetened beverages, high-fat foods, and refined carbohydrates) plays a role in displacing nutrient-dense foods and can contribute to the risk of childhood obesity, type 2 diabetes, and adult chronic diseases (Stroehla et al, 2005). See Section 3 for childhood obesity and Section 9 for type 2 diabetes in children.

Many children live in poverty; some may be exposed to lead poisoning, others risk ID anemia. The preschool period (1–5 years of age) is a time of rapid and dramatic postnatal brain development, neural plasticity, and of fundamental acquisition of cognitive development such as working memory, attention and inhibitory control (Rosales et al, 2009). Because even mild undernutrition affects brain growth and function, food assistance programs should be

used whenever possible. Children need nutritious snacks to eliminate transient hunger. Attention is easily diverted at this age; total intake may vary from day to day. Scheduling of lunch after physical activity encourages greater intake of all foods and energy.

Misconceptions must be corrected, such as "good foods/bad foods" or "foods that are good for you taste bad." Dietary fat restriction may compromise growth and should not be implemented. There is no proof of long-term safety and efficacy for restricting fat in children's diets; lowered calcium, zinc, magnesium, phosphorus, vitamins E and B_{12}, thiamin, niacin, and riboflavin intakes can be a problem.

The National Academy of Sciences recommends adequate dietary intake of calcium for the development of peak bone mass and prevention of fractures and osteoporosis later in life (Food and Nutrition Board, 2002). The current recommended adequate intake for children 9–18 years of age is 1300 mg/d, based on calcium-balance studies that show that, in healthy children of this age, maximal net calcium balance is achieved with this intake (Food and Nutrition Board, 2002).

Adequate calcium and vitamin D are essential during growth and into puberty, especially during rapid bone growth and mineralization. Current mean dietary intakes are below desired levels; families may need information (Greer and Krebs, 2006). Dietary calcium needs of children who take medications that alter bone metabolism are likely higher than usual.

Infectious diseases of childhood may be related to poor nutrition, especially lack of vitamin C, zinc, and vitamin A (Long et al, 2007). Children who are prone to repetitive illness may benefit from a basic multivitamin–mineral supplement in addition to a carefully planned diet. ID is another major concern in young children (Skalicky et al, 2006). Participation in WIC programs may be helpful (Altucher et al, 2005). Children should have access to an adequate supply of healthful and safe foods that promote optimal physical, cognitive, and social growth and development; nutrition assistance programs play a vital role (American Dietetic Association, 2010).

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial.

Clinical/History

- Age
- Weight
- Height
- Growth percentile for age
- Diet/intake history
- Dental status
- Physical handicaps
- Appetite
- Hydration (I & O)
- Triceps skinfold (TSF)
- Midarm muscle circumference (MAMC), midarm circumference (MAC)

Lab Work

- Glucose
- H & H, serum Fe
- Chol, Trig (check family history for risks)
- Homocysteine
- Alk phos
- Ca^{++}
- Alb (if needed)

INTERVENTION

OBJECTIVES

- Assess growth patterns, feeding skills, dietary intake, activity patterns, inherited factors, and cognitive development. Promote adequate growth and development patterns such as increased independence at 12–18 months (stop bottle, begin eating with a spoon) and growth slowdown from 18 months to 2 years (less interest in food, begin eating with utensils); energy intake varies from 2 to 3 years (control exerted), and brain growth triples by age 6.

SAMPLE NUTRITION CARE PROCESS STEPS

Lead Poisoning in Childhood

Assessment Data: Dietary recall; labs such as H & H, serum ferritin, and serum lead levels; growth charts.

Nutrition Diagnosis (PES): Excessive bioactive substance intake related to lead consumption from lead-based paint exposure in environment as evidenced by high serum lead levels, documented ID anemia, and deposition seen on x-rays.

Intervention: Education and counseling tips on avoiding accidental lead intake; increasing sources of iron and calcium in the diet; tips on reducing environmental lead sources; running water awhile before drinking.

Monitoring and Evaluation: Reduced intake of sources of lead; improved lab values, improved weight gain on growth grid; successful growth and development.

Limited Fruit-Vegetable Consumption

Assessment Data: Dietary recall; growth charts; physical signs of malnutrition.

Nutrition Diagnosis (PES): Inadequate vitamin intake (vitamin C) related to minimal consumption of fruits and vegetables as evidenced by diet history, no use of children's vitamins or fortified foods, and signs of bleeding gums, petechiae, irritability, and easy bruising.

Intervention: Education and counseling tips on improving intake of fruits and vegetables; recipes and tips for increasing citrus fruits and good sources of vitamin C in foods well accepted by children. Referral to WIC program if eligible.

Monitoring and Evaluation: Improved signs of nutrition and resolution of bleeding gums, etc; diet history and mother's description of improved vitamin C intake and financial assistance from WIC.

- Avoid food deprivation, which may decrease ability to concentrate, cause growth failure or anemia, aggravate stunting, and lead to easy fatigue.
- Monitor long-term drug therapies and related side effects, such as use of anticonvulsants and the effects on folate, vitamin D and growth.
- Assess nutritional deficiencies, especially iron. If possible, detect and correct pica (eating nonfood items or any one food to the exclusion of others—even ice chips). Prevent "milk anemia" from drinking too much milk with meals and not consuming enough iron-rich meats, grains, and vegetables.
- Evaluate status of the child's dental health. Prevent dental decay.
- Support adequate nutritional immunity through a balanced diet; encourage vaccinations to prevent infectious diseases such as measles, mumps, and tetanus.
- Promote adequate intake of calcium, vitamin D, fiber, and zinc, which are nutrients that are often poorly consumed by young children.
- Help reduce onset of chronic diseases later in life by prudent menu planning and meal intakes. Early lesions of atherosclerosis begin in childhood; diet, obesity, exercise, and certain inherited dyslipidemias influence progression of such lesions (American Heart Association, 2006; Holmes and Kwiterovich, 2005). Good nutrition, a physically active lifestyle, and absence of tobacco use can delay or prevent the onset of cardiovascular disease (American Heart Association, 2006).
- Avoid mislabeling overweight children as "fat," which may trigger eating disorders (EDs) later. All providers should be aware of the problems of childhood obesity and refer accordingly. See entry in the text about childhood obesity.
- To promote proper growth, especially for stature, parents and caretakers should limit sweetened beverage intake to 12 fl oz/d; fruit juice should be only 4–6 oz daily for proper dental health and to prevent diarrhea. Encourage sufficient calcium intake from dairy beverages.
- Emphasize food variety to reduce fear of new foods (neophobia), which may reduce nutritional status. Introduction of many new foods and flavors before age 4 may be an important way to enhance children's acceptance of new food items (Nicklas et al, 2005).

FOOD AND NUTRITION

- Energy and nutrient requirements vary by age and sex; see charts below.

	Recommendation		
Nutrient	**Ages 1–3 Years**	**Ages 4–8 Years**	**Ages 9–13 Years**
Energy	1046 kcal/d	1742 kcal/d	2279 kcal/d males; 2071 females
Protein	13 g/d or 1.1 g/kg	19 g/d or 0.95 g/kg	34 g/d or 0.95 g/kg
Calcium	500 mg/d	800 mg/d	1300 mg/d
Iron	7 mg/d	10 mg/d	8 mg/d
Folate	150 μg/d	200 μg/d	300 μg/d
Phosphorus	460 mg/d	500 mg/d	1250 mg/d
Vitamin A	300 μg	400 μg	600 μg
Vitamin C	15 mg/d	25 mg/d	45 mg/d
Thiamin	0.5 mg/d	0.6 mg/d	0.9 mg/d
Riboflavin	0.5 mg/d	0.6 mg/d	0.9 mg/d
Niacin	6 mg/d	8 mg/d	12 mg/d
Fiber	19 g	25 g	26 g females; 31 g males
Sodium	<1500 mg	<1900 mg	<2200 mg
Potassium	3000 mg	3800 mg	4500 mg

Data adapted from: A Report of the Panel on Macronutrients, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes; Food and Nutrition Board; and Institute or Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids*. Washington, DC: The National Academies Press, 2005:1357.

- The American Dietetic Association (2008) supports the following macronutrient distribution:

  Carbohydrates—45–65% of total calories. Added sugars should not exceed 25% of total calories (to ensure sufficient intake of essential micronutrients).

  Fat—30–40% of energy for 1–3 years and 25–35% of energy for 4–18 years.

  Protein—5–20% for young children and 10–30% for older children. Include protein foods with 50% high biological value when possible.

- The American Heart Association and the American Academy of Pediatrics support portion control and energy intake as shown in Table 1-10. Where there is evidence or high risk for cardiovascular disease, start with a diet low

TABLE 1-10 Daily Estimated Calories and Recommended Servings in Children and Teens

	1 Year	2–3 Years	4–8 Years	9–13 Years	14–18 Years
Kilocalories[a]					
Female	900	1000	1200	1600	1800
Male	900	1000	1400	1800	2200
Fat,% of total kcal	30–40	30–35	25–35	25–35	25–35
Milk/dairy, cups[b]	2[c]	2	2	3	3
Lean meat/beans, oz	1.5	2		5	
Female			3		5
Male			4		6
Fruits, cups[d]	1	1	1.5	1.5	
Female					1.5
Male					2
Vegetables, cups[d]	¾	1			
Female			1	2	2.5
Male			1.5	2.5	3
Grains, oz[e]	2	3			
Female			4	5	6
Male			5	6	7

Calorie estimates are based on a sedentary lifestyle. Increased physical activity will require additional calories: increase of 0–200 kcal/d if moderately physically active and increase of 200–400 kcal/d if very physically active.

[a]For child 2 years and older; adapted from Tables 2 and 3 and Appendix A-2 in U.S. Department of Health and Human Services, U.S. Department of Agriculture. *Dietary guidelines for Americans*. 6th ed. Washington, DC: U.S. Government Printing Office, 2005; www.healthierus.gov/dietaryguidelines. Nutrient and energy contributions from each group are calculated according to the nutrient-dense forms of food in each group (e.g., lean meats and fat-free milk).

[b]Milk listed is fat free (except for children under the age of 2 years). If 1%, 2%, or whole-fat milk is substituted, this will use, for each cup, 19, 39, or 63 kcal of discretionary calories and add 2.6, 5.1, or 9.0 g of total fat, of which 1.3, 2.6, or 4.6 g are saturated fat, respectively.

[c]For 1-year-old children, calculations are based on 2% fat milk. If 2 cups of whole milk are substituted, 48 kcal of discretionary calories will be utilized. The American Academy of Pediatrics recommends that low-fat/reduced-fat milk not be started before 2 years of age.

[d]Serving sizes are 1/4 cup for 1 year of age, 1/3 cup for 2–3 years of age, and 1/2 cup for ≥4 years of age. A variety of vegetables should be selected from each subgroup over the week.

[e]Half of all grains should be whole grains.

Sources: American Heart Association, 2006, and Pediatrics Web site, http://pediatrics.aappublications.org/cgi/content/full/117/2/544/T3; accessed February 2, 2009.

in total and saturated fat, trans fats, and cholesterol; use water-soluble fiber and plant sterols; promote weight control and exercise (Holmes and Kwiterovich, 2005). For example, select lower fat foods, use low-fat cooking techniques, spread jelly on bread instead of butter.

- Offer calcium to increase mineral density. Yogurt, plain or flavored milks, calcium-fortified juices or soy milk, soft-serve ice cream, and cheeses are generally well accepted by children. If dairy foods are not used, include foods such as 1 oz of cooked dried beans (161 mg), 10 figs (169 mg), spinach (120 mg), 1 packet of oatmeal (100 mg), 1 medium orange (50 mg), 1/2 cup of mashed sweet potato (44 mg), or 1/2 cup of cooked broccoli (35 mg).
- Phosphorus intake should be relatively similar to calcium intake.
- Give 50–60 mL/kg of fluids daily. Milk, fruit juice, vegetable juices, and water should be the basic fluids offered. Cut out carbonated beverages as much as possible.
- Encourage exposure to sunlight and monitor dietary intake of vitamin D. Adequate folate, magnesium, selenium, and vitamin E are important to obtain from dietary sources.
- Day care meals given for a 4- to 8-hour stay should provide for one third to one half of daily needs. School lunch programs generally provide one third of daily needs. Meals at home should be planned carefully to make up the difference.
- Fiber from fruits, vegetables, grains, and legumes may help to prevent or alleviate constipation. Ensure that adequate fluid is consumed each day.

Common Drugs Used and Potential Side Effects

- Anticonvulsants may cause problems with the child's growth and normal body functions. Diet should be adjusted carefully, such as increasing intake of folate.
- Corticosteroids may cause growth stunting if given over an extended time in large doses.
- Drug therapy with inhibitors of hydroxymethylglutaryl CoA reductase, bile acid sequestrants, and cholesterol absorption inhibitors may be considered in those with a positive family history of premature coronary artery disease and a low-density lipoprotein (LDL) cholesterol level above 160 mg/dL after dietary and lifestyle changes (Holmes and Kwiterovich, 2005).
- Nutritional supplements should be taken only when prescribed by a physician, although over-the-counter use is

common. Avoid serving cereals to children that fulfill the adult RDAs for vitamins and minerals. Poly-Vi-Fluor contains fluoride; use caution in areas where water is fluoridated. Too much can cause fluorosis.

- Stimulants such as methylphenidate (Ritalin) or dextroamphetamine (Dexedrine) work on dopamine levels and may cause anorexia, growth stunting, nausea, stomach pain, or weight loss; use frequent snacks. Strattera (atomoxetine) works on norepinephrine; it may also decrease appetite.
- Tofranil (imipramine,) used for bedwetting, can cause dry mouth. Include adequate liquids.

Herbs, Botanicals, and Supplements

- Herbs and botanical supplements have not been proven to be safe for children. While not needed or desirable, use of nutrient supplements is common in the first 2 years of life (Eichenberger Gilmore et al, 2005).
- Discuss the relevance of tolerable ULs from the dietary reference intakes of the National Academy of Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements.
- Children are more prone to toxicity than adults. For example, jinbuhuan causes bradycardia and CNS and respiratory depression and is to be avoided in children; fenugreek may trigger asthma in susceptible individuals.

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Children should be treated respectfully. Converse with the child and not only with parents or caregivers. A personalized conversation elicits the most effective response. Review Erikson's developmental phases of childhood (1963): toddlers 1–3 years of age want autonomy; preschoolers 4–6 years of age seek initiative; and school-age children (6–12 years of age) are industrious. Age-appropriate games, projects, or tasks help in learning nutrition concepts.
- Explain the age-appropriate diet for children. Encourage parents to use finger foods for toddlers. Young children have food jags, and they often prefer single foods. Older children need nutritious snacks such as cheese cubes and iron-rich desserts. Avoid use of high-energy foods with low nutrient value.
- Encourage a relaxed atmosphere at mealtime, without pressure to eat, hurry, or finish meals. Bribery or rewards for eating should not be used; rewards can actually decrease acceptance. Parents must not "control" meals or foods; disordered eating may result.
- Education is needed to support optimal nutrition and physical activity; see Table 1-11 (American Heart Association, 2006).
- With toddlers, continue use of iron-fortified cereal and juices that are naturally high in vitamin C.
- Children should be allowed to vary in their food acceptance, choices, and intake. An authoritative feeding style is generally more effective than an authoritarian style (Patrick et al, 2005).
- Proper atmosphere is important to children since their eating patterns are strongly influenced by both the physical and social environment. Children are more likely to eat foods that are available and easily accessible; they tend to eat greater quantities when larger portions are provided; and structured family mealtimes are important (Patrick and Nicklas, 2005).
- Many children skip breakfast each day. Discuss the importance of eating breakfast for enhancing the abilities to concentrate, learn, and retain new information. Breakfasts should contain a variety of foods, with high-fiber and nutrient-rich whole grains, fruits, and dairy products (Rampersaud et al, 2005).
- Promote healthy meals at school. School-aged children need adequate meals and snacks to eliminate transient hunger. Recess before lunch is a good way to increase intake.
- Both school and the community have a shared responsibility to provide students with high-quality foods and school-based nutrition services (American Dietetic Association, 2006). Establish at least one "champion" for nutrition issues at school (e.g., a parent, the principal, the foodservice manager), and promote teamwork (Making It Happen, 2009). Standards should allow children to have access to nutritious choices.
- Knowledge and training are needed to improve food consumption patterns as children consume foods away from home and as they take on greater responsibility for meal preparation and food selection.
- Zinc absorption is improved when consumed with dairy products (Baylor, 2009).
- Vegan children should be encouraged to consume adequate sources of vitamin B_{12}, riboflavin, zinc, and calcium, and vitamin D if sun exposure is not adequate.
- Children who have chronic illnesses fare better if parents give them responsibilities, such as meal planning and taking their own medications. Tasks should be age appropriate. Section 3 addresses pediatric illnesses in greater detail.
- Nutrition education targeting low-income African–American parents should address planning and preparing convenient and economical meals and snacks that include fruits and vegetables using social support strategies (Hildebrand and Shriver, 2010).
- Specific considerations about lead poisoning and measles are found in Table 1-12.
- Adult diseases often have a fetal or childhood onset. Childhood height, growth, diet and BMI have been associated with breast cancer later in life (Ruder et al, 2008). Size at birth, rapid weight gain, and childhood growth patterns affect the onset of type 2 diabetes (Dunger et al, 2007). Elevations in homocysteine levels begin in childhood and have implications for stroke and heart disease (Kerr et al, 2009).
- A dramatic increase in childhood obesity is related to many things, including decreased physical activity and fitness. Too much time in front of the television or computer results in low energy expenditure. Promote healthy forms of activity; the USDA Kids' Activity MyPyramid Food Guidance System is a useful guide. Table 1-13 provides suggestions for increasing physical activity.

TABLE 1-11 General Dietary Recommendations for Children Aged 2 years and Older

Balance dietary calories with physical activity to maintain normal growth.

Get 60 minutes of moderate to vigorous play or physical activity daily.

Use fresh, frozen, and canned vegetables and fruits and serve at every meal.

Limit high-calorie sauces such as Alfredo sauce, cream sauces, cheese sauces, and hollandaise.

Use canola, soybean, corn, safflower, or olive oils in place of solid fats during food preparation.

Reduce the intake of sugar-sweetened beverages and foods. Limit juice intake to 1–2 servings.

Use nonfat (skim) or low-fat milk and dairy products daily.

Remove the skin from poultry before eating.

Use only lean cuts of meat and reduced-fat meat products.

Introduce and regularly serve fish as an entree, especially oily fish, broiled, or baked.

Use recommended portion sizes on food labels when preparing and serving food.

Eat whole-grain breads and cereals rather than refined products; read labels and ensure "whole grain" as the first ingredient on the food label (Thane et al, 2005).

Eat more legumes (beans) and tofu in place of meat several times a week.

Reduce salt intake, including salt from processed foods (breads, breakfast cereals, soups).

Read food labels and choose high-fiber, low-salt/low-sugar alternatives.

Patient Education—Food Safety

- Children should be taught to wash their hands before eating and after use of the toilet, sneezing, etc., to prevent foodborne illness and the spread of various infections.
- Children can be taught to avoid food and beverages that have an unusual flavor or odor.
- Avoid raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Five of the most commonly eaten varieties of fish are low in mercury (shrimp, canned light tuna, salmon, pollack, and catfish); AHA continues to recommend two servings of fish weekly (American Heart Association, 2006).

TABLE 1-13 Tips for Encouraging Children to Enjoy Nutrition and Physical Activity

Children should be empowered to make food choices that reflect the Dietary Guidelines for Americans.

Good nutrition and physical activity are essential to children's health and educational success.

School meals that meet the Dietary Guidelines for Americans should appeal to children and taste good.

Programs must build upon the best science, education, communication, and technical resources available.

School, parent, and community teamwork is essential to encouraging children to make food and physical activity choices for a healthy lifestyle.

Messages to children should be age appropriate and delivered in a language they speak, through media they use, and in ways that are entertaining and actively involve them in learning.

Focus on positive messages regarding the food choices children can make.

Support education and action at national, state, and local levels to improve children's eating behaviors.

Source: USDA Team Nutrition, http://www.fns.usda.gov/tn; accessed January 31, 2009.

- Do not use raw (unpasteurized) milk or products made from it.
- Avoid serving unpasteurized juices and raw sprouts.
- Only serve certain deli meats and frankfurters that have been reheated to steaming hot temperature.
- Child care centers should follow guidelines for safe food handling and for inclusion of nutritious meals and snacks (American Dietetic Association, 2010). A safe and sanitary setting is needed.

For More Information

- Activity Pyramid for Children
  http://extension.missouri.edu/explorepdf/hesguide/foodnut/n00386.pdf
- American Academy of Pediatrics
  http://www.aap.org/
- American Dietetic Association
  http://www.eatright.org
- American Dietetic Association—Fact sheets
  http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition_350_ENU_HTML.htm
- American School Foodservice Association
  http://www.asfsa.org/

TABLE 1-12 Special Considerations in Children: Lead Poisoning and Measles

Lead Poisoning: Lead poisoning is the most common environmental health problem affecting American children. Exposure occurs through ingestion of lead-contaminated household dust and soil in older housing containing lead-based paint. Lead replaces calcium in the bone; deposition may be seen in x-rays of the knee, ankle, or wrist. Anemia may also occur. Lead is also a confirmed neurotoxicant; lower arithmetic scores, reading scores, nonverbal reasoning, and short-term memory deficits occur. Nutritional interventions suggest regular meals with adequate amounts of calcium, and iron supplementation. Parents need education about lead exposure, hygiene, and housekeeping measures to prevent ingestion of dust and soil. Use drinking water from the cold tap, not hot water tap. Bottled water is not guaranteed as a safe alternative. Blood lead screening may be recommended universally at ages 1 and 2 years. For more information, visit the CDC website: http://www.cdc.gov/nceh/lead/lead.htm and the Environmental Protection Agency website at: http://www.epa.gov/lead/pubs/nlic.htm.

Measles and Blindness in Children: Childhood blindness and visual impairment in developing countries remains a significant public health issue (Maida et al, 2008). Control of blindness in children is a priority within the World Health Organization's VISION 2020 program. Vitamin A supplementation and measles immunizations and have caused a decrease in xerophthtalmia; cataract is more treatable (Maida et al, 2008).

- Bright Futures
  http://www.brightfutures.org
- Centers for Disease Control and Prevention—Children
  http://www.cdc.gov/LifeStages/children.html
- Children's Nutrition Research Center—Baylor University
  http://www.bcm.tmc.edu/cnrc/
- Growth Charts
  http://www.cdc.gov/growthcharts
- Healthy School Meals
  http://schoolmeals.nal.usda.gov/
- Kids Activity Pyramids
  http://www.uwex.edu/ces/cty/waupaca/documents/KidsActivityPyramid.pdf
- Kids Nutrition
  http://www.kidsnutrition.org/consumer/archives/
- My Pyramid for Preschoolers
  http://www.mypyramid.gov/preschoolers/index.html
- Pediatric Nutrition Practice Group
  http://www.pediatricnutrition.org/
- Team Nutrition
  http://www.fns.usda.gov/tn/Healthy/execsummary_makingithappen.html
- USDA Kids MyPyramid Food Guidance System
  http://www.cnpp.usda.gov/FGP4Children.htm

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ADOLESCENCE

NUTRITIONAL ACUITY RANKING: LEVEL 2

DEFINITIONS AND BACKGROUND

Adolescents need to consume food and beverages that provide adequate energy and nutrients to reduce risk for poor outcomes including growth retardation, ID anemia, poor academic performance, development of psychosocial difficulties, and an increased likelihood of developing diseases such as heart disease and osteoporosis (American Dietetic Association, 2010). Breakfast consumption is important to enhance cognitive function related to memory, test grades, and school attendance (Rampersaud et al, 2005).

Physiological growth is more accurately assessed by using Tanner Stages than by chronological age alone. Girls often start their growth spurt by age 10–11 and generally stop by age 15, whereas boys begin at 12–13 and generally stop by age 19. Teens require increased nutrients for accelerated growth; deficiencies can lead to loss of height, osteoporosis, and delayed sexual maturation.

Skeletal growth is unpredictable, and girls may gain 3.5 inches in 1 year, and boys may gain 4 inches in 1 year. When the teen years begin, the adolescent has achieved 80–85% of final height, 53% of final weight, and 52% of final skeletal mass. Teens may almost double their weight and can add 15–20% in height. Maintaining adequate calcium intake during childhood and adolescence is necessary for the development of peak bone mass, which may be important in

reducing the risk of fractures and osteoporosis later in life (Greer and Krebs, 2006).

Some teens develop more rapidly than others (early maturers), while others may develop more slowly (late maturers). The Tanner stages of development are more useful than just use of chronological age. Girls who mature early may be prone to depression, EDs, and anxiety. Obesity is an increasing trend. Parental pressure and weight status concerns are evident among girls who are "picky eaters" (Galloway et al, 2005).

Intakes change often during teen years, especially during growth spurts and stages of physical maturation. Sociocultural influences affect adolescent eating patterns and behaviors. Some teens reject a meat-based diet to become vegetarians; others take up dieting to lose weight or develop an ED. Meal skipping, snacks at odd hours, laxative or diuretic use, fasting, bulimia, self-induced vomiting, and sports requirements are issues that should be addressed in a nutritional assessment. Food choices established during childhood and adolescence tend to persist into adulthood (Fitzgerald et al, 2010). Adolescents need improved diets. Fast food is one factor that impacts adolescents' intake of nutrient-dense foods (Sebastian et al, 2009).

Daily requirement tables separate preteens as ages 9–13 years and teen years as ages 15–18 years. The growth spurt of girls occurs at 9½ to 13½ years of age; menarche generally occurs at 12½ years. For boys, the growth spurt occurs between 11 and 14½ years. Sexual maturation occurs at ages 10–12 years for girls and at ages 12–14 years for boys. The increase in percentage of total body fat in girls is 1.5–2 times that in boys at this time. Boys have greater increases in lean body mass (LBM, muscle) and greater increases in height before epiphyseal closure of long bones occurs. Most skeletal growth is completed by 19 years of age. Girls have more total body fat and less total body water than boys.

According to Erickson's psychological stages of development (1968), teens (12–18 years of age) are working on "identity." In cognitive development, the concrete, "here and now" stage lasts from ages 11 to 14 years in girls and from ages 13 to 15 years in males. Early abstract thinking and daydreams are common among 15- to 17-year-old females and 16- to 19-year-old males. True abstract thinking and idealism (faith, trust, and spirituality) occur for young women at ages 18–25 years and for males at 20–26 years of age.

The brain continues developing through late adolescence, especially with the nerve fiber system that transmits messages from one hemisphere to the other. There is an increase in gray matter at the onset of adolescence, followed by a substantial loss in the frontal lobes from the mid-teens through the mid-twenties, where inhibiting impulses and regulating emotions may be altered. Teens should make the most of their brains during this time, when they can "hard wire" their ability to process skills in academics, sports, and music. Among adolescents, parental control begins to diminish; teens exercise more autonomy over their food choices as compared with children (Fitzgerald et al, 2010).

Dietary intake and body size influence age at menarche and growth patterns in teen girls. Puberty comes early for some girls because of a gene (*CYP1B1*) that speeds up the body's breakdown of androgensas well as percentage of energy intake from dietary protein. These factors have implications for later development of diseases, including breast cancer and heart disease. Another concern is polycystic ovarian syndrome (PCOS). The genetic polymorphisms are not yet clearly identified, but the risks for metabolic syndrome, diabetes, infertility and heart disease must be managed. Diet, physical activity, insulin-sensitizers or anti-androgen medications may be useful. Weight loss of 5–10% may help improve blood functions and ovarian function.

Teens should have access to an adequate supply of healthful and safe foods that promote optimal physical, cognitive, and social growth and development; nutrition assistance programs play a vital role (American Dietetic Association, 2010).

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial.

Clinical/History

- Age
- Height
- Weight
- Weight/height percentile
- BMI or HBW
- Waist to hip ratio
- Recent changes (height, weight)
- Diet history
- Tanner stage of sexual maturation
- Hydration status (I & O)
- Physical activity level or athletics
- Physical handicaps
- Disordered eating patterns
- GI complaints
- Signs of PCOS in girls
- Sleep disorder screening

Lab Work

- H & H, serum Fe
- Glucose
- Chol
- Trig
- Albumin (if needed)
- Na^{+}, K^{+}
- Ca^{++}, Mg^{++}, phosphorus
- Homocysteine

SAMPLE NUTRITION CARE PROCESS STEPS

Disordered Eating Pattern

Assessment Data: Dietary recall; labs such as H & H, serum ferritin; growth charts; recent growth spurt; age at menarche.

Nutrition Diagnosis (PES): Disordered eating pattern related to dieting behavior as evidenced by restricted eating, skipping breakfast, frequent infections, BMI of 19, low H & H, irregular intake of nutrient-dense foods and daily consumption of fast foods.

Intervention: Education and counseling tips on desirable nutritional intake in adolescence; consequences on energy, appearance and health from poor dietary habits.

Monitoring and Evaluation: Improved intake of nutrient-dense foods; improved lab values, improved quality of life (energy for school, recreation, and physical activity) and fewer illnesses.

INTERVENTION

OBJECTIVES

- Provide adequate energy for growth and development, especially for current and future growth spurts.
- Evaluate the patient's weight status. Offer appropriate guidance.
- Prevent or correct nutritional anemias. Determine a girl's sexual maturity, onset of menstruation, and growth spurts, which are often associated with iron depletion. Alter diet accordingly to provide sufficient vitamins and minerals.
- Evaluate use of fad diets, skipping meals, unusual eating patterns, or tendency toward EDs. If problems are noted, seek immediate assistance. Family therapy may be beneficial.
- To prevent obesity in a teen whose parents are obese, a family approach focused on regular breakfast consumption is most beneficial (Fiore et al, 2006).
- Prevent future tendency toward osteoporosis. Because of the influence of the family's diet on the diet of children and adolescents, adequate calcium intake by all members of the family is important; low-fat dairy products, fruits and vegetables, and appropriate physical activity are important for achieving good bone health (Greer and Krebs, 2006).
- Encourage healthy food choices according to the factors of greatest interest to teens (taste and appearance). Health, energy, and price are often not viewed as essential at this stage. Introduce food changes one at a time.
- Vegetarians should be encouraged to consume adequate sources of vitamin B_{12}, riboflavin, zinc, iron, calcium, protein, and energy for growth. Cobalamin deficiency, in the absence of hematologic signs, may lead to impaired cognitive performance. Vegan children tend to have higher intakes of fiber and lower intakes of saturated fatty acids and cholesterol than omnivore children; they may need to increase intake of omega-3 fatty acids.
- Girls may have higher total serum cholesterol concentration than boys, somewhat related to differences in male and female hormones.

FOOD AND NUTRITION

- The MyPyramid Food Guidance System: 4 cups of milk or equivalent source of calcium; 2–3 servings of meat or equivalent; 6–12 servings from the bread group; 2–4 servings of fruit or juices; 3–5 servings from vegetable group.
- Protein intake should be sufficient to support growth. For energy needs, see nutrient recommendation charts.

	Recommendation	
Nutrient	**Males 14–18 Years**	**Females 14–18 Years**
Energy	3152 kcal/d	2368 kcal/d
Protein	52 g/d or 0.85 g/kg/d	46 g/d or 0.85 g/kg/d
Calcium	1300 mg/d	1300 mg/d
Iron	12 mg/d	15 mg/d
Folate	400 μg/d	400 μg/d
Phosphorus	1250 mg/d	1250 mg/d
Vitamin A	900 mg	700 mg
Vitamin C	75 mg/d	75 mg/d
Thiamin	1.2 mg/d	1.0 mg/d
Riboflavin	1.3 mg/d	1.0 mg/d
Niacin	16 mg/d	14 mg/d

Data from: Food and Nutrition Board, Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients)*. Washington, DC: National Academy Press, 2002.

- Snacks should be planned as healthy options. Snacking frequency affects intake of macronutrients and a few micronutrients and promotes consumption of fruits; an excess of discretionary calories as added sugars and fats (Sebastian et al, 2009).
- Adequate zinc and iodine are needed for growth and sexual maturation; use iodized salt and foods such as meat and dairy products.
- Calcium is needed for bone growth; vitamins D and A are also essential in this age group. Iron is needed for menstrual losses in girls.
- Debut age of drinking alcohol is important to note. If drinking begins before age 15, there is twice the risk of substance abuse and four times the risk of dependence.
- Diet for athletes: an acceptable diet for the athlete would be a normal diet for age, sex, and level of activity plus adequate intake of carbohydrates and fluids. Avoid excess of protein and inadequate replacement of electrolytes (see Sports Nutrition entry).
- For pregnant teens, follow guidelines listed in Table 1-14.

TABLE 1-14 Special Considerations for Adolescent Pregnancy

Issue	Comments
Mother is still growing	Check gynecological age (chronological age less age of menarche) to determine future potential growth of the mother.
Low birth weight (LBW) and prematurity	Fetuses grow more slowly in 10- to 16-year-olds. Increased weight in the last trimester is helpful in lessening the incidence of LBW.
Fetal growth and optimal nutritional status during and after gestation	By the end of the pregnancy, the mother's desired weight gain should be between 25 and 35 lb. Add desired increments for energy for requirements of same-age nonpregnant teens, or monitor the weight gain pattern to assess the adequacy of the present diet. Adolescents are at high risk of gaining an excessive amount of weight during pregnancy and should be monitored during pregnancy by dietetics professionals.
Protein requirements	Protein requirement is 1.1 g/kg body weight for most adolescents.
Prenatal supplements	The physician will prescribe prenatal vitamins.
Meal patterns	Mom will need 5 cups of milk, 3 servings of protein or meat, 4 servings of fruits/vegetables, 4 servings of breads/cereals. Three snacks daily will be needed.
Nutrients needed	Frequently missing nutrients include calcium, zinc, iron, folate, vitamins A and B_6 and C. Nutrient-dense choices include: Vitamin A: Chicken liver, cantaloupe, mango, spinach, apricots. Vitamin C: Citrus fruits and juices, broccoli, spinach, melon, strawberries. Calcium: Low-fat milk, yogurt, broccoli, cheddar cheese, low-fat shakes, skim-milk cheeses. Iron: Liver, rice, whole milk, raisins, baked potatoes, enriched cereal. Vitamin B_6: White meats, bananas, potatoes, egg yolks. Folacin: Wheat germ, spinach, asparagus, strawberries. Zinc: Apples, chicken, peanut butter, tuna, rice, whole milk.
Bad habits, cravings, and aversions	Discourage skipping of meals. Cravings are common, especially for chocolate, fruit, fast foods, pickles, and ice cream. Watch for aversions to meat, eggs, and pizza during this time.
Iron deficiency anemia (IDA) during pregnancy	Women who conceive during or shortly after adolescence are likely to enter pregnancy with low or absent iron stores. IDA during pregnancy is associated with significant morbidity for mothers and infants; supplementation is a strategy to improve iron balance in pregnant teens.
Smoking	Pregnant teens are more likely to smoke, to deliver preterm infants, and to have their infants die in the first year than other mothers (Markovitz et al, 2005).
Resistance to authority figures	Encourage the teen to see herself as having a key role in providing good nutrition for her new family. Allow her to express her feelings and concerns.
WIC Program	Encourage enrollment in programs such as WIC where an individualized nutrition risk profile is developed for each pregnant teen. Positive outcomes are noted in birth weight, rates of low or very low birth weight, preterm delivery, maternal morbidity, and perinatal morbidity/mortality (Dubois et al, 1997).

Common Drugs Used and Potential Side Effects

- Vitamin-mineral supplements are not needed, except for pregnant teens or teens whose diets are generally inadequate (such as those following an unplanned vegetarian pattern or restricted energy plans). The majority of American teens do not use supplements; those who do use them tend to eat a more nutrient-dense diet than those who do not. Vitamins A and E, calcium, and zinc tend to be low regardless of use of supplements. In addition, excesses of these nutrients are not recommended and may lead to toxic levels of vitamins A and D if taken indiscriminately.
- Discuss the relevance of tolerable ULs from the dietary reference intakes of the National Academy of Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements.
- Monitor use of nonprescription medications (such as aspirin and cold remedies) and use of illegal drugs, including marijuana and alcohol. Side effects may include poor oral dietary intakes of several nutrients. Smoking cigarettes tends to decrease serum levels of vitamin C.

Herbs, Botanicals, and Supplements

- Herbs and botanical supplements should not be used without discussing with the physician. In general, these supplements have not been proven to be safe for adolescents. There may be subgroups that are at risk for inappropriate use of these products (e.g., individuals with EDs and athletes).
- The use of multivitamin–mineral preparations is most common. More males than females use creatine and diuretics. Females consume herbal weight control products significantly more than males.
- Athletes reported supplementing with creatine and protein. There may be misguided beliefs in performance enhancement by these products.

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Explain the MyPyramid Food Guidance System and the rationale behind the concepts. School-based interventions to promote healthy choices are beneficial.

- Diets of teens are often low in vitamins A and C, folate, and iron. Discuss the concept of nutrient density; food comparison charts are useful. Encourage a minimum of five servings of fruits and vegetables daily. Having easy access to ready-to-eat, appealing fruits and vegetables is important (Befort et al, 2006). Educate about desirable snacks; link discussions to dental and oral health.
- Limit intake of sweetened beverages (soda, sweetened tea, fruit drinks) to improve nutrient density (Nelson et al, 2009) and to prevent or correct obesity (Dubois et al, 2007).
- Explain the relation of diet to the needs of the adolescent athlete, as well as its influence on skin, weight control, and general appearance.
- Discuss body image, heroes, and peer pressure. Boys generally want larger biceps, shoulders, chests, and forearms. Girls often want smaller hips, waistlines, and thighs, and larger bustlines.
- The 5-year period between adolescence and adulthood is a time of potential weight gain. Emphasize the importance of not skipping meals, especially breakfast. Discourage obsessions with dieting and weight and promote safe dieting practices when needed.
- Discuss calcium and vitamin D; many adolescent girls consume inadequate amounts. Assess current intake by asking questions such as: How many times a day do you drink milk or eat cheese and yogurt? Have you had any bone fractures? Low-fat dairy products may be helpful for maintaining or achieving a HBW; use 3–4 servings daily. Teens who live in northern climates may need extra vitamin D intake (Sullivan et al, 2005).
- Teens respond well to discussions that respect their independence, sense of justice, and idealism. One of their roles is to establish a clear identity of how they fit into the world. Teens spend increased amounts of time with their friends but still tend to conform to parental ideals when it comes to values, education, and long-term life plans. Help the family recognize the adolescent's need for independence in choosing meals and snack items.
- Teens often feel that "it can't happen to me," prompting them to take unnecessary risks like drinking and driving ("I won't crash this car"), having unprotected sex ("I can't possibly get pregnant"), or smoking ("I can't possibly get cancer"). Effects of various nutrients on appearance or energy levels may be helpful.
- Encourage family meals and discuss options for nourishing meals eaten away from home ("portable foods"). Parents play a large role in modeling eating behavior; today's access to low density, high-energy foods must be carefully managed to prevent obesity (Savage et al, 2007). Parents need to limit soft drink consumption and encourage intake of calcium-rich beverages (Cluskey et al, 2008).
- Parents need to work closely with physicians when there are childhood-onset disorders, especially when it is time to change from a pediatrician to a doctor treating young adults (Peter et al, 2009).
- Consumption of fast food is common and may contribute to weight gain if not carefully monitored. A focus on eating or physical activity behaviors without discussing weight specifically is preferred over direct approaches about weight (Shrewsbury et al, 2010).

Patient Education—Food Safety Tips

- Since teens may not think about the consequences of their actions, gentle reminders about hand washing and safe food handling may be important. Use of hand sanitizers may be popular among teen girls.
- Avoid raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Do not use raw (unpasteurized) milk or products made from it.
- Avoid serving unpasteurized juices and raw sprouts.
- Only serve processed deli meats and frankfurters that have been reheated to steaming hot temperature.
- Safe food handling is an important part of school food service (American Dietetic Association, 2006).

For More Information

- American Academy of Child and Adolescent Psychology
  http://www.aacap.org/
- Attention Deficit Hyperactivity Disorder
  http://www.nimh.nih.gov/publicat/adhd.cfm#adhd14
- Body and Mind (BAM)
  http://www.bam.gov/index.html
- Body Image
  http://www.focusas.com/BodyImage.html
- Bright Futures—Adolescence
  http://brightfutures.aap.org/web/
- Calorie King
  http://www.calorieking.com/
- Centers for Disease Control and Prevention—Adolescents
  http://www.cdc.gov/HealthyYouth/az/index.htm
- Food Safety for Teens
  http://www.fsis.usda.gov/food_safety_education/for_kids_&_teens/index.asp
- National Institute of Health and Human Development
  http://www.nichd.nih.gov/health/
- Polycystic Ovarian Syndrome
  http://women.webmd.com/tc/polycystic-ovary-syndrome-pcos-topic-overview
- President's Challenge for Physical Activity
  http://www.presidentschallenge.org/
- Teens Health
  http://kidshealth.org/teen/
- Vegetarian Nutrition for Teens
  http://www.vrg.org/nutrition/teennutrition.htm

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Sullivan SS, et al. Adolescent girls in Maine are at risk for vitamin D insufficiency. *J Am Diet Assoc*. 105:971, 2005.

PHYSICAL FITNESS AND STAGES OF ADULTHOOD

SPORTS NUTRITION

NUTRITIONAL ACUITY RANKING: LEVEL 2

DEFINITIONS AND BACKGROUND

Many athletes are involved in active sports (running, jogging, weight lifting, or wrestling) when they seek nutritional guidance. Questions about weight control, disordered eating patterns, and wellness are common; fewer athletes have questions about conditions such as diabetes. During high physical activity, energy and protein intakes must be met to maintain body weight, replenish glycogen stores, and provide adequate protein for building and repairing tissues (American Dietetic Association, 2009). Use of carbohydrate drinks can maintain energy intake and prevent dehydration.

Female children and adolescent athletes may develop nonanemic ID (Unnithan and Goulopoulu, 2004), disordered eating, menstrual dysfunction, or decreased BMD. Pediatricians need to carefully monitor their health. All athletes should be screened for ID using serum ferritin, serum transferrin receptor, and hemoglobin (Sinclair and Hinton, 2005).

Female athletes who are under intense pressure to have a low percentage of body fat for performance, may have disordered eating with subsequent amenorrhea and osteoporosis, the "female athlete triad." This triad is serious and requires a multidisciplinary approach. Perfectionism enhances the risk for disordered eating, especially in varsity athletes. Prevention requires de-emphasis on percentage of body fat and adequate emphasis on good nutrition. The consequences of lost BMD can be devastating; premature osteoporotic fractures can occur, and lost BMD might never be regained. Winter sports may protect bone density because of the vigor required.

The primary fuel for athletic events using less than 50% VO_{2max} (or aerobic capacity) is fat. Muscle glycogen and blood glucose supply half of the energy for aerobic exercise during a moderate workout (at or below 60% of VO_{2max} or aerobic capacity) and nearly all the energy during a hard workout (above 80% of aerobic capacity). In short-duration events of more than 70% VO_{2max} (as in events like swimming or sprint running), glycogen is the key fuel. In long-duration events or activities of more than 70% VO_{2max} (such as long-distance running, cycling, or swimming), muscle glycogen can be depleted in 100–120 minutes; maintaining a high-carbohydrate daily diet while training for adequate glycogen replenishment is necessary.

Carbohydrate (CHO) ingestion during prolonged exercise and CHO loading before exercise can have different effects on fuel substrate kinetics. The glycemic index of the carbohydrates consumed during the immediate postexercise period might not be important as long as sufficient carbohydrate is consumed; high insulin concentrations following a high–glycemic index meal later in the recovery period could facilitate further muscle glycogen resynthesis (Stevenson et al, 2005). Elite athletes may metabolize CHO more effectively than nonathletes, but nutritional factors still affect glycemic control (Chou et al, 2005).

Performance in endurance events depends upon maximal aerobic power, sustained by the availability of substrates (carbohydrates and fats). Fatigue is associated with reduced muscle glycogen; increasing muscle glycogen or blood glucose prolongs performance, while increasing fat and decreasing CHO decreases performance.

A sports diet aligns 20% protein, 30% CHO, and 30% fat, with the remaining 20% of the energy distributed between CHO and fat based on the intensity and duration of the sport. Table 1-15 lists the position statements of the International Society of Sports Nutrition.

Trained individuals have higher levels of fat oxidative capacity, which spares glycogen during endurance sports. Endurance runners who eat a low-fat diet may not consume enough energy, EFAs, and some minerals, especially zinc; these inadequate intakes may compromise their performance. Gymnasts often have a lower weekly calorie intake but a higher dietary protein intake than nonathletes; this places them at risk of malnutrition and immunosuppression.

A qualified sports dietitian who is Board-Certified Specialist in Sports Dietetics can provide individualized nutrition direction and advice following a comprehensive nutrition assessment (American Dietetic Association, 2009). Athletes should be well hydrated before the start of exercise and should drink enough fluid during and after exercise to balance fluid losses. Consumption of sports drinks containing

TABLE 1-15 International Society of Sports Nutrition Position Statements

Individuals engaged in regular exercise training require more dietary protein than sedentary individuals. Protein intakes of 1.4–2.0 g/kg/d for physically active individuals are not only safe, but may improve the training adaptations to exercise training. When part of a balanced, nutrient-dense diet, protein intakes at this level are not detrimental to kidney function or bone metabolism in healthy, active persons.
While it is possible for physically active individuals to obtain their daily protein requirements through a varied, regular diet, supplemental protein in various forms are a practical way of ensuring adequate and quality protein intake for athletes. Different types and quality of protein can affect amino acid bioavailability; superiority of one protein type over another in terms of optimizing recovery and/or training adaptations remains to be demonstrated.
Appropriately timed protein intake is an important component of an overall exercise training program, essential for proper recovery, immune function, and the growth and maintenance of lean body mass. Under certain circumstances, specific amino acid supplements, such as branched-chain amino acids (BCAAs), may improve exercise performance and recovery from exercise.
Maximal endogenous glycogen stores are best promoted by following a high-glycemic, high-carbohydrate diet (600–1000 g CHO or 8–10 g CHO/kg/d). Ingestion of free amino acids and protein (PRO) alone or in combination with CHO before resistance exercise can maximally stimulate protein synthesis.
Ingesting CHO alone or in combination with PRO during resistance exercise increases muscle glycogen, offsets muscle damage, and facilitates greater training adaptations after either acute or prolonged periods of supplementation with resistance training.
Nutrient timing incorporates methodical planning and eating of whole foods, nutrients extracted from food, and other sources. The timing of the energy intake and the ratio of ingested macronutrients allow for enhanced recovery and tissue repair following high-volume exercise, augmented muscle protein synthesis, and improved mood states when compared with unplanned or traditional strategies of nutrient intake.

Sources: Kerksick et al, 2008; Campbell et al, 2007.

carbohydrates and electrolytes during exercise will provide fuel for the muscles, help maintain blood glucose and the thirst mechanism, and decrease the risk of dehydration or hyponatremia (American Dietetic Association, 2009).

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial.

Clinical/History	Lab Work	
Height	H & H, serum Fe	Total Chol
Weight	Transferrin	High-density lipoprotein (HDL)
Goal weight	Na^+, K^+, chloride	LDL
BMI	Serum glucose	Trig
HBW range for height	BP	Serum insulin
Diet/intake history	Alb, transthyretin (if needed)	Ca^{++}, Mg^{++}
Hydration (I & O)		Alk phos
		Homocysteine

INTERVENTION

OBJECTIVES

- Promote healthy, safe eating habits and activities that can be continued throughout life. Aerobic activity and resistance training are especially beneficial. Participation in sports activity can be an important component of obesity prevention.
- Because physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition, adequate energy intake is needed to support peak performance (American Dietetic Association, 2009).
- Correct faddist beliefs, dangerous dieting trends, meal skipping, and other unhealthy eating behaviors.
- Prevent or correct amenorrhea, which may result from poor energy and fat intake. Runners may be especially vulnerable (Barrack et al, 2008). Monitor or correct EDs, including bulimia and anorexia nervosa.
- Help prevent injuries, dehydration, overhydration, and hyponatremia.
- Enhance overall health and fitness. A certain amount of fat is essential to bodily functions. Fat regulates body temperature, cushions and insulates organs and tissues. Fat intake provides EFAs and fat-soluble vitamins, as well as energy for weight maintenance (American Dietetic Association, 2009).

SAMPLE NUTRITION CARE PROCESS STEPS

Inadequate Fluid Intake in Athlete

Assessment Data: Dietary recall; labs (BUN, sodium); I & O descriptions.

Nutrition Diagnosis (PES): Inadequate fluid intake related to marathon preparation as evidenced by altered labs, poor skin turgor, frequent headaches, reports of dehydration and limited intake of fluids on workout days.

Intervention: Education on fluid intake for body size, extent of training, and types of physical activities. Counseling on use of any supplements or sports drinks.

Monitoring and Evaluation: Improved hydration status; improved lab values (BUN, sodium); fewer headaches and signs of dehydration; I & O levels that are balanced.

TABLE 1-16 Percent Body Fat Standards[a]

Stages	Men	Women
Essential for life	4–5%	10–12%
Athletes	6–13%	14–20%
Very lean/Underweight	≤8%	≤21%
Recommended	8–20%	21–32%
Overweight	20–25%	32–38%
Obese	>25%	>38%
Children[b]	14% newborn	14% newborn
	13% 10-year-old boy	19% 10-year-old girl

[a]These standards are for 20–40 years of age. Add approximately 1% body fat for each additional decade above 40 years of age.
[b]Shils M, et al. *Modern nutrition in health and disease*. 9th ed. Philadelphia: Lippincott Williams & Wilkins, 1999, p. 799.

Ranges of body fat standards are listed below to evaluate and counsel accordingly (see Table 1-16).

- Body weight and composition should not be a criterion for sports performance and daily weigh-ins are discouraged (American Dietetic Association, 2009).

FOOD AND NUTRITION

- For active individuals, use a normal diet for age and sex with special attention to energy needs for the specific activity and frequency. Most athletes should consume 6–10 g of CHO per kg of body weight on a daily basis. Female athletes may not consume sufficient levels of protein and energy, often because they want to lose weight.
- Maintain total fat intake at a level determined by age, medical status, type of performance and endurance required. Focus on heart healthy fats such as olive oil and canola oil.
- Protein eaten in excess of recommendations is used by the body as a fuel; the body will store the excess as fat tissue. Athletes who eat many high-protein foods and take protein supplements in addition may be at risk for dehydration or kidney problems. Protein requirements should be calculated by age and sex, with a slightly higher requirement in endurance sports activity (Gleeson, 2005). Table 1-17 provides a chart for calculating protein needs.
- Vitamin and mineral supplements are not needed if adequate energy to maintain body weight is consumed from a variety of foods, but may be needed if the individual's diet is imbalanced (American Dietetic Association, 2009). Extra riboflavin may be needed to meet muscle demands; this is easily met by dairy products (Manore, 2000).
- Fluid replacement may be essential with a calculation of 1 mL/kcal used for an average. With too much, there is a risk for hyponatremia in slow runners and marathon walkers; drink too little, risk dehydration as in marathon runners.
- Electrolytes must be carefully monitored and replaced. Sports drinks are formulated to have between 6 and 8% CHO along with an appropriate amount of electrolytes; they should not be diluted. Newer sports drinks on the market contain glucose polymers with lower osmolality than sugared drinks or fruit juice. Gatorade and other recently formulated sports drink products are acceptable.
- When athletes omit meat from their diets, other sources of zinc and heme iron must be obtained. Dried beans, nuts, seeds, peanut butter, soy products, tofu, and enriched cereals provide protein and some iron. A good rule of thumb is to consume twice the iron in nonheme foods as would have been available from heme sources.
- Adequate calcium intake may prevent osteoporosis, reduce muscle cramping and protect against stress fractures. For maximum bone density, include 4 servings of dairy or calcium-fortified foods (or 3 servings plus a 500 mg calcium supplement) until age 24.
- Avoid skipping meals. Breakfast is especially important; small meals or frequent snacks are useful for some individuals.
- Glucose loading is not recommended for athletes who train daily for endurance sports. Complex CHO in the form of starch promotes glycogen storage. Table 1-18 lists tips on planning meals for athletes.

Common Drugs Used and Potential Side Effects

- If an athlete is in a sport that requires drug testing, check first with the U.S. Olympic Committee or the National Collegiate Athletic Association (NCAA) before using any drug. Androstenedione and anabolic steroids do promote muscle mass enhancement but are not allowed. Steroids affect numerous nutritional parameters. Take a careful drug history and discuss all side effects.
- Salt tablets should be discouraged. A balanced sports drink is more desirable.
- Discuss the relevance of tolerable ULs from the latest dietary reference intakes of the National Academy of

TABLE 1-17 Protein for Athletes

Protein Needs: Group	Protein Intake Per Day
Sedentary men and women	0.8–1.0 g/kg or 0.4 g /lb body weight
Moderate-intensity endurance athletes, 45–60 minutes 4–5 times per week	1.2 g/kg or 0.6 g/lb body weight
Elite male endurance athletes	1.6 g/kg or 0.8 g/lb body weight
Competitive sports which emphasize building muscle mass	1.4 g/kg or 0.7 g/lb body weight
Recreational endurance athletes, 30 minutes at <55% VO_2 peak 4–5 times per week	0.8–1.0 g/kg or 0.5 to 0.6 g/lb body weight
Football, power sports	1.4–1.7 g/kg
Resistance athletes (early training)	1.5–1.7 g/kg
Resistance athletes (steady state)	1.0–1.2 g/kg

Adapted from: Burke L, Deakin V. *Clinical sports nutrition*. 3rd ed. McGraw-Hill, 2006, pp. 73–112; Clark N, *Nancy Clark's sports nutrition guidebook*. 4th ed. Champagne, IL: Human Kinetics Publishers, 2008, pp. 127–146.

TABLE 1-18 Guidelines for Planning Meals for Athletes

	Number of Servings Per Day		
	Female Nonathletes	**Female Athletes, Male Nonathletes**	**Male Athletes**
Bread/Grains Group	6–11	9–15	11–18
Vegetable Group	3+	3+	3+
Fruit Group	2–4	3–5	4–8+
Dairy Group	4	4+	4–5+
Protein/Meat Group	2 (= 5 oz)	2 (= 6 oz)	3 (= 7–11 oz)
Fats/Lipids	20–35% calories	20–35% calories	20–35% calories

Source: *U.S. Department of Agriculture* and *the U.S. Department of Health and Human Services.*

Preexercise

- Consumption of a CHO + PRO supplement may result in peak levels of protein synthesis.
- Eat lightly before an athletic competition; chew foods well. Remember, it takes 4–5 hours to fully digest a meal. Focus on complex carbohydrates (about 65% of the meal).
- Avoid bulky foods (raw fruits and vegetables, dry beans and peas, and popcorn), which may stimulate bowel movements; avoid gas-forming foods (cabbage family and cooked dry beans).
- Drink water to be adequately hydrated: drink 2 cups of cool water 1–2 hours before the event and 1–2 cups of fluid 15 minutes before the event.
- Avoid drastic changes in normal diet routine immediately prior to competition; focus on well-tolerated or favorite foods.

During Exercise

- CHO should be consumed at a rate of 30–60 g of CHO/hour in a 6–8% CHO solution (8–16 fluid ounces) every 10–15 minutes. CHO:PRO ratio of 3–4:1 may increase endurance performance and maximally promotes glycogen resynthesis during acute and subsequent bouts of endurance exercise.

Postexercise (within 30 minutes)

- Consumption of CHO at high dosages (8–10 g CHO/kg/d) stimulates muscle glycogen resynthesis Adding 0.2–0.5 g protein/kg/d to CHO at a ratio of 3–4:1 (CHO: PRO) further enhances glycogen resynthesis. Fruits, juices, and high-carbohydrate drinks are examples (Kerksick et al, 2008).
- Replace fluids that have been lost; drink 2 cups of fluids for every lost pound. Replace any potassium or sodium that has been lost during competition or training; fruits and vegetables are excellent sources of potassium. Replace sodium by eating salty foods; if activity was vigorous and exceeded 2 hours, a sports beverage may be useful (Kerksick et al, 2008).

Postexercise Ingestion (immediately to 3 hours post)

- Protein (essential amino acids) has been shown to stimulate robust increases in muscle protein synthesis, while the addition of CHO may stimulate even greater levels of protein synthesis (Kerksick et al, 2008).
- Meat and soy substitutes have 7 g protein/serving; dairy products have 8 g protein/serving; and breads/cereals/grains have 3 g protein/serving.

During Consistent, Prolonged Resistance Training

- Postexercise consumption of CHO plus PRO supplements in varying dosages have been shown to stimulate improvements in strength and body composition when compared to control or placebo conditions. The addition of creatine (0.1 g Cr/kg/day) to a CHO + PRO supplement may facilitate even greater adaptations to resistance training (Kerksick et al, 2008).
- The following list estimates for carbohydrates (CHO):

5 g CHO
1 serving of nonstarchy vegetables
12 g CHO
1 serving of milk and dairy products
15 g CHO
1 serving each of breads, cereals, grains, "starchy" vegetables corn, peas, lima beans; fruits
40–45 g CHO
4 graham crackers
4 fig newtons
1 Power Bar
12 oz can soda
1 cup cranberry juice cocktail
1 baked potato with skin
3 oz pretzels
20 saltine crackers
6 cups popcorn (any kind)
1 cup rice (any kind)
1 large flour tortilla
2 hamburger buns
16 oz PowerAde
22 oz Gatorade
8 graham crackers, 2–1/2" squares
3 slices of bread (any kind)

Resource: Brown University, 2009.

Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements. Discuss the fact that excessive use of vitamin-mineral supplements can lead to toxicity, especially for vitamins A and D.

Herbs, Botanicals, and Supplements

- Herbs and botanical supplements should not be used without discussing with the physician, especially for underlying medical conditions. Use of supplements is common in athletes, and there may be undesirable side effects (Burns et al, 2004). FDA has taken steps to implement the Dietary Supplementation Health and Education Act (DSHEA) with a stronger stance than in the past.
- Some supplements may be contaminated with banned substances. If an athlete is found to have taken a banned substance, actions are taken by the regulatory agency (such as the International Olympic Committee, NCAA, or other sports sanctioned agencies). Athletes must be advised accordingly.
- Because regulations specific to nutritional ergogenic aids are poorly enforced, they should be used with caution, and only after careful product evaluation for safety, efficacy, potency, and legality (American Dietetic Association, 2009). Athletes often use supplements such as those found in Table 1-19 (Brown University, 2009).

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- A well-balanced diet will suffice for most events (American Dietetic Association, 2009). Dispel myths, such as "milk is for children only," "meat is bad for you," "carbohydrates are fattening," or "dieting is the key to fluid control."
- Athletes with traits such as perfectionism, compulsive or controlling behaviors, and a need for attention may need referral to counseling from an appropriate health provider. Restrictive eating behaviors practiced for physical activities that emphasize leanness are a concern. Educate athletes, parents, coaches, trainers, judges, and administrators about the dangers of restrictive eating (Nattiv et al, 2007). Where there are weight problems, address body weight, family genetics, body type, parenting styles, socioeconomic issues, and environmental cues.
- Pre-event diets should be eaten up to an hour before the activity. Complex carbohydrates should be consumed, using less fat and protein because of their effect on digestive processes. After an event, recovery carbohydrate intake is suggested.
- There is no such thing as "quick energy." The habit of eating candy before a game can cause an insulin overshoot, leading to hypoglycemia. A balanced diet is more practical. Discuss how to obtain a high-calorie, high-complex carbohydrate diet with attention to individual preferences. In vigorous training programs such as ultramarathons, 3000–6000 kcal may be needed.
- Prevent dehydration. Drink fluids before, during, and after exercising. Weigh before and after events and replace lost weight (such as 2 cups of fluid per pound lost). Avoid use of alcoholic beverages as they do nothing to promote performance and may negatively affect neurologic and cardiac systems.
- Some populations have lower resting metabolic rates and physical activity energy expenditures than others. If confirmed, target interventions to decrease energy intake and to increase physical activity (Gannon et al, 2000).

TABLE 1-19 Supplements Commonly Used by Athletes

Androstenedione "andro" (hormone)	Banned by the NCAA, the IOC, the U.S. Olympic Committee, the National Football League, and the Association of Tennis Professionals.
Caffeine	Ergogenic aid for endurance athletes when taken before and/or during exercise in moderate quantities, such as 3–6 mg/kg body mass (Ganio et al, 2009). However, caffeine use is limited in competitive sports.
Chromium Picolinate (CrPl)	Widely available in many foods; supplements are not necessary.
Creatine	Increases the capacity of skeletal muscle to perform work during periods of alternating intensity exercises, possibly because of increased aerobic phosphorylation (Rico-Sanz and Mendez Marco, 2000). Creatine is useful for strength training (Becque et al, 2000), but not for endurance sports. If used, use 20–25 g daily for 5–7 days, followed by maintenance at 5 g/d. It requires a month to completely leave the bloodstream after stopping.
Ephedra/Ephedrine (Ma Huang)	Raises heart rate. Does not increase energy. Removed from the market by FDA.
Ginseng	Often used for performance enhancement. Avoid use with warfarin, insulin, oral hypoglycemics, CNS stimulants, caffeine, steroids, hormones, antipsychotics, aspirin, or antiplatelet drugs.
Tryptophan	Precursor to serotonin. Sometimes used for performance enhancement. May cause psychosis if used with antidepressants, MAO inhibitors
Yohimbe, smilax, tribulus, and wild yams	Cannot be converted by the body to anabolic steroids or enhance muscle mass.
Zinc	Sometimes taken to enhance performance. Zinc should not be taken with immunosuppressants, fluoroquinolones, and tetracycline.

- Women who are breastfeeding can exercise reasonably without adverse effects and may find that return to normal weight is easier than while being sedentary (Lovelady et al, 2004).
- Female athletes with subclinical EDs tend to have dietary intakes of energy, protein, and CHO below desired levels. Micronutrient status is generally unaffected, probably due to use of supplements (Hinton et al, 2004). The aim here is to increase energy intake or reduce excessive energy expenditure (Nattiv et al, 2007). Signs that someone is exercising excessively include rigid rules about exercising, anxiousness, or restlessness when off schedule, working out more than a coach or athletic trainer recommends, rigid or calculated eating patterns to exactly match calories expended on exercise (Brown University, 2009).

Patient Education—Food Safety Tips

- Reminders about hand washing and safe food handling may be important, especially for athletes with busy lifestyles. Use of hand sanitizers can be encouraged.
- Athletes who are on the road may find that they are vulnerable to foodborne illnesses. They should be advised to choose foods carefully when traveling.
- Athletes who compete in other countries should become aware of potential risks where they will be traveling. For example, food and water sources are not always reliably safe.

For More Information

- American Academy of Family Physicians: Nutrition Prescription
  http://familydoctor.org/298.xml
- American College of Sports Medicine
  http://www.acsm.org/
- American College of Sports Medicine Position Stand: Female Athlete Triad
  http://www.acsm-msse.org
- American Council on Exercise
  http://www.acefitness.org
  ACE Recipes: http://www.acefitness.org/getfit/recipes.aspx
- American Alliance for Health, Physical Education, Recreation and Dance
  http://www.aahperd.org
- American Dietetic Association: Sports and Cardiovascular Nutritionists
  http://www.scandpg.org/
- Brown University Guidelines for Athletes
  http://www.brown.edu/Student_Services/Health_Services/Health_Education/nutrition/sportsnut.htm):
- Centers for Disease Control and Prevention—Nutrition and Physical Activity
  http://www.cdc.gov/nccdphp/dnpa/
- Food and Nutrition Information Center
  http://www.nal.usda.gov/fnic/etext/000054.html
- Health and Human Services: Physical Activity Guidelines for Americans
  http://www.health.gov/paguidelines/
- Hydration
  http://www.aces.edu/pubs/docs/H/HE-0749/
- Gatorade Sports Science Institute
  http://www.gssiweb.com/
- Intelihealth—Fitness
  http://www.intelihealth.com/IH/ihtIH/WSIHW000/7165/7165.html
- National Institutes of Health
  http://www.nlm.nih.gov/medlineplus/exerciseandphysicalfitness.html
- Penn State University Fitness and Sports Nutrition
  http://nirc.cas.psu.edu/fitness.cfm
- President's Council on Physical Fitness and Sports
  http://www.fitness.gov/
- Sports Science Peer Reviewed Information
  http://www.sportsci.org/index.html?jour/03/03.htm&1
- Women's Sports Foundation
  http://www.womenssportsfoundation.org/
- Young Men's Health Site
  http://www.youngmenshealthsite.org/nutrition-sports.html
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  http://www.youngwomenshealth.org/nutrition-sports.html

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ADULTHOOD

NUTRITIONAL ACUITY RANKING: LEVEL 2

DEFINITIONS AND BACKGROUND

Nutrition is involved in the 10 leading causes of death in women. Heart disease is the number one disabler and killer of women in the United States, whereas cancer is the leading cause of premature death. Table 1-20 lists special considerations for men.

From the Human Genome project, scientists know that variations occur in all humans, even though they are 99.5% identical for DNA sequencing. At a particular chromosome, slight variations can occur; these are recognized as single nucleotide polymorphisms (SNPs). Some of these changes (alleles) lead to chronic diseases such as heart disease, cancer, diabetes, and others. There are 2400 known phenotypes affecting disease onset; 3700 more are suspected to have a genetic origin (McKusick, 2007) or have gene–environmental interactions (see http://www.ncbi.nlm.nih.gov/Omim/mimstats.html. Many diseases are caused by different mutations in genes, with variable age of onset, severity and outcome. Polymorphisms can lead to differences in susceptibility of individuals to adverse environments or to reproductive success. For example, methylenetetrahydrofolate reductase (MTHFR) and folate metabolism affects early pregnancy loss and infertility. Table 1-21 lists some of the disorders that have a genetic link for which mutations have been identified.

"Healthy life expectancy" measures the distribution of health status within a population. People living in poor countries face low life expectancy and a life of poor health. Changes in health and nutritional behaviors can improve quality of life and promote longevity; peer support may be needed. In young adulthood between 18 and 40 years, careers are a priority. In middle adulthood (40–65 years,) family is the primary focus. Peer pressure and family persuasion can promote long-term changes in behavior.

Weight control is another major concern. Over the past 40 years, height, BMI, and weights have increased in both sexes, all ethnic groups, and all ages. There are health implications with this weight increase. Both men and women should attempt to maintain a HBW.

Up to 60% of adults may have prehypertension, especially African Americans, older people, individuals with low socioeconomic status, and overweight individuals. Lifestyle modification and appropriate medications may be needed.

Both genetics and conditioning influence taste preferences and intake. Taste seems to be innate, whereas responses to odors are more conditioned. The influence of genetic variation in taste on food intake depends on how perceptible sweet, fat, or bitter components are in foods and beverages (Duffy and Bartoshuk, 2000). Bitterness "supertasters" may avoid high-fat or sweet foods because the oral sensations are too intense and less pleasant. Supertasters may taste more bitterness in vegetables but still enjoy eating them if condiments are added (Duffy and Bartoshuk, 2000).

It is important to work with individuals to identify foods and taste preferences that will help to achieve healthy eating patterns. When adults are hospitalized, nutritional declines occur and lead to higher hospital charges and more complications. Longstanding dietary habits from childhood, confusion about oral instructions, coexisting depression, inadequate referral or information, literacy deficits, social influences or barriers, and even the right to refuse treatment make it difficult for patients to follow a modified diet (Stein, 2005).

Understanding why patients refuse to follow a diet prescription is a priority. The use of the Standardized Language and Nutrition Care Process from the American Dietetic Association promotes thorough assessment, selection of nutrition diagnoses, targeted goals and interventions, and careful monitoring for evaluation of outcomes.

TABLE 1-20 Leading Causes of Death and Nutritional Implications for Men in the United States

1. **Heart disease:** hyperlipidemia and hypertension are commonly related (see appropriate entries).
2. **Cancer:** prostate, testicular, esophageal, and stomach cancers have special nutritional implications (see appropriate entries). Increasing intake of soy products, fruits, and vegetables and reducing red meat intake may be beneficial.
3. **Stroke:** high intake of sodium and alcohol are problematic, as is chronic hypertension that is untreated (see appropriate entry).
4. **Accidents:** excessive alcohol intake may be related (see appropriate entry).
5. **Chronic lower respiratory diseases:** weight loss or gain may aggravate breathing problems.
6. **Diabetes:** carbohydrate intake should be consistent and consumed at regular intervals.
7. **Influenza and pneumonia:** infectious diseases burn more energy; weight loss can occur if energy intake is poor.
8. **Suicide:** depression and excessive alcohol intake may play a role (see appropriate entries).
9. **Kidney disease:** many renal diseases have implications for control of protein, sodium, electrolytes, and fluid. Kidney stones are more common in men than in women and drinking plenty of fluids and consuming adequate calcium may prevent onset or recurrence (see appropriate entries).
10. **Chronic liver disease and cirrhosis:** excessive alcohol intake is often related (see appropriate entry).

TABLE 1-21 Disorders and Their Related Genes

Neurological Disorders	Related Genes
Premature family Alzheimer's disease	*APP* gene *PSEN1* gene *PSEN2* gene
Late-onset Alzheimer's disease	*APOE* gene
Huntington's disease	CAG triplet-repeat expansion in the IT15 region of the *HD* gene
Frontotemporal dementia	*MAPT* gene
Tay-Sachs disease	*HEXA* gene
Pantothenate kinase neurodegeneration	*PANK2* gene
Hereditary neuropathy with pressure palsies (HNPP)	17p11.2 deletion in the *PMP22* gene *PMP22* gene
Familial Parkinson disease (PARK1)	*SNCA* gene
Early-onset Parkinson disease (PARK2)	*PARK2* gene
Autosomal dominant Lewy body parkinsonism (PARK4)	*SNCA* gene
Rett syndrome	*MECP2* gene
Fragile X syndrome (FRAX)	CGG triplet-repeat expansion analysis of the *FMR-1* gene
Hematological and Cardiovascular Disorders	
Thrombophilia	Mutation of G1691 A (Arg506Gln) in the *Factor V (Leiden)* gene Mutation of G20210 A in the *Prothrombin* (Factor II) gene Mutation C677 T (Ala222Val) and A1298 C (Glu429Ala) in the *MTHFR* gene *PAI1* gene, pasminogene activator inhibitor Angiotensine enzime converter gene
Fanconi anemia (complementation group A)	*FANCA* gene
Fanconi anemia (complementation group C)	Mutation of IVS4+4 A-T in the *FANCC* gene *FANCC* gene
Hemophilia	Intron 22 inversion mutation of *F8* gene *F8* gene Type A; F9 gene in Type B
Glucocorticoid-remediable aldosteronism type 1	*CYP11B1/CYP11 B2* chimeric gene
Marfan syndrome	*FBN1* gene
Congenital thrombocytopenia	*MPL* gene
Metabolic Disorders	
Pituitary hormone deficiency	*POU1F1* and *PROP1* genes
Alpha-1-antitrypsin deficiency	Mutation of E264 V (Allele S) and E342 K (Allele Z) in the *PI* gene
Fructose-1,6-diphosphatase deficiency	*FBP1* gene
Growth hormone deficiency	*GH1* gene
Hereditary hemochromatosis	Mutation of C282Y, H63D and S65 C in the *HFE* gene
Familial hypercholesterolemia	*LDLR* gene Mutation of Arg3500Gln, Arg 3531Cys and Arg3480Trp in the *APOB* gene Mutations of the *CYP11B1* gene and *CYP21A2* gene
Homocystinuria	Mutation of Gly307Ser and Ile278Thr in the *CBS* gene Mutation of C677 T and A1298 C in the *MTHFR* gene
Muscular and Skeletal Disorders	
Achondroplasia	Mutation of G1138 A, G1138 C and G375 C in the *FGFR3* gene
Myoclonus-dystonia (DYT11)	*SGCE* gene
Rapid-onset dystonia-parkinsonism (DYT12)	*ATP1A3* gene
Duchenne/Becker muscular dystrophy	*DMD* gene
Amyotrophic lateral sclerosis (ALS1)	*SOD1* gene
Osteoporosis	BsmI, ApaI, TaqI and FokI polymorphism in the *VDR* gene Pro463Leu polymorphism detection in the *CTR* gene PCOL2 (-1997 G/T) and Sp1 (1546 G/T) polymorphisms in *COL1A1* gene PvuII (397 T>C) and XbaI (351 C>G) polymorphism in *ESR1* gene Polymorphisms in the *IL-6* gene

(continued)

TABLE 1-21 Disorders and Their Related Genes *(continued)*

Reproductive Disorders	Related Genes
Preeclampsia, eclampsia, Hellp syndrome or recurrent spontaneous pregnancy loss	Mutation of G1691 A (Arg506Gln) in the *Factor V* gene Mutation of G20210 A in the *Factor II* gene Mutation of C677 T (Ala222Val) and A1298 C (Glu429Ala) in the *MTHFR* gene
Neoplastic Disorders	
Breast/ovarian cancer	Mutation in exons 2, 3, 5, 8, 11, 18, 20, and 23 of the *BRCA1* gene *BRCA1* gene Mutation in exons 2, 10, 11, and 23 of the *BRCA2* gene *BRCA2* gene
Hereditary nonpolyposis colon cancer—Lynch syndrome	Microsatelites instability *MLH1* gene or *MSH2* gene
Medullary thyroid carcinoma	Mutation in exons 10, 11, 13, 14, and 16 of the *RET* gene *RET* gene
Cutaneous malignant melanoma 2	*CDKN2 A* gene
Familial adenomatous polyposis (FAP)	*APC* gene
Colorectal polyposis	*MUTYH* (MYH) gene
Retinoblastoma	*RB1* gene
Wilms' tumor	*WT1* gene
Multisystemic Disorders	
Cystic fibrosis	30 prevalent European mutations of the CFTR gene IVS8-Tn (poli-T) polymorphism detection in the CFTR gene
Polycystic kidney disease	*PKD1* gene *PKD2* gene
Pharmacogenetics	
Breast cancer	*HER2* (NEU) overexpression detection and Herceptin (trastuzumab) treatment
Nonsmall cell lung cancer (NSCLC)	Mutation screening in exons 18–21 of the *EGFR* gene and Gefinitib treatment
CYP2D6 for psychiatric and cardiovascular disorders treatment	Polymorphism of the *CYP2D6* gene. This gene is involved in metabolizing different drugs such as, Prozac, Zoloft, Haldol, Metoprolol, Tagamet, Tamoxifen, Paxil, Effexor, Hydrocodone, Amitryptiline, Claritin, Cyclobenzaprine, Allegra, Dytuss, Tusstat, Rythmol
CYP2C9 linked to thrombosis, diabetes and other disorders treatment	Polymorphism of the *CYP2C9* gene. This gene is involved in metabolizing Coumadin (Warfarin), Viagra, Amaryl, Isoniazid, Sulfa, Ibuprofen, Amitriptiline, Dilantin, Hyzaar, Tetrahidrocannabinol, Naproxen
CYP2C19 linked to psychiatric diseases, epilepsies, malaria and anesthesia	Polymorphism of the *CYP2C19* gene. This gene is involved in metabolizing different drugs: Carisoprodol, Diazepam, Dilantin, Premarin and Prevacid
Chronic myeloide leukemia	Mutation screening in exons 4–10 of the *ABL* gene, for the treatment with Gleevec (Imatinib)
Acute myeloide leukemia	Mutation in the *KIT* (CD117) gene, for the treatment with Gleevec (Imatinib) Mutation of the *FLT3* gene
5-Fluorouracil toxicity	Allele 2 A (IVS14+1G-A) determination in the *DPD* gene
Thiopurines toxicity	For the treatment of thrombosis, diabetes, and a variety of diseases. The TPMT gene is associated to the different tiopurines metabolism: azatioprine (Imuran,) 6-mercaptopurina (Purinetol,) and 6-tioguanina (Lanvis)
Mitochondrial Disorders	
Neuropathy, ataxia and retinitis pigmentosa (NARP)	Mutation of T8993G and T8993 C in the *MTATP6* gene
Maternal hereditary deafness	Mutation of A1555G, A827G, T961 C, T961insC, T961delT+C(n)ins, T1005 C, A1116G and C1494 T in the *MTRNR1* gene Mutation screening of T7445 C and A7443G in the *MTCO1* gene

Source: LabGenetics, www.labgenetics.com.es; accessed March 1, 2009.

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial.

Clinical/History	Lab Work	
BP	Glucose	C-reactive protein (CRP)
Height	Chol—HDL, LDL, total	Alb, transthyretin (if needed)
Weight, current	Trig	BUN, Creat
Weight, usual	Na^{+}, K^{+}	Sleep disorder screening
BMI and waist to hip ratio	Mg^{++}, Ca^{++}	
Recent weight changes	H & H, serum Fe	
HBW range	Homocysteine	
Diet history	Serum folic acid and vitamin B_{12}	
Body fat analysis		
Smoking		
Alcohol use		

INTERVENTION

OBJECTIVES

- Maintain quality of nutrition while compensating for energy needs that are lower than those during periods of growth.
- Maintain a healthy lifestyle, which offers greater longevity than genetics alone. Losing excess weight, exercising, and eating a nearly meat-free diet are tips shared by many centenarians.
- Prevent obesity resulting from a sedentary lifestyle where relevant. Highly sedentary people lose 20–24% of overall muscle mass and strength. Every adult should accumulate 30 minutes or more of moderate-intensity physical activity on most days of the week. Also useful are strength training (resistance or weight training with 8–12 repetitions), isotonics, and aerobics (20 minutes of walking, jogging, swimming, or bicycling).
- Prevent or delay the onset of conditions such as, hypertension, osteoporosis, cardiovascular disease, diabetes, renal disorders, Alzheimer's disease, and cancers. Focus on a plant-based diet, rich in colorful fruits and vegetables plus nuts, seeds, and whole grains. Include fish and sources of omega-3 fatty acids, including walnuts, flaxseed, and dark-green leafy vegetables. The Mediterranean diet is a good pattern to follow.
- Improve nutrient density of meals, especially those eaten away from home. The average American eats 3–4 meals away from home each week. Making "each calorie count more" is a message that encourages selecting foods that offer more quality per "bite." The Naturally Nutrient Rich (NNR) approach is also helpful; encourage "super foods" such as salmon, blueberries, bananas, whole-wheat grains, fat-free yogurt, broccoli, and top round steak (Drewnoski, 2004).
- Use of a multivitamin–mineral supplement can assure that the basics are met, but a balanced diet provides other beneficial phytochemicals. Lutein and zeaxanthin from food protect against age-related eye diseases such as macular degeneration.
- Promote adequate bone mass density, which peaks at 25–30 years of age. Osteopenia is common in women over age 40, and testing of bone density is recommended. Men are also at risk as they age.
- Identify food insecurity and its relationship to availability of varied foods and intake patterns. For example, food insecurity is common among migrant workers and farm worker households. The impact of hunger varies by factors such as participation in food banks, dependence on family members or friends outside the household for food, inadequate transportation, and not having a garden (Holben et al, 2010).

SAMPLE NUTRITION CARE PROCESSES

Imbalance of Nutrients

Assessment Data: Dietary recall, nutrient analysis for vitamins and minerals, results of genetic testing.

Nutrition Diagnosis (PES): Imbalance of nutrients related to low micronutrient intake (vitamins A and C, magnesium, and potassium) and C>T genetic allele of methyltetrahydrofolate reductase (MTHFR) as evidenced by consistent omission of fruits and vegetables in dietary intake records, genetic inability to metabolize folic acid, and history of three miscarriages in past 5 years.

Intervention: Education about a healthy diet for promoting optimal reproductive health. Counseling about use of L-methylfolate and multivitamin–mineral supplement in preparation for a healthy pregnancy.

Monitoring and evaluation: Dietary intake records, increased intake of fruits and vegetables; successful pregnancy where possible.

Menopause

Assessment Data: Dietary recall, side effects of taking multiple herbs, weight history, labs.

Nutrition Diagnosis (PES:) Harmful beliefs about food/nutrition related to regular intake of dietary supplements as evidenced by dietary recall indicating use of large doses of Chinese herbal remedies that are unsubstantiated by medical efficacy.

Intervention: Education about safe use of herbs and supplements for menopausal symptoms (soy, black cohosh, multivitamin–mineral supplements). Counseling about acceptable choices.

Monitoring and Evaluation: Dietary recall, dietary supplement usage pattern, side effect reports, improvement of symptoms of menopause.

TABLE 1-22 Special Nutrition-Related Concerns of Adult Women[a]

Fibrocystic breast changes	50–60% of all women present with breast nodularity, swelling, and pain with monthly hormonal changes. A low-fat (15–20% kcal), adequate fiber diet (30 g/d) and soy isoflavones seems to be useful. Fruit and vegetable intake should be high. Studies fail to support nutrition interventions with decreased sodium or fluid and caffeine; increased use of primrose oil, herbal teas, vitamins A, C, E, B_6, iodine, selenium.
Infertility	Women desiring to become pregnant should stop smoking and drinking alcohol, and increase intakes of folate and vitamin B_{12} (American Dietetic Association, 2004).
Premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD)	Up to 40% of women experience symptoms including edema, migraines, depression, and mastalgia. PMDD is generally more severe, although women experience anxiety and irritability in both conditions. A basic multivitamin–mineral supplement can help assure adequacy of all micronutrients, especially calcium, vitamin B_6 and magnesium (American Dietetic Association, 2004). Herbal supplements have limited supporting evidence (Johnson, 2007).
Perimenopause	In the 2- to 10-year stage before menopause, women may experience hot flashes, night sweats, fatigue, insomnia, weight gain, loss of libido, irregular periods, fibroids or heavy bleeding, breast pain, mood swings and irritability, cravings for sweets or alcohol, digestive problems, hair loss, stiffness or joint pain, anxiety, and depression. Women should exercise regularly and consume a balanced, healthy diet. Herbal remedies are not very effective.
Menopause	Declining levels of estrogens and other hormones, cessation of menstrual periods, and a decreased need for iron. Hormone replacement therapy is no longer the mainstay for preventing osteoporosis and fractures because of the risk for cancer. Exercise, calcium, vitamin D and physical examinations are needed. A diet that is moderate in carbohydrate slows insulin shifts; lean proteins and moderate fat help to prevent weight gain. Food sources of selenium, vitamins C and E contribute antioxidant benefits. Whole grains, flax seed, and other omega-3 fatty acids may reduce the inflammation that aggravates hot flashes. Phytoestrogens from isoflavones, lignans, and coumestans (soy foods, flaxseed, and red clover) are useful for some women. Avoid large amounts of soy if breast cancer is a known risk. Black cohosh has some merit but may also have undesirable side effects (see herbal guidelines).
Postmenopause	Older women may be at risk for poor nutritional intake because their diets tend to be more limited; they may have difficulty chewing; and they may no longer enjoy cooking (American Dietetic Association, 2004). Nutrient supplementation may be beneficial, especially for calcium, zinc, and the vitamins.

[a]See related disorder sections for specific disease advice.

- ID affects approximately one half of all women. Correct through diet as far as possible. Avoid iron excesses in men and in post menopausal women. Table 1-22 provides a summary of conditions that affect women specifically.

FOOD AND NUTRITION

- Ensure intake from the MyPyramid Food Guidance System: 2–3 servings of milk, 2–3 servings of meat or substitute, 3–5 servings of vegetables, 2–4 servings of fruits, and 6–12 bread group servings. Control fats, oils, sugars, alcohol, and sweets as needed to increase or decrease energy intake; foods from this group often replace nutrient-dense foods in the American diet. Limit or eliminate foods that contain trans-fatty acids.
- Follow the dietary guidelines. Modify diet as needed for special medical conditions, such as hypertension, heart disease, and osteoporosis.
- Energy needs will vary by sedentary or active status; 30 kcal/kg/d is average. Use 20–25 kcal/kg/d when weight loss is desired and 35–40 kcal/kg/d when weight gain is needed. Adults are encouraged to maintain weight rather than gaining weight after reaching adulthood. See nutritional recommendation charts.

	Nutrient Recommendations for Adults	
Nutrient	**Males 19–50 Years**	**Males 51–70 Years**
Energy	3067 kcal/d	3067 kcal/d
Protein	56 g/d or 0.8 g/kg/d	56 g/d or 0.8 g/kg/d
Calcium	1000 mg/d	1200 mg/d
Iron	8 mg/d	8 mg/d
Folate	400 mg/d	400 mg/d
Phosphorus	700 mg/d	700 mg/d
Vitamin A	900 μg/d	900 μg/d
Vitamin C	90 mg/d	90 mg/d
Thiamin	1.2 mg/d	1.2 mg/d
Riboflavin	1.3 mg/d	1.3 mg/d
Niacin	16 mg/d	16 mg/d

- For most healthy adults, 0.8 g of protein/kg will suffice. Use fish, poultry, and nonmeat entrees (e.g., dry beans, peas, nuts as tolerated) regularly instead of just meat-centered meals. Soy products such as tofu, textured soy protein, soynut butter, or tempeh can be useful. The Continuing Survey of Food Intakes by Individuals (CSFII) has found that households with higher income tend to use more chicken and less beef and pork (Guenther et al, 2005).

- For carbohydrate, the Institute of Medicine has set the minimum intake at 130 g daily. In general, use of whole grains, fresh fruits or vegetables, and low-fat dairy products will provide high-quality carbohydrate. Refined carbohydrates in sweetened beverages, desserts, and candy should be limited.
- Mineral and phytochemical balance is important, including sodium, potassium, calcium, and magnesium. The DASH diet may be useful for designing meal patterns to lower BP and lipids, when needed.
- Eat a balanced diet. The most recent national study of What We Eat in America (United States Department of Agriculture, 2006) identified that vitamins A, C, and E and magnesium tend to be low in most diets; teen girls and older men and women tend to be low in zinc intakes; and potassium, calcium, vitamin D, vitamin K, and fiber are low as well.
- Hyperhomocysteinemia is an independent risk factor for cardiovascular disease in men and women as well as for Alzheimer's disease, and stroke. B-complex vitamins (folic acid, vitamins B_6 and B_{12}) are needed. If an individual has an MTHFR allele, L-methylfolate may be needed.
- Women of childbearing age should include foods rich in folic acid, now available through fortification of grains, to prevent neural tube defects. Men may need to eat more folic acid–rich foods to lower risk for colorectal cancer. Cold cereals, cooked pinto or navy beans, asparagus, spinach, orange juice, lentils, and avocado should be planned into the diet regularly.
- Fiber-rich foods may help protect against heart disease, stroke, diabetes, high BP, some types of cancer, constipation, and diverticulosis. They are also helpful with management of weight by increasing satiety with meals. Soluble fiber is found in pectins, gums, plums, apples, berries, figs, broccoli, potatoes, and okra. Insoluble fibers are found in bran cereal, whole-wheat bread, brown rice, legumes, vegetables, and many fruits. Nuts and seeds are also good sources of fiber.
- Favorable dietary habits promote health, whereas unfavorable habits are linked to various chronic diseases; an individual's "sense of coherence" (SOC) correlates with prevalence of some diseases to which dietary habits are linked (Lindmark et al, 2005).
- Family meals are associated with positive dietary intakes and healthy behaviors. Family interaction can lower risks for obesity, enhance language skills and academic performance, and improve social skills. A positive atmosphere is beneficial; see http://www.cfs.purdue.edu/CFF/promotingfamilymeals/index.html.
- Use spices and herbs liberally in cooking. Oregano, cinnamon, dill, savory, coriander, cumin, and other herbs have potent antioxidant properties.
- A Mediterranean-style diet can enhance cholesterol-lowering plans; design menus accordingly.
- Adequate vitamins A, C, and E and selenium foods should be consumed for their antioxidant properties. Foods rather than supplements are recommended because of the phytochemical and biological properties that may prevent or delay some chronic diseases.
- Functional food ingredients, including fortified, enriched, or enhanced foods, have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis (American Dietetic Association, 2005). Functional foods may reduce the risk of coronary heart disease, cancers, hypertension, and osteoporosis. Each food or ingredient should be assessed individually for its relative merit. Soybeans, fruits, and vegetables seem to yield the greatest risk reductions. Soy protein, as in tofu and meat extenders, may reduce serum cholesterol and possibly reduce risks of some forms of cancer. Quercetin (found in apples, broccoli, oranges, tomatoes, kale, and onions) may help protect against cataracts. Phytosterols in sunflower seeds, pistachio nuts, sesame seeds, and wheat germ are good for the heart. Plant sterols and stanols help to lower serum cholesterol levels and are less expensive than statin drugs. Polyphenols (flavonoids from tea, cocoa, red wine, Concord grape juice, blueberries, and chocolate) also support heart health. See Table 1-23 for a list of functional food ingredients and their beneficial effects.

Common Drugs Used and Potential Side Effects

- In general, discuss the relevance of tolerable ULs from the latest dietary reference intakes of the National Academy of Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements. Table 1-24 provides a useful chart.

Herbs, Botanicals, and Supplements

- Herbs, botanical products, and supplements should not be used without discussing with a physician, especially with underlying medical conditions (Boullata, 2005). The Food and Drug Administration implement guidelines for DSHEA.
- Supplement use is common among middle-aged men and women in the United States, it should be recognized that micronutrient intakes of vitamins A, C, and E, niacin, folate, and iron are often higher than from foods alone (Archer et al, 2005). Section 2 provides an extensive list of herbs and botanicals; see Table 2-1.
- Use of multivitamins/minerals (MVMs) has grown rapidly; dietary supplements are now used by more than half of the adult population in the United States (NIH, 2006). The NIH consensus report (2006) reported that fortification of foods has reduced vitamin and mineral deficits. Now there are safety concerns about exceeding upper levels and there is limited evidence for beneficial health-related effects of supplements taken singly, in pairs, or in combinations of three or more (NIH, 2006).

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Help plan a diet in accordance with individual lifestyle. Explain nutrient density, food cost, and portion sizes. Meal and snack patterns are markers for nutrient intakes and diet quality (Kerver et al, 2006).

TABLE 1-23 Functional Foods and Ingredients

Food	Function
Almonds	Lower LDL and total cholesterol to reduce heart disease. Source of potassium, vitamin E, riboflavin, magnesium, and zinc.
Apples	Good source of fiber, quercetin in the skin. May protect against cancer, asthma, and Alzheimer's disease.
Apricots	Good source of vitamins A and C, as well as lycopene. Cancer prevention.
Avocado	Reduces risk of heart disease, high blood pressure, and osteoporosis. Contains vitamins B_6 and E, folate, potassium, and fiber.
Bananas	Good source of potassium and magnesium, which are helpful to prevent heart disease, bone loss, and hypertension.
Barley	Good whole grain source.
Blueberries and other berries	Reduce risk of cancer; may improve cognitive function. Contain vitamin C as well as anthocyanins, fiber, and ellagic acid.
Brazil nuts	Supply of selenium, which is a cancer preventive. Use no more than 2 per day.
Broccoli	Reduces risk of cancer and maintains healthy immune system. Sulforaphane detoxifies carcinogens. Source of quercetin.
Brown rice	Rich whole grain with phosphorus and potassium in greater amounts than white rice.
Brussels sprouts	Source of sulforaphane to prevent cancer; also good source of vitamin K.
Cabbage	Contains sulforaphane; consume often as a cancer prevention measure.
Canola oil	Good source of fatty acids, which reduce heart disease and cancer.
Cantaloupe	Great source of beta-carotene and vitamin C.
Carrots	Rich source of beta-carotene.
Cauliflower	Rich in sulforaphane and vitamin C; may protect against cancer.
Cheese	May decrease risk of colon cancer because of calcium content.
Chicken or turkey breast	Skinless poultry is a great source of protein and zinc; turkey is also high in B vitamins and selenium.
Chocolate	May decrease risk for cardiovascular disease; flavonoid content is a powerful antioxidant.
Cinnamon	May lower LDL cholesterol and blood glucose levels. Anti-clotting effect. Anti-inflammatory effect in arthritis.
Citrus fruits	Limonoids reduce risk of certain cancers. Oranges are a source of quercetin.
Cloves	Ground cloves are the richest source of polyphenols among the spices.
Cocoa	Rich source of flavonols; reduces risk of cancer and heart disease.
Collard greens and kale	Great source of carotenoids, vitamin C, lutein, sulforaphane, and calcium.
Cranberries	Improves urinary tract health and prevents infection; reduces risk of heart disease; may reduce periodontitis/gingivitis.
Cruciferous vegetables	Sulforaphane content helps to prevent cancer. Brussels sprouts, cauliflower, broccoli, and bok choy are in this family.
Edamame	Green soybeans, a staple in Asia. They can lower LDL cholesterol and may protect against colon cancer.
Fatty fish	Source of omega-3 fatty acids; helpful for brain, eye, and neurological health.
Flaxseed	Reduces risk of heart disease, high blood pressure, and osteoporosis. Provides lignans and alpha linolenic acid, an omega-3 fatty acid.
Garlic	Reduces risk of cancer; lowers cholesterol levels and blood pressure.
Kale	High in antioxidants lutein and zeaxanthin; protects eye health. Source of quercetin.
Kiwifruit	High in potassium, vitamin C, fiber, folate, magnesium, vitamin E, copper, and lutein. Great antioxidant fruit.
Legumes and beans	Lentils, dried beans, and peas provide folate, which reduces DNA damage and helps with cancer prevention. Rich in fiber, magnesium, potassium, protein, iron.
Lycopene	Lycopene is especially rich in tomatoes, pink grapefruit. A substance called Fru-his in rehydrated tomato products protects against prostate cancer.
Marjoram	Good source of polyphenols.
Milk, nonfat	Reduces risk of osteoporosis, high blood pressure, and colon cancer. Good source of vitamin D, calcium, and potassium.
Nuts, Seeds	Good source of arginine, magnesium, fiber.
Oatmeal	Reduces total and LDL cholesterol levels.
Olive oil	Good source of monounsaturated fatty acids (MUFA), which reduce heart disease risk by improving cholesterol levels.
Onions	Sulfur-rich and full of quercetin (red or yellow are richer). Blood thinning to help lower blood pressure and LDL cholesterol levels.
Oranges	Great source of potassium and vitamin C. Source of quercetin.
Oregano	Good source of polyphenols.
Peaches	Good source of vitamin C, carotenoids, niacin, and potassium.
Peanut butter	Good source of protein, MUFA, and niacin.

(continued)

TABLE 1-23 Functional Foods and Ingredients *(continued)*

Food	Function
Pistachio nuts	Good source of phytosterols for heart health.
Pomegranate	Antioxidant that protects against hormonal and lung cancers, Alzheimer's disease and heart disease.
Pork loin	Leanest cut of "red meat" sources. Protein, zinc, and iron source.
Prunes	Great source of antioxidants, fiber, potassium, and vitamins A and B_6.
Pumpkin seeds	Good source of phytosterols; B vitamins, along with C, D, E, and K; calcium, potassium, niacin, and phosphorous. May protect against depression and learning disabilities. Excellent source of magnesium.
Pycogenol	Antioxidant plant extract from the bark of a French pine tree; reduces blood sugar in type 2 diabetes patients, allows people to lower their antihypertensive medication, and improves cardiovascular disease risk factors.
Quinoa	Seed containing high amounts of protein, fiber, magnesium, potassium, vitamin E, riboflavin, zinc, copper, and iron.
Sage, tarragon, thyme	Moderately good sources of polyphenols.
Salmon, sardines, mackerel	Improve mental and visual function; reduce risk of heart disease and may prevent cancers. Rich omega-3 fatty acid source.
Shredded wheat	Great source of whole-grain fiber, as well as magnesium; helpful in maintaining normal blood glucose levels.
Soy	Reduces risk of heart disease by lowering LDL cholesterol; eases menopausal symptoms. Isoflavones have weak estrogenic effects.
Spinach and romaine lettuce	Great source of lutein, carotenoids, and vitamin C; maintain healthy vision.
Squash, acorn	Rich in carotenoids, folate, vitamin C, and potassium; all helpful in reducing heart disease and cancer risk.
Strawberries	May lower blood pressure, reduce the risk of heart disease and some cancers, and improve memory.
Sunflower and sesame seeds	Good source of phytosterols for heart health.
Tea, black, green or white	Reduces risk for stomach, esophageal, and skin cancers, and heart disease. Flavonoids neutralize free radicals.
Tofu	Great meat substitute; rich in protein and isoflavones and may be high in calcium.
Tomatoes	Reduce risk of prostate cancer and heart attack; rich in lutein, lycopene, and vitamin C. Lycopene protects cell membranes. Source of quercetin.
Tuna	Reduces risk of heart disease; high in vitamins B_6 and B_{12}, omega-3 fatty acids, and protein.
Turmeric	Natural anti-inflammatory that reduces cancer risk. Thought to slow Alzheimer's disease.
Walnuts	Lower total and LDL cholesterol and reduces risk of heart disease. Good source of vitamin E, alpha linolenic acid, minerals, and folate.
Whey protein	Immune-enhancing properties including lactoferrin, beta-lactoglobulin, alpha-lactalbumin, and immunoglobulins. Useful for intracellular conversion of cysteine to glutatione, a powerful antioxidant. Whey protein is found naturally in milk.
Whole grains	Reduce risk of certain cancers and heart disease. Contain saponins, flavonoids, and lignans.
Wine, red, grapes and grape juice	Reduce risk of cardiovascular disease and cancer because of resveratrol, a flavonoid (polyphenol).
Winter squash	Butternut squash is one example. Good source of beta-carotene, calcium, potassium, and folate.
Yogurt	Improves intestinal health because of bacterial (probiotic) content; reduces risk of cancer; lowers cholesterol. Rich source of calcium, vitamin B_{12}, magnesium, and protein. May also use cultured dairy products.

Derived from: Functional Foods List, http://www.mealsmatter.org/EatingForHealth/FunctionalFoods/func_list.aspx; accessed February 9, 2009; Fruits and Veggies More Matters, http://www.fruitsandveggiesmorematters.org/; accessed February 9, 2009.

- Explain the benefits of weight management for adults to prevent or delay the onset of chronic diseases. Start with BMI; select a healthy weight goal as needed. Successful weight losers tend to follow a low-fat, high-carbohydrate food plan with high levels of physical activity; they eat breakfast regularly.
- Popular low-carbohydrate, high-protein diet plans may contribute to problems such as kidney stones and are not advised for most adults. The South Beach diet, by recommending olive oil and fatty fish, mimics the Mediterranean diet plan more than the Atkins plan.
- Encourage planned meals. Skipping breakfast may lead to overeating later at night.
- Describe the effects of alcohol at the "business lunch;" alcohol intake may equal 300 calories or more. Discourage intake of more than two alcoholic drinks per day for men or one drink for women.
- Being physically fit can improve the odds against chronic diseases. Goal setting may be an effective strategy. The Surgeon General recommends 1 hour daily of physical activity. Using a pedometer to count steps is very motivating; "10,000 steps a day" is the goal; one mile is approximately 2000 steps. Other forms of exercise should be encouraged as well; yoga, pilates, and Tai chi can help increase flexibility.
- Fluid intake may be lower than desirable. Dehydration can contribute to kidney stones, strain on the heart and cardiovascular system, or even drug toxicity. Encourage daily intake of 30 mL/kg of water and other liquids.

TABLE 1-24 Medications Commonly Used by Adult Women and Men

Infertility	Smoking can reduce the ability of sperm to bind to an egg and can also reduce fertility in women (Bordel et al, 2006). Oxidative stress is detrimental to sperm function and a significant factor in male infertility. Dietary and supplementary intake of the antioxidants vitamin C, vitamin E, and beta-carotene on sperm chromatin integrity (Silver et al, 2005).
Women: Childbearing Age	
Infertility and miscarriages	Genetic defects in the MTHFR (methyltetrahydrofolate reductase) enzyme can cause spontaneous abortions and infertility; forms of L-methylfolate (such as Deplin® or Neevo®) may be needed.
Intrauterine devices	May increase menstrual losses of iron and vitamin C.
Interstitial cystitis (IC)	Acidic foods and beverages such as coffee, alcoholic beverages, fruit juices, carbonated beverages, tomato products, hot peppers, and other spicy foods or beverages may cause irritation. Use buffering products or pain relievers.
Women: Menopause	Low doses of Megace (megestrol acetate) may be used to decrease hot flashes in postmenopausal women who cannot take estrogen. Megace can cause increased appetite, edema, and sodium retention.
Bone density loss	Alendronate (Fosamax) may be used to maintain bone density without breast cancer risk.
Men: Baldness	Androgenic alopecia (baldness) may suggest higher risk for prostate cancer or for early, severe coronary heart disease.
	Rogaine (minoxidil) can cause diarrhea, low blood pressure, nausea, vomiting, and weight gain; it is a vasodilator. A low-sodium, low-calorie diet may be beneficial.
	5-Alpha reductase catalyzes the conversion of testosterone to dihydrotestosterone. Disturbances in 5-alpha reductase activity in skin cells might contribute to male pattern baldness, acne, or hirsutism. Plant homologs are being tested.
Men: Prostate Problems	Proscar (finasteride) and other medications are used with some relief. Monitor blood pressure; no nutritional side effects are noted. Saw palmetto may be useful (see following herb section).
	Antioxidant foods may help protect against prostate cancer (Kranse et al, 2005). Brazil nuts, seafood, and whole grains are natural sources of selenium. Lycopene from dietary sources (tomato sauce, pink grapefruit) are preferable over supplements. Broccoli and cauliflower also be protective.

- Coffee and tea contain antioxidants that can be preventive against cancers, diabetes, heart disease, and Parkinson's disease; moderate daily inclusion may be promoted.
- Annual doctor visits are reasonable. Cholesterol, dental check-ups, BP screening should start at age 20; women need Pap smears and vaccinations against Human papilloma virus (HPV) and cervical cancer (Gardisil®). Women more than 35 years of age should be tested for thyroid status (as with the thyroid stimulating hormone (TSH) test) and should schedule mammograms at least every 3 years. Periodic electrocardiograms (EKGs) and fasting blood glucose are useful after age 40. After age 50, a fecal occult blood test, bone density scan, and (for men), a prostate-specific antigen test should be added. Vaccines for tetanus, flu, shingles, and pneumonia are useful after age 60.
- Help clarify conflicting information about a "serving" and a "portion" on food labels.
- The American Council on Science and Health (ACSH) ranks consumer magazines as sources of reliable nutrition information; *Parents*, *Cooking Light*, and *Good Housekeeping* rank highly.
- Discuss food choices when eating away from home. For travelers who experience jet lag, adjust meal times to match new time zone, which may help the liver adjust more readily.
- Discuss calcium alternatives for people who exclude milk products. There are calcium-fortified foods and beverages, such as fortified orange juice, cereals, mineral waters, and margarine.
- For people living in northern climates, taking vitamin D_3 may be important.
- Discuss the role of managing BP and how diet can help. Ignoring high BP can set the stage for stroke, dementia, and heart disease later in life. Intensive diet and physical activity modifications can greatly reduce disease risk (Aldana et al, 2005).
- Determine psychological readiness for dietary and lifestyle change and the individual's current stage. The Transtheoretical Model for Stages of Change (precontemplation, contemplation, preparation, action, maintenance, or termination) is a useful tool that defines motivation as a dynamic process (Prochaska and DiClemente, 1982). People in the action stages tend to display healthier eating; demographic and psychosocial factors help to mediate readiness to change dietary factors; and precontemplators need individually tailored interventions.
- Many primary care patients are ready to lose weight, improve diet, and increase exercise (Wee et al, 2005). Concentrate on small changes with the client.
- The "Slow Food" movement is trying to counter the fast-food culture by returning to traditional foods, having pleasurable mealtimes, and enjoying the aroma and flavors of foods more fully.

TABLE 1-25 Tips for Eating More Fruits and Vegetables

- Eat at least one vitamin A–rich fruit or vegetable, such as apricots, cantaloupe, carrots, sweet potatoes, spinach, collards, or broccoli each day.
- Eat at least one vitamin C–rich fruit or vegetable such as oranges, strawberries, green peppers, or tomatoes each day.
- Eat several high-fiber fruits or vegetables daily, such as apples, grapefruit, broccoli, baked potato with skin, or cauliflower.
- Eat berries often; blueberries have been highly rated for their antioxidant properties (anthocyanins). Other berries are equally nutritious and contain fiber, quercetin, and other flavonoids.
- Eat cabbage family vegetables, such as cauliflower, broccoli, Brussels sprouts, and cabbage, several times every week.
- Add fruit to cereal or plain yogurt.
- Use fruit juice instead of water when preparing cakes and muffins.
- Drink 100% fruit juice instead of soda.
- Eat a piece of fruit for a morning snack; choose a grapefruit or an orange for an afternoon snack.
- Choose the darkest green or red leaf lettuce greens for salads; add carrots, red cabbage, and spinach.
- Add more vegetables or add tomato juice to soups and stews for vitamins A and C.
- Choose pizza with extra mushrooms, green pepper, onion, broccoli, and tomatoes.
- Munch on raw vegetables with a low-fat dip for an afternoon snack.
- When dining out, choose a side dish of vegetables.
- Fill up most of the plate with vegetables at lunch and dinner.
- Choose fortified foods and beverages, such as juice with added calcium.
- Snack on dried fruits, such as dried apricots, peaches, raisins, or "craisins."
- Use dried plums (prunes) for a natural laxative.
- Use dried plum puree as a butter or margarine substitute in recipes to reduce fat; use half the measure required.

Refer clients to: (1) *Centers for Disease Control and Prevention. Resources for Fruits and Vegetables*. http://www.fruitsandveggiesmorematters.org/?page_id=71

- If needed, provide resources to alleviate food insecurity (American Dietetic Association, 2006).
- Discuss fiber, nonmeat vegetarian meals, cooking methods for nutrient preservation, and phytochemicals. Nutrition messages that lead to increased consumption of dietary fiber need to be strengthened.
- The "Total Diet" message is important to share with consumers (American Dietetic Association, 2007). Peer support is effective for increasing fruit and vegetable intake; Table 1-25 lists ways to include more fruits and vegetables and Table 1-26 describes their key nutrients.
- Nutrition information on packaged food labels is useful to teach point-of-purchase tips, and adults can be encouraged to use them (Satia et al, 2005). However, many adults do not know how to use the food label as well as they might. Consumers are confronted with food and dietary supplement products that claim to improve health, manage conditions, and reduce disease risks (Turner et al, 2005). Label reading may be a marker for other dietary behaviors that predict healthful food choices. Table 1-27 describes food labeling terms. Table 1-28 briefly describes Health Claims that are approved and under review by the Food and Drug Administration.

Patient Education—Food Safety Tips

- Reminders about hand washing and safe food handling may be important, especially for those adults who prepare and serve meals for others.
- Avoid food preparation when sick with viral or bacterial infections. Use latex gloves if there are any cuts on the hands. Thoroughly cook meat, poultry, and fish entrees. Keep cold foods cold and hot foods hot.
- Bacteria are commonly found on foods such as green onions (scallions), cantaloupe, cilantro, and many types of imported produce. Wash all fresh fruits and vegetables. Scrub the outside of produce such as melons and cucumbers before cutting.
- Avoid tap water and ice made from tap water, uncooked produce such as lettuce, and raw or undercooked seafood when traveling. Moderate use of alcoholic beverages may prevent foodborne illness; studies are under way to determine why.
- Airline water may not be free from contamination. Use of bottled water is recommended. Coffee and tea may not be hot enough to kill all bacteria.
- Throw out cooked foods that have been at room temperature for longer than 2 hours.
- Consumption of sulforaphane in foods such as broccoli, cauliflower, cabbage and Brussels sprouts may reduce the presence of *Helicobacter pylori*.
- Avoid raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Do not use raw (unpasteurized) milk or products made from it.
- Avoid serving unpasteurized juices and raw sprouts.
- Only serve processed deli meats and frankfurters that have been reheated to steaming hot temperature.

TABLE 1-26 Key Nutrients in Fruits and Vegetables[a]

Food	Vitamin A, >500 IU	Vitamin C, >6 mg	Folate, >0.04 mg	Potassium, >350 mg	Dietary Fiber, >2 g
Fruits					
Apple, with skin (1 medium)		X			X
Apricot, dried (3)	X	X		X	X
Banana (1 medium)		X		X	X
Blackberries (1/2 cup)					X
Blueberries (1 cup)		X			X
Cantaloupe (1 cup)	X	X		X	
Grapefruit (1/2 medium)		X			
Grapefruit juice (3/4 cup)		X		X	
Grapes (1/2 cup)		X			
Honeydew melon (1 cup)		X		X	X
Kiwifruit (2 medium)		X	X	X	X
Mango (1 medium)	X	X			X
Nectarine (1 medium)	X	X			X
Orange (1 medium)		X	X		X
Orange juice (3/4 cup)		X	X	X	
Papaya (1 medium)	X	X	X	X	X
Peach, with skin (1 medium)	X	X			X
Pear, with skin (1 medium)		X			X
Pineapple (two 3/4" slices)		X			X
Plum, with skin (2 medium)		X			X
Prunes (4) (dried plums)	X				X
Raspberries (1 cup)		X			X
Strawberries (1/2 cup)		X			X
Watermelon (1 cup)	X	X			
Vegetables					
Artichokes (1 medium)					X
Asparagus (5 spears)		X	X		X
Beans, kidney (1/2 cup)			X	X	X
Beans, lima (1/2 cup)			X	X	X
Black-eyed peas (1/2 cup)			X		X
Bok choy (1 cup cooked)		X			
Broccoli (1/2 cup)	X	X	X		X
Brussels sprouts (1/2 cup)		X			
Carrots (1 medium)	X	X			X
Cauliflower (1 cup)		X	X		X
Collards (1/2 cup)	X	X	X		X
Corn (1 cup)		X	X	X	X
Green beans (1/2 cup)		X			X
Green pepper (1 medium)	X	X			X
Kale (1/2 cup)	X	X			X
Lentils (1/2 cup)			X	X	X
Peas, green (1/2 cup)		X	X		X
Peas, split (1/2 cup)			X	X	X
Potato (1 medium)		X		X	
Potato, with skin (1 medium)		X		X	X
Romaine lettuce (6 leaves)	X	X	X		
Spinach, cooked (1/2 cup)	X	X	X	X	X
Squash, winter (1/2 cup)	X	X		X	X
Sweet potato (1 medium)	X	X		X	X
Tomato (1 medium)	X	X		X	
Turnip greens (1/2 cup)	X	X	X		

Adapted from: *Supermarket Savvy* newsletter, Linda McDonald Associates Inc., www.supermarketsavvy.com. Used with permission.
[a]X indicates that the item provides 10% or more of the daily value in the serving size specified or at least 2 g of dietary fiber.

TABLE 1-27 Food Labeling Terms

Labeling Terms	
% Fat free	Food must be a low-fat or fat-free food to include this value
Free	Food contains 0% of the indicated nutrient
Good source	Contains 10–19% of the daily value (DV) for a nutrient
High	Contains 20% or more DV for a nutrient
Lean	Contains 10 g fat or less and 95 mg cholesterol or less (extra lean 5% fat by weight)
Less	Food contains 25% less than original food
Light/lite	Food contains fewer calories or 50% less fat than original food OR description of color (if indicated on the label)
Low	Low fat as 3 g or less; low sodium as 140 mg or less; very low sodium as 35 mg or less; low cholesterol as 20 mg or less; low calorie as 40 calories or less
More	Food contains 110% or more DV than original food
Reduced	Product has 25% or less of a nutrient or the usual calories of that food
Reduced cholesterol	The food contains 75% or less of the cholesterol found in the original product

Source: U.S. Food and Drug Administration.

TABLE 1-28 Health Claims

(1) Authorized Health Claims		**Health claims must be supported by significant scientific agreement among experts that the proclaimed benefit of a food or food component on a disease or health-related condition is true (Turner et al, 2005).**
Diet	**Disease**	**Model Claim**
Calcium	Osteoporosis	Regular exercise and a healthful diet with enough calcium help teens and young adult white and Asian American women maintain good bone health and may reduce their risk of osteoporosis.
Sodium	Hypertension	Diets low in sodium may reduce the risk of high blood pressure, a disease associated with many factors.
Dietary fat	Cancer	Development of cancer depends on many factors. A diet low in total fat may reduce the risk of some cancers.
Dietary saturated fat and cholesterol	Coronary heart disease	While many factors affect heart disease, diets low in saturated fat and cholesterol may reduce the risk of this disease.
Fiber-containing grain products, fruits, and vegetables	Cancers	Low-fat diets rich in fiber-containing grain products, fruits and vegetables may reduce the risk of some types of cancer, a disease associated with many factors.
Fruits, vegetables, and grain products that contain fiber, particularly soluble fiber	Coronary heart disease	Diets low in saturated fat and cholesterol and rich in fruits, vegetables, and grain products that contain some types of dietary fiber, particularly soluble fiber, may reduce the risk of heart disease, a disease associated with many factors.
Fruits and vegetables	Cancer	Low-fat diets rich in fruits and vegetables may reduce the risk of some types of cancer, a disease associated with many factors.
Folate	Neural tube birth defects	Healthful diets with adequate daily folate may reduce a woman's risk of having a child with a brain or spinal cord birth defect.

(continued)

TABLE 1-28 Health Claims *(continued)*

(2)Authorized Health Claims after Petition		**When significant scientific agreement is lacking, qualifying statements may be required on the label to describe the strength of the evidence that supports the claim (Turner et al, 2005).**
Diet	**Disease**	**Approved Health Claim**
Sugar alcohols	Dental caries	"Frequent eating of foods high in sugars and starches as between-meal snacks can promote tooth decay. The sugar alcohol [name of product] used to sweeten this food may reduce the skin of dental caries."
Foods that contain fiber from whole-oat products	Coronary heart disease	"Diets low in saturated fat and cholesterol that include soluble fiber from whole oats may reduce the risk of heart disease."
Foods that contain fiber from psyllium	Coronary heart disease	"Diets low in saturated fat and cholesterol that include soluble fiber from psyllium seed husk may reduce the risk of heart disease."
Soy protein	Coronary heart disease	"Diets low in saturated fat and cholesterol that include 25 g of soy protein a day may reduce the risk of heart disease. One serving of [name of food] provides 6.25 g of soy protein."
Plant sterol/stanol esters	Coronary heart disease	Plant sterols: "Foods containing at least 0.65 g per serving of plant sterols, eaten twice a day with meals for a daily total intake of at least 1.3 g, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. A serving of [name of the food] supplies ___ g of vegetable oil sterol esters." Plant stanol esters: "Foods containing at least 1.7 g per serving of plant stanol esters, eaten twice a day with meals for a total daily intake of at least 3.4 g, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. A serving of [name of the food] supplies ___ g of plant stanol esters."
(3) Qualified Health Claims NOT Approved by FDA		**Qualified health claims, where FDA has found some support but not enough clear evidence to allow an approved health claim.**
Diet–Disease Relationship	**Disease**	**Qualified Health Claim**
Omega-3 fatty acids	Coronary heart disease	Consumption of omega-3 fatty acids may reduce the risk of coronary heart disease. FDA evaluated the data and determined that, although there is scientific evidence supporting the claim, the evidence is not conclusive.
Folic acid, B_6, B_{12}	Vascular disease	As part of a well-balanced diet that is low in saturated fat and cholesterol, Folic Acid, Vitamin B_6 and Vitamin B_{12} may reduce the risk of vascular disease. FDA evaluated the above claim and found that, while it is known that diets low in saturated fat and cholesterol reduce the risk of heart disease and other vascular diseases, the evidence in support of the above claim is inconclusive.
Selenium	Cancer	Selenium may reduce the risk of certain cancers. Some scientific evidence suggests that consumption of selenium may reduce the risk of certain forms of cancer. However, FDA has determined that this evidence is limited and not conclusive.
Phosphatidylserine	Dementia	Very limited and preliminary scientific research suggests that phosphatidylserine may reduce the risk of dementia [cognitive dysfunction] in the elderly. FDA concludes that there is little scientific evidence supporting this claim.

From: Hasler CM. Functional foods: benefits, concerns and challenges—a position paper from the American Council on Science and Health. *J Nutr.* 132:3772–3781, 2002. Reprinted with permission.

For More Information

- American Association of Family and Consumer Sciences
  http://www.aafcs.org/
- American Pregnancy Association: Preconceptual Nutrition
  http://www.americanpregnancy.org/gettingpregnant/preconceptionnutrition.html
- American Public Health Association
  http://www.apha.org/
- Centers for Disease Control and Prevention—Young Adults
  http://www.cdc.gov/lifestages/youngAdults.html
- Centers for Disease Control and Prevention—Men
  http://www.cdc.gov/men/
- Centers for Disease Control and Prevention—Women
  http://www.cdc.gov/women/
- Chronic Disease Prevention and Health Promotion
  http://www.cdc.gov/nccdphp/index.htm
- Dietary Supplements
  http://www.foodsafety.gov/~dms/supplmnt.html
- Eating Well
  http://www.eatingwell.com
- Family Mealtime
  http://www.cfs.purdue.edu/CFF/promotingfamilymeals
- Food and Drug Administration
  http://www.fda.gov/
- Gardisil® and Human Papilloma Virus Vaccines
  http://www.gardasil.com/
- Healthfinder—Information
  http://www.healthfinder.gov/
- Health Statistics
  http://www.cdc.gov/nchs/fastats/Default.htm
- Human Genome Project
  http://www.genome.gov/
- Human Variome Project
  http://www.humanvariomeproject.org/
- International Food Information Council
  http://ific.org/
- Interstitial Cystitis Association
  http://www.ichelp.org/
- Menopause—Women's Healthcare Forum
  http://www.womenshealthcareforum.com/menopause.cfm
- Men's Health
  http://www.nlm.nih.gov/medlineplus/menshealth.html
- Men's Health Network
  http://www.menshealthnetwork.org/
- MyPyramid Food Guidance System
  http://www.mypyramid.gov/
- National Center for Complementary and Alternative Medicine
  http://nccam.nih.gov/
- National Institutes of Health
  http://www.nih.gov/
- National Women's Health Resource Center
  http://www.4woman.org/
- Recipes:
  http://www.deliciousdecisions.org
  http://www.cookinglight.com
  http://www.mealsforyou.com
  http://www.allrecipes.com
- Shape Up America
  http://www.shapeup.org/
- Slow Food Movement
  http://slowfood.com
- Sustainable Food Systems
  http://www.localharvest.org
- Web MD—Men's Health
  http://men.webmd.com/
- Women's Health Initiative
  http://www.nhlbi.nih.gov/whi/index.html

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NUTRITION IN AGING

NUTRITIONAL ACUITY RANKING: LEVEL 2

DEFINITIONS AND BACKGROUND

Aging involves a progression of physiological changes with cell loss and organ decline. Decreased glomerular filtration rate (GFR) and creatine-height index (CHI), constipation, decreased glucose tolerance, and lowered cell-mediated immunity can occur. Energy needs for basal metabolism decrease as much as 10% for ages 50–70 years and by 20–25% thereafter.

Life span is the length of time an organism could live; for humans, this is between 120 and 140 years. But life expectancy (average life span) is seldom beyond 114 years. Many gerontologists prefer to have patients start out a little overweight to support immunity. Nutrition density is an integral part of successful aging; culturally appropriate food and nutrition services should be customized to the individual's needs (American Dietetic Association, 2005).

It is estimated that most of the older population have one or more chronic conditions that would benefit from nutrition interventions. Challenges of nutritional assessment in older adults include limited recall, hearing and vision losses, changes in attention span, and variations in dietary intake from day to day. The inability to perform activities of daily living can be a major concern. Older adults may need assistance with shopping, meal preparation, and in ensuring adequate intake. Food insecurity exists among senior citizens and should be addressed (American Dietetic Association, 2006).

According to the U.S. Census Bureau, people older than 65 years of age comprise 13% of the United States population. Only about 5% of senior citizens are in nursing homes, the others live in the community, often alone. Approximately 20–50% of patients admitted to hospital are malnourished, especially older adults. Although the stress response to surgery (decrease in albumin and transferrin) is not affected by age, serum protein levels return to normal more slowly in older individuals, a factor to consider in older surgical patients. In addition, it is important to consider the wishes of the individual about nutrition and hydration (American Dietetic Association, 2008).

Loss of teeth, decreased salivation, lower nutrient absorption, as well as declining taste and smell, are common problems in the aged. More importantly, BMR declines 2% with each decade of life. LBM declines with each decade, generally replaced by fat. Being too thin is risky to the immune system; weight loss is not desirable in older adults because it is usually difficult for them to recover lost muscle mass. Essentially, older persons consume less food, about one third few calories, than younger people. Over 30% of seniors consume less energy than recommended levels, and 50% have low mineral and vitamin intakes. Lower food intake by this population appears to be a result of smaller meals eaten at a slower rate. In addition, protein intake is below the desired levels in many older adults.

Inflammatory chronic conditions such as obesity, cardiovascular disease, insulin resistance, and arthritis are associated with aging (Jensen, 2008). Seniors exhibit loss of muscle strength, easy fatigue, physical inactivity, slow or unsteady gait, poor appetite, unintentional weight loss, impaired cognition, depression and mortality. Muscle loss with aging (sarcopenia) comes from changes in anabolic hormones, decreased intake of dietary protein, a decline in physical activity, and inflammation driven by cytokines and oxidative stress with elevated levels of interleukin-6 and CRP (Jensen, 2008).

Protein-energy undernutrition contributes to pressure ulcers, immune dysfunction, infections, hip fractures, anemia, muscle weakness, fatigue, edema, cognitive changes, and mortality. While weight loss, depression, dehydration, and feeding problems are the easy to detect, elevated CRP levels should also be noted. Interventions for sarcopenia include enhanced physical activity, resistance exercise, calorie restriction, use of anabolic hormones, anti-inflammatory agents, nutritional supplements, and antioxidants (Jensen, 2008). Nutrition alone is not sufficient.

Growth hormone (GH) supports appetite and intake. Because GH secretion declines after puberty, researchers have developed oral ghrelin mimetics to improve intake, prevent declines in fat-free muscle mass, and reduce abdominal visceral fat in older adults (Hanauer, 2009). Multivitamin–mineral supplementation should be recommended; extra vitamins E, B_{12}, $B_{6,}$ folate, calcium, and zinc are needed to counteract gastric atrophy, decreased levels of hydrochloric acid, and poor nutrient intakes. Folate and vitamin D_3 seems to play a role in depression and dementia.

Use of medications including digoxin, furosemide, warfarin, paroxetine, nifedipine, ranitidine, theophylline, amlodipine, ciprofloxacin, and sertraline may cause anorexia or nausea. Scrutiny of the rationale of all medications should be undertaken.

Always follow abnormal lab work with evaluation of nutritional intake. Request labs that are truly warranted or cost effective. Low albumin may indicate infection or a draining wound, and not dietary inadequacy. Precipitously declining cholesterol (<150 mg/dL) appears to be a marker for depression, poor nutrition, or mortality. At the opposite end of the spectrum, lowering high cholesterol and homocysteine levels, obesity management, smoking cessation are

beneficial for heart and brain health. The Mediterranean diet has been found to be especially useful. This diet improves cholesterol levels, blood sugar levels and blood vessel health, and reduces inflammation (Scarmeas et al, 2009).

When done properly, medical nutritional therapy can save thousands of dollars *per patient, per hospital stay*. Studies by the American Dietetic Association demonstrate that for every dollar spent on nutrition screening and intervention, at least $3.25 is saved in healthcare costs.

Common factors used for nutritional risk assessments are found in Table 1-29. The CNAQ, MNA and DETERMINE assessments are short, simple appetite assessment tools that predict anorexia-related weight loss in community-dwelling adults and long-term care residents (Wilson et al, 2005).

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Genetic Markers: Each individual has a unique genetic profile and phenotype. Because both parents contribute genes and chromosomes to the fetus, a genetic history may be beneficial.

Clinical/History

- Age
- Height (actual)
- Weight, current
- Weight, usual
- Recent weight changes
- BMI
- Waist circumference
- Diet history
- Temperature (hypothermia?)
- BP
- Dentition
- Eyesight
- Hearing
- Difficulty in chewing
- Dysphagia
- Constipation, diarrhea
- Fecal impaction
- Changes in bowel habits or incontinence
- Urinary incontinence or indwelling catheter
- Skin condition and pressure ulcers
- Hx of surgery, radiation, chemotherapy
- Mini-Mental State Examination
- Hydration status, I & O
- Clinical signs of malnutrition
- DXA for sarcopenia or osteopenia
- Changes in appetite
- Nausea, vomiting, indigestion
- Pain
- Infection
- Abnormal gait or motor coordination
- Sleep disorder screening

Lab Work

- Glucose
- CRP
- Ca^{++}, Mg^{++}
- Urinary N
- Na^{+}, K^{+}
- H & H, serum Fe
- Serum vitamin B_{12}, methylmalonic acid
- Serum folate
- Serum homocysteine
- Chol, Trig
- Alb or transthyretin (can be high in dehydration)
- TSF, MAC, MAMC
- BUN, Creat
- Transferrin
- TLC
- Protime (PT) or international normalized ratio (INR)

SAMPLE NUTRITION CARE PROCESS STEPS

Unintentional Weight Loss In Long-Term Care

Assessment: Intake reports and food preferences, I & O records, weight changes, lab values, psychological issues.

Nutrition Diagnosis (PES): Involuntary weight loss related to inadequate food and beverage intake as evidenced by 24-lb weight loss and dining room records indicating intake less than 50% at meals.

Intervention: Offer more favorite foods; promote consumption of between-meal nourishments, collaboration with social worker.

Monitoring and Evaluation: Changes in weight, verbalized improvement in appetite, dining room food intake records.

Palliative Care Nutrition

Assessment: Individual not eating or drinking; physician-ordered palliative care; resident wishes to have "no heroic measures" including tube feeding as per Advanced Directives.

Nutrition Diagnosis (PES): Inadequate food and beverage intake related to patient's choice to withdraw nutritional support as evidenced by minimal oral intake and palliative care status.

Intervention: Make food and fluids available upon patient or family request.

Monitoring and Evaluation: Check measures taken for meeting patient or family requests.

INTERVENTION

OBJECTIVES

- Provide proper nutrition for weight control, healthy appetite, prevention of acute illness, and complications of chronic diseases such as osteoporosis, fractures, anemia, obesity, diabetes, heart disease, and cancer.
- Avoid rapid unintentional weight loss, which often indicates underlying disease and accelerated muscle loss (Miller and Wolfe, 2008). Determine baseline functional level and evaluate changes over time.
- Monitor signs of malnutrition. Prevalence increases with age, is more common in institutionalized individuals, and is associated with susceptibility to infection, longer hospital stay, and increased mortality (Hudgens and Langkamp-Henken, 2005). Malnutrition may be caused by poverty, ignorance, chronic disease, poor dietary intake, chewing or swallowing problems, polypharmacy, mental or physical disability, even depression. MIA syndrome reflects the triad of malnutrition, inflammation, and atherosclerosis that often includes oxidative stress and elevated cytokines.
- Correct existing nutritional deficiencies. Avoid restrictive diets as much as possible (Niedert, 2005).
- Recognize cachexia syndromes that are not reversible by hypercaloric feeding. Sometimes failure of nonpharmacologic therapies warrant consideration of orexigenic drug therapy. Malnourished older adults benefit from receiving oral supplemental beverages.
- Vitamin B_{12} deficiency in older people is most often from malabsorption of food-bound vitamin B_{12} (Johnson, 2007). High serum folate levels along with vitamin B_{12} deficiency

TABLE 1-29 Nutrition Assessment Tools for the Elderly

DETERMINE Checklist	***Warning signs for malnutrition*** (from the Nutrition Screening Initiative, a project of the American Academy of Family Physicians, The American Dietetic Association and the National Council on the Aging, Inc., and Abbott Laboratorie, 1994. No longer published.)
D	Disease (illness affects nutritional intake)
E	Eating poorly, especially fewer than two meals daily
T	Tooth loss, mouth pain, chewing difficulty
E	Economic hardship (too few dollars to buy food)
R	Reduced social contact; eating meals alone
M	Multiple medicines (three or more prescribed or over-the-counter medications)
I	Involuntary weight loss or gain (10 lb in 6 months)
N	Needs assistance with self-care (shopping, cooking, eating)
E	Elderly years (older than 80 years of age), with increasing frailty
MNA: Mini Nutrition Assessment	MNA is a reliable and easy-to-use nutritional assessment tool for physicians, dietitians, medical students, or nurses to quickly evaluate the nutritional status of an individual (Nestle.) http://www.mna-elderly.com/clinical-practice.htm
18 questions, 4 categories: anthropometric assessment, general assessment, dietary assessment, subjective assessment	Asks questions relating to the last 3 months, such as: • Weight loss; BMI • Mobility problems; psychological stress; acute disease • Food intake, digestive problems, chewing or swallowing difficulties • Depression or dementia
SGA: Subjective Global Assessment	SGA classification technique can aid in the recognition of undernutrition by assessing a patient's nutritional status based on features of the medical history and physical examination. See Section 13 for examples of the SGA.
SNAP: Malnutrition Screening in Senior Citizens	Common factors to assess (adapted from the Australian College of Royal General Practitioners. SNAP: a population guide to be behavioral risk factors in general practice. *Austr Fam Phys*. 33:1, 2004.)
Protein and muscle mass	Impaired synthesis of new tissue Decline of the protein reserve of the body Diminished capacity to meet the extra demand of protein synthesis associated with disease or injury Increased frailty Sarcopenia
Nutrient deficits	Decreased energy intake; anorexia of aging
Changes in mobility	Falls Illness Hospitalization Immobilization

Nonphysiological Causes of Undernutrition	
Social factors	Poverty Inability to shop Inability to prepare and cook meals Inability to feed oneself Living alone, social isolation, or lack of social support network Failure to cater to ethnic food preferences
Psychological factors	Dementia Alcoholism Bereavement Depression Phobia about cholesterol, fat, calories
Medical factors	Anorexia, early satiety, malabsorption, increased metabolism, cytokine-mediated and impaired functional status Cancer Alcoholism Cardiac failure Chronic obstructive pulmonary disease Infection Dysphagia Rheumatoid arthritis Parkinson disease Hyperthyroidism, HIV or AIDS
Gastrointestinal issues	Malabsorption syndromes Dyspepsia, atrophic gastritis, vomiting Diarrhea or constipation Poor dentition
CNAQ: Council on Nutrition Appetite Questionnaire	Eight questions from the Council on Nutrition http://medschool.slu.edu/agingsuccessfully/pdfsurveys/appetitequestionnaire.pdf.
A. My appetite is	1. Very poor 2. Poor 3. Average 4. Good 5. Excellent
B. When I eat, I feel full after	1. Eating only a few mouthfuls 2. Eating about 1/3 of a plate or meal 3. Eating over 1/2 of a plate or meal 4. Eating most of the food 5. Hardly ever
C. I feel hungry	1. Never 2. Occasionally 3. Sometimes 4. Most of the time 5. All of the time
D. Food tastes	1. Very bad 2. Bad 3. Average 4. Good 5. Very good
E. Compared to when I was 50, food tastes	1. Much worse 2. Worse 3. Just as good 4. Better 5. Much better
F. Normally, I eat	1. Less than one regular meal a day 2. One meal daily 3. Two meals daily 4. Three meals daily 5. Over three meals daily including snacks
G. I feel sick or nauseated when I eat	1. Most times 2. Often 3. Sometimes 4. Rarely 5. Never
H. Most of the time my mood is	1. Very sad 2. Sad 3. Neither happy nor sad 4. Happy 5. Very happy
Total Score	Add the numbers associated with the patient's response. 8–16 at risk for anorexia and needs nutrition counseling 17–28 patient needs frequent reassessment >28 patient is not at risk at this time.

exacerbate anemia and can worsen cognitive symptoms, therefore careful monitoring is important (Clarke et al, 2007; Johnson, 2007; Tangney et al, 2009).
- Provide foods of proper consistency by dental status. Dentures alter the taste of foods by increasing bitter and sour taste sensations (Duffy et al, 1999). Chop foods as needed; puree only if necessary.
- Provide a diet of correct texture; exclude hard, sticky foods that are difficult to chew and swallow.
- Older individuals have fewer taste buds. More sweet flavors and stronger seasonings may be required to satisfy the appetite.
- Evaluate for laxative and enema use or abuse; recommend suitable alternatives and interventions, such as oat fiber, prunes or other dried fruits, extra liquid.
- Evaluate for alcohol abuse; make appropriate referrals as needed.
- "If the gut works, use it." Maintain oral diet as much as possible. For individuals who are unable to regain unintentional weight losses, artificial nutrition may be needed. Review advance directives and proceed accordingly.
- Investigate hydration status and any major weight shifts. Diminishing thirst mechanisms and incontinence contribute to dehydration. Generally, older adults should ingest 25–30 mL/kg of fluids per day. Alterations would be needed for heart, liver, or renal failure.
- Indices of overweight and obesity such as BMI do not correlate as strongly with adverse health outcomes in older as compared to younger individuals (Miller and Wolfe, 2008).
- Assess the behavioral and environmental situations (i.e., Who shops? Who cooks? How are finances handled? How often are meals eaten away from home? Is this person dependent or independent?). Evaluate family and social support. If there is a need for assistance, make appropriate referrals.
- Correct frailty where possible by addressing depression, use of multiple medications, underlying medical illnesses. Low levels of serum cholesterol (<189 mg/dL) may indicate signs of occult disease or rapidly declining health.
- Encourage physical activity, especially resistance training. This can help to maintain metabolically active tissue, stimulate appetite, improve sleep, correct mild constipation, improve cognitive function, enhance nitrogen balance, and promote positive outcomes in memory, self-esteem, and independence.

FOOD AND NUTRITION

- Ensure intake of the MyPyramid Food Guidance System: 3–4 servings of milk, dairy products, or calcium substitutes; 2–3 servings of protein foods (meat or substitute); 3–5 servings of vegetables; 2–4 servings of fruits; and 6–12 bread group servings. Recommend fats, oils, alcohol, sugars, and sweets to increase or decrease energy intake, as appropriate for the individual.
- Diet should provide adequate intake of protein: 0.8–1 g/kg body weight. This may mean 63 g for men and 50 g for women. Considering liver and renal impairments, decrease protein intake if needed. Increase protein intake in case of pressure ulcers, cancers, infections and other conditions requiring tissue repair.
- Energy: 25–35 kcal/kg. The Institute of Medicine suggests that the average 75-year-old female and male need 2403 and 3067 kcal, respectively, if ambulatory. Fewer kilocalories are needed if nonambulatory (e.g., living in an institution). Nutritional supplements may provide needed energy and protein for nursing home residents (Avenell and Handoll, 2010). See Table 1-30.
- Consume 1200 mg of calcium from milk, yogurt, and related dairy products when possible. Include sources of the B vitamins and zinc. Iron needs are lower in women after menopause, but include at least the RDA. Ensure sufficiency of other nutrients according to the patient's age and sex, using Table 1-29.
- If patient has heart disease or hypertension, encourage the Mediterranean diet or the DASH diets. Liberalize where possible to keep intake at a sufficient level. Extra natural vitamin E may be used from nuts, olive and canola oils, and some fruits and vegetables.
- The consistency of the food should be altered (i.e., ground, pureed, or chopped) only as required. Try to maintain whole textures as often as possible to enhance the food's appeal and to increase chewing with saliva. Mechanically altered diets are often not necessary, may have been started inappropriately, and may compromise taste, acceptability, and micronutrient intake.
- Adequate fiber and fluid intakes are necessary. Prudent increases in fiber (e.g., from prunes and bran) can reduce laxative abuse. Dehydration is a common cause of confusion and should be identified or avoided.
- A low-fat, vegan diet is associated with significant weight loss in overweight postmenopausal women, even without prescribed limits on portion size or energy intake (Barnard et al, 2005). If obesity is present, this change may improve health status.
- Adequate amounts of vitamins C and D, folic acid, and iron are often deficient in the diets of older individuals. Vitamin C levels must be increased for those individuals who smoke. Consider a multivitamin–mineral supplement.
- When taste and olfactory sensations are weak, the diet should provide adequate intake of zinc, folate, and vitamins A and B_{12}. Season with herbs and spices; add butter-flavored seasonings, garlic, maple or vanilla extract, and cheese or bacon-flavored seasonings. Consider all possible taste enhancers.
- Increased thiamin may be needed because of decreased metabolic efficiency. Men are especially susceptible.
- Reduce intake of excessive sweets; poor glucose tolerance and insulin resistance are common after 65 years of age.
- If early satiety is a problem, serving the main meal at noon may help with overall intake.
- Encourage socialization at mealtimes. Healthy individuals have food intakes that are greater when eating with other people, especially family or friends.
- Offer substitutes for major foods not consumed. If the individual resides in an institution, it is recommended to try other menu alternatives before offering a nutritional supplement as a meal replacement. Consult a dietitian if intake is chronically poor. If necessary, liquid supplements can provide needed energy, protein, and micronutrients.
- Offer tips for those who must eat alone. Menus and shopping tips may be needed, such as cooking in batches and freezing extra portions.
- For hospice patients, provide comfort foods and liquids as requested.

TABLE 1-30 Dietary Reference Intakes for Older Adults

		Vitamins and Elements									
		Vitamin A (μg)[a,b]	Vitamin C (mg)	Vitamin D (μg)[c,d]	Vitamin E (mg)[e,f,g]	Vitamin K (μg)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)[g,h]	Vitamin B_6 (mg)	Folate (μg)[g,i]
RDA or AI[j]											
Age 51–70	Male	**900**	**90**	10*	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**
	Female	**700**	**75**	10*	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**
Age 70+	Male	**900**	**90**	15*	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**
	Female	**700**	**75**	15*	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**
Tolerable upper intake levels[k]											
Age 51–70	Male	3000	2000	50	1000	ND	ND	ND	35	100	1000
	Female	3000	2000	50	1000	ND	ND	ND	35	100	1000
Age 70+	Male	3000	2000	50	1000	ND	ND	ND	35	100	1000
	Female	3000	2000	50	1000	ND	ND	ND	35	100	1000

		Vitamin B_{12} (μg)[l]	Pantothenic Acid (mg)	Biotin (μg)	Choline (mg)[m]	Boron (mg)	Calcium (mg)	Chromium (μg)	Copper (μg)	Fluoride (mg)	Iodine (μg)
RDA or AI[j]											
Age 51–70	Male	**2.4**	5*	30*	550*	ND	1200*	30*	**900**	4*	**150**
	Female	**2.4**	5*	30*	425*	ND	1200*	20*	**900**	3*	**150**
Age 70+	Male	**2.4**	5*	30*	550*	ND	1200*	30*	**900**	4*	**150**
	Female	**2.4**	5*	30*	425*	ND	1200*	20*	**900**	3*	**150**
Tolerable upper intake levels[k]											
Age 51–70	Male	ND	ND	ND	3500	20	2500	ND	10,000	10	1100
	Female	ND	ND	ND	3500	20	2500	ND	10,000	10	1100
Age 70+	Male	ND	ND	ND	3500	20	2500	ND	10,000	10	1100
	Female	ND	ND	ND	3500	20	2500	ND	10,000	10	1100

		Elements and Macronutrients								
		Iron (mg)	Magnesium (mg)[n]	Manganese (mg)	Molybdenum (mg)	Nickel (mg)	Phosphorus (mg)	Selenium (ug)	Vanadium (mg)[o]	Zinc (mg)
RDA or AI[j]										
Age 51–70	Male	**8**	**420**	2.3*	**45**	ND	**700**	**55**	ND	**11**
	Female	**8**	**320**	1.8*	**45**	ND	**700**	**55**	ND	**8**
Age 70+	Male	**8**	**420**	2.3*	**45**	ND	**700**	**55**	ND	**11**
	Female	**8**	**320**	1.8*	**45**	ND	**700**	**55**	ND	**8**
Tolerable upper intake levels[k]										
Age 51–70	Male	45	350	11	2000	1	4000	400	1.8	40
	Female	45	350	11	2000	1	4000	400	1.8	40
Age 70+	Male	45	350	11	2000	1	3000	400	1.8	40
	Female	45	350	11	2000	1	3000	400	1.8	40

(continued)

TABLE 1-30 Dietary Reference Intakes for Older Adults *(continued)*

	Elements and Macronutrients							
	Energy (kcal)[b]	Protein (g)[c]	Carbohydrates (g)[d]	Total Fat (% kcal)[e,f]	*n* -6 PUFA (g)	*n* -3 PUFA (g)	Total Fiber (g)	Drinking Water, Beverages, Water in Food (L)
RDA or AI[a]								
Age 51–70 Male	2204	**56**	**130**		14*	1.6*	30*	3.7*
Female	1978	**46**	**130**		11*	1.1*	21*	2.7*
Age 70+ Male	2054	**56**	**130**		14*	1.6*	30*	2.6*
Female	1873	**46**	**130**		11*	1.1*	21*	2.1*
AMDR[a]		10–35%	45–65%	20–35%	5–10%	0.6–1.2%		

[a]Recommended dietary allowances (RDAs) are in **bold type** and adequate intakes (AIs) are in ordinary type followed by an asterisk (*).
[b]Values are based on Table 5-22 estimated energy requirements (EER) for men and women 30 years of age. Used height of 5'7", "low active" physical activity level (PAL), and calculated the median BMI and calorie level for men and women. Caloric values based on age were calculated by substracting 10 kcal/d for males (from 2,504 kcal) and 7 kcal/d for females (from 2,188 kcal) for each year of age above 30. For ages 51–70, calculated for 60 years old, for 70+, calculated for 75 years old. 80 year old male calculated to require 2,004 kcal, female, 1,838 kcal.
[c]The RDA for protein equilibrium in adults is a minimum of 0.8 g/kg body weight for reference body weight.
[d]The RDA for carbohydrate is the minimum adeqaute to maintain brain function in adults.
[e]Because percentage of energy consumed as fat can vary greatly and still meet energy needs, an AMDR is provided in absence of AI, EAR, or RDA for adults.
[f]Values for mono- and saturated fats and cholesterol not established as "they have no role in preventing chronic disease, thus not required in the diet."
[g]Acceptable macronutrient distribution ranges (AMDRs) for intakes of carbohydrates, proteins, and fats expressed as percentage of total calories.
The values for this table were excerpted from the Institute of Medicine, *Dietary reference intakes: Applications in dietary assessment,* 2000, and *Dietary reference intakes for energy, carbohydrates, fiber, fat, protein and amino acids (macronutrients),* 2002.
[j]Recommended dietary allowances (RDAs) are in bold type and adequate intakes (AIs) are in ordinary type followed by an asterisk (*).
ND—Indicates values not determined.
The values for this table were excerpted from the Institute of Medicine, *Dietary reference intakes: Applications in dietary assessment,* 2000, and *Dietary reference intakes for energy, carbohydrates, fiber, fat, protein and amino acids (macronutrients),* 2002.

	Electrolytes		
	Potassium (g)	Sodium (g)	Chloride (g)
RDA or AI[a]			
Age 51–70 Male	4.7	1.3*	2.0*
Female	4.7	1.3*	2.0*
Age 70+ Male	4.7	1.2*	1.8*
Female	4.7	1.2*	1.8*
Tolerable upper intake levels[a]			
Age 51–70 Male		2.3	3.6
Female		2.3	3.6
Age 70+ Male		2.3	3.6
Female		2.3	3.6

[a]Recommended dietary allowances (RDAs) are in bold type and adequate Intakes (AIs) are in ordinary type followed by an asterisk (*).
ND—Indicates values not determined.
The values for this table were excerpted from the Institute of Medicine, *Dietary reference intakes: Water, potassium, sodium, chloride, and sulfate,* 2004.

Common Drugs Used and Potential Side Effects

- Discuss the relevance of tolerable ULs from the latest dietary reference intakes of the National Academy of Sciences. These levels were set to protect individuals from receiving too much of any nutrient from diet and dietary supplements.
- Many drugs affect the nutritional status of the patient. A thorough drug history is needed.
- Drug metabolism and detoxification require an adequate diet containing methionine and other sulfur amino acids; vitamins A, B_{12}, C, and E; choline; folate and selenium.
- Polypharmacy is common in older adults, especially those living in institutionalized settings.
- Long-term use of high-carbohydrate, low-protein diets is undesirable when protein-bound drugs are prescribed. Drug metabolism is slowed, a potentially dangerous occurrence. See Table 1-31.

Herbs, Botanicals, and Supplements

- Herbs and botanical supplements should not be used without discussing with the physician, especially for underlying medical conditions.
- Older people should be encouraged to report the use of herbs and nutritional supplements to their doctors. Doctors should provide comprehensive and current information about potential herb–drug interactions. Among older

TABLE 1-31 Drugs with Potentially Undesirable Side Effects in Seniors

Effect	Medications
Addiction	Amphetamines, anorexic agents, and barbituates
Anorexia	Antibiotics, digoxin
Calcium and fat-soluble vitamin depletion	Mineral oil as a laxative
Confusion	Cimetidine (Tagamet) can decrease vitamin B_{12} levels
Constipation	Opiates, iron supplements, diuretics
Decreased sense of taste	Metronidazole, calcium channel blockers, angiotensin-converting enzyme (ACE) inhibitors, metformin
Diarrhea	Laxatives, antibiotics
Dysphagia	Potassium supplements, NSAIDs, bisphosphonates, prednisolone
Early satiety	Anticholinergic drugs, sympathomimetic agents
Hypotension	Cardiac drugs (amiodarone, guanethidine, guanadrel, doxazosin, nifedipine, and clonidine)
Hypermetabolism	Thyroxine, ephedrine
Nausea/vomiting	Antibiotics, opiates, digoxin, theophylline, nonsteroidal anti-inflammatory drugs (NSAIDs)
Neurological effects	Indomethacin
Reduced feeding ability	Sedatives, opiates, psychotropic agents
Renal clearance, decreased	Digoxin
Urinary excretion of electrolytes and water-soluble vitamins	Diuretics: thiamin deficiency; a low-dose thiamin supplement may be useful to prevent subclinical beri-beri (McCabe-Sellers et al, 2005). Diuretics can also decrease serum levels of potassium, magnesium, calcium, and zinc.
Vitamin C, iron and folic acid depletion	Large amounts of aspirin
Vitamin K and B-complex depletion	Sulfonamides

adults, herbal supplement users are more likely to perceive their supplements as safe and to consider conventional medicine to be less effective than nonusers (Shahrokh et al, 2005).

- Increases in prostaglandin E2 production contribute to the decline in T-cell–mediated function with age. Black currant seed oil is rich in both gamma and alpha linoleic acids.
- Creatine supplements have been used to increase strength in older individuals; results are mixed.
- Echinacea may be used as an immune system stimulant. It should not be taken with steroids, cyclosporine, or immunosuppressants. It may aggravate allergies in susceptible individuals.
- Gingko biloba is proposed for memory support; studies show no effectiveness.
- Ginseng may be used for stress adaptation, impotence, or as a digestive aid. It should not be taken with warfarin, insulin, oral hypoglycemics, CNS stimulants, caffeine, steroids, hormones, antipsychotics, aspirin, or antiplatelet drugs.
- Kava is sometimes used as a sleep aid. Discourage use with sedatives, alcohol, antipsychotics, or other CNS depressants.
- Vitamin E supplements may ward off colds or flu in older people (Meydani et al, 2004).

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Efforts to correct malnutrition in seniors are beneficial. Numerous tools are available and can be used in a variety of settings.
- Dietitians should handle nutritional discharge planning (Baker and Wellman, 2005). Senior citizens often improve protein intake after appropriate counseling (Rousset et al, 2006).
- Emphasize the need to consume adequate amounts of calcium, folic acid, vitamins A, E, and D. Review the desired nutrient intakes with the client; supplemental iron is not often needed unless there is anemia. Vitamin B_{12} and thiamin may be needed, depending on medications used and concurrent chronic disease.
- Be aware of income limitations when planning a menu—less-expensive protein sources may be necessary. Discuss shopping and meal preparation tips.
- Prevent excessive use of caffeine from coffee, colas, and tea if it prevents intake of other desirable juices and beverages. Three 6- to 9-oz cups of coffee per day pose no specific health risk and caffeine may also promote improved cognition.
- Make every effort to determine whether the patient is using alcohol because multiple deficiencies may result, especially for thiamin, vitamin B_{12}, folate, and zinc. Make appropriate referrals. Older adults may not admit the true amount of alcohol being consumed because of embarrassment.
- Encourage participation in Meals on Wheels, SNAP (food stamps,) congregate feeding programs, and Senior Farmers' Market programs.
- Ensure adequate fluid intake for age and medical condition. Ensure that the diet provides adequate fluid and fiber to alleviate constipation.
- Encourage physical activity such as strength conditioning and walking. Yoga may help to prevent weight gain with aging.

TABLE 1-32 Weight Table for Men Aged 70 and Over

Height (inches)	Ages 70–74	Ages 75–79	Ages 80–84	Ages 85–89	Ages 90–94	Ages Over 94
61	128–156	125–153	123–151	120–145	118–142	113–139
62	130–158	127–155	125–153	122–148	119–143	114–140
63	131–161	129–157	127–155	122–150	120–146	115–141
64	134–164	131–161	129–157	124–152	122–148	116–142
65	136–166	134–164	130–160	127–155	125–153	117–143
66	139–169	137–167	133–163	130–158	128–156	120–146
67	140–172	140–170	136–166	132–162	130–160	122–150
68	143–175	142–174	139–169	135–165	133–163	126–154
69	147–179	146–178	142–174	139–169	137–167	130–158
70	150–184	148–182	146–178	143–175	140–172	134–164
71	155–189	152–186	149–183	148–180	144–176	139–169
72	159–195	156–190	154–188	153–187	148–182	143–173
73	164–200	160–196	158–192	157–189	156–187	155–177
74	169–205	165–201	163–197	162–190	160–188	158–181

Adapted from: *J Am Med Assoc.* 177:658, with permission of American Medical Association, Copyright 1960.

- Olfactory decline is common. Flavorful foods release endorphins, which boosts the immune system (Duffy et al, 1999). Discuss adding herbs, spices, and other flavor enhancers to foods.
- Hypothermia (body temperature of 95°F or lower) can occur, with fatigue, weakness, poor coordination, lethargy, slurred speech, and drowsiness. Give hot beverages and keep patient in a warm bed. If body temperature reaches 90°F, death is likely.
- Support intake of antioxidants to protect the aging brain. Top choices include: grape juice, blueberries, pomegranate, papaya, kiwifruit, cantaloupe, mango, apricot, broccoli, spinach, tomato, sweet potato, and collards.
- Encourage physical activity. Peer and leader encouragement for strength training is especially beneficial in this age group (Layne et al, 2008).
- Restorative dining may require attention. The American Dietetic Association has suggested three visits for medical nutrition therapy for restorative dining procedures.
- For patients with a history of, current status of, or risk for dehydration, the American Dietetic Association recommends two or more medical nutrition therapy visits.
- For end of life, advanced directives document a patient's wishes, regardless of the setting. If advance directives

TABLE 1-33 Weight Table for Women Aged 70 and Over

Height (inches)	Ages 70–74	Ages 75–79	Ages 80–84	Ages 85–89	Ages 90–94	Ages Over 94
55	117–143	106–132	107–132	94–113	86–108	85–107
56	118–144	108–134	108–133	95–114	88–110	87–109
57	119–145	110–136	109–134	96–115	90–112	89–110
58	120–146	112–138	111–135	97–118	94–115	93–114
59	121–147	114–140	112–136	100–122	99–121	98–120
60	122–148	116–142	113–139	106–130	102–124	101–123
61	123–151	118–144	115–141	109–133	104–128	103–129
62	125–153	121–147	118–144	112–136	108–132	107–131
63	127–155	123–151	121–147	115–141	112–136	107–131
64	130–158	126–154	123–151	119–145	115–141	108–132
65	132–162	130–158	126–154	122–150	120–146	112–136
66	136–166	132–162	128–157	126–154	124–152	116–142
67	140–170	136–166	131–161	130–158	128–156	120–146
68	143–175	140–170	137–164	134–162	131–160	124–150
69	148–180	144–176	Not available	Not available	Not available	Not available

Adapted from: *J Am Med Assoc.* 177:658, with permission of American Medical Association, Copyright 1960.

TABLE 1-34 Formula for Calculating Stature Using Knee Height

Knee height can be used to estimate standing height in a bedridden or handicapped person. Knee height is not affected by aging. Different populations may require the use of different equations; equations derived from taller statured populations (e.g., Caucasians) may be less accurate when applied to shorter statured populations. Sample formulas are as follows:

Stature for Caucasian men = 64.19 − (0.04 × age in years) + (2.02 × knee height in cm)

Stature for Japanese men = 71.16 − (0.56 × age in years) + (2.61 × knee height in cm)

Stature for Caucasian women = 84.88 − (0.24 × age in years) + (1.83 × knee height in cm)

Stature for Japanese women = 63.06 − (0.34 × age in years) + (2.38 × knee height in cm)

Sources: Chumlea, 1984; Chumlea et al, 1994; Knous and Arisawa, 2002; and Mendoza-Nunez et al, 2002.

indicate "no heroic measures," be sure to identify if that includes tube feeding and hydration. Both terminally ill patients and their caregivers need education, information, advocacy, and emotional support. Effective end of life discussions lead to earlier hospice referral and less-aggressive treatments (Wright et al, 2008).

- Depression affects 20–40% of older Americans but is not a normal part of aging. It causes a lot of weight loss in nursing homes and in the community and must be treated. Tables 1-32, 1-33, and 1-34 can be used to follow weight changes in older adults.

Patient Education—Food Safety Tips

- Reminders about hand washing and safe food handling may be important, especially for adults who prepare and serve meals for older adults. Check out the home food safety website at http://www.homefoodsafety.org/pages/tips/tips/adults.jsp
- Avoid food preparation when sick with viral or bacterial infections; use gloves if needed.
- Thoroughly cook meat, poultry, and fish entrees. Keep cold foods cold and hot foods hot.
- Because bacteria are commonly found on foods such as green onions (scallions), cantaloupe, cilantro, and imported produce, wash all fresh fruits and vegetables. Scrub the outside of produce such as melons and cucumbers before cutting.
- When traveling, avoid tap water and ice made from tap water, uncooked produce such as lettuce, and raw or undercooked seafood.
- Airline water may not be free from contamination. Use of bottled water is recommended. Coffee and tea may not be hot enough to kill all bacteria.
- Throw out cooked foods that have been at room temperature for longer than 2 hours.
- Consumption of sulforaphane in foods such as broccoli, cauliflower, cabbage, and Brussels sprouts may reduce the presence of *Helicobacter pylori*, which is beneficial.
- Avoid raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Do not use raw (unpasteurized) milk or products made from it.
- Avoid serving unpasteurized cider, juices, and raw sprouts because they may contain *Escherichia coli*.
- Only serve processed deli meats and frankfurters that have been reheated to steaming hot temperature. If the patient is immunocompromised, it may be best to avoid deli meats and ready-to-eat meat and poultry products; smoked fish; and soft cheese such as brie and blue-veined varieties because of the risk for *Listeria*. Homemade egg nog, cookie and cake batter, and other foods prepared with raw eggs should be avoided because of the risks of *Salmonella*.
- Raw seafood such as oysters, clams, and mussels may contain *Vibrio* bacteria. Caution or avoidance is recommended.

For More Information

- American Association of Retired Persons (AARP)
  http://www.aarp.org/
- Administration on Aging
  http://www.aoa.gov/
- Aging Well
  http://agingwell.state. ny.us/
- Aging with Dignity
  http://www.agingwithdignity.org/
- American Federation for Aging Research
  http://www.afar.org/
- American Geriatrics Society
  http://www.americangeriatrics.org/
- American Society on Aging
  http://www.asaging.org/
- Centers for Medicare & Medicaid Services (CMS)
  http://www. cms.hhs.gov/home/medicare.asp
- Colorado State Extension
  http://www.ext.colostate.edu/pubs/foodnut/09322.html
- Diabetes and Aging
  http://diabetes.niddk.nih.gov/about/dateline/spri02/8.htm
- Food and Drug Administration—Aging
  http://www.fda.gov/opacom/lowlit/eatage.html
- Food Safety for Seniors
  http://www.cfsan.fda.gov/~dms/seniors.html
- Gerontological Society of America
  http://www.geron.org/
- Government Page for Seniors
  http://www.firstgov.gov/Topics/Seniors.shtml
- Health and Age
  http://www.eldercare.com/
- Hearing Loss
  http://www.nia.nih.gov/HealthInformation/Publications/hearing.htm
- Homecare and Hospice
  http://www.nahc.org/consumer/home.html
- Hospice Foundation
  http://www.hospicefoundation.org/

- Human Nutrition Resource Center on Aging (Tufts University)
  http://hnrc.tufts.edu/1191590448205/HNRCA-Page-hnrca2 w_1191937436491.html
- Meals on Wheels
  http://www.mowaa.org/
- Medicare Information
  http://www.medicare.gov/
- National Association Directors of Nursing Administration in Long Term Care
  http://www.nadona.org/
- National Association of Nutrition and Aging Services Programs
  http://www.nanasp.org/
- National Council on Aging (NCOA)
  http://www.ncoa.org/
- National Eye Institute
  http://www.nei.nih.gov/about/
- National Institute on Aging (NIA)
  http://www.nih.gov/nia/
- National Institutes of Health—Senior Health
  http://nihseniorhealth.gov/
- National Policy and Resource Center on Nutrition and Aging
  http://nutritionandaging.fiu.edu/
- Okinawa Centenarians Study
  http://www.okicent.org/
- Older Americans Resource Toolkit
  http://nutritionandaging.fiu.edu/OANP_Toolkit/
- U.S. Department of Disability, Aging and Long-Term Care
  http://aspe.hhs.gov/_/office_specific/daltcp.cfm
- U.S. Senate Committee on Aging
  http://aging.senate.gov/
- Young at Heart—Tips for Seniors
  http://win.niddk.nih.gov/publications/young_heart.htm

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SECTION 2

Nutrition Practices, Food Safety, Allergies, Skin and Miscellaneous Conditions

CHIEF ASSESSMENT FACTORS

- Complementary and Integrative Medicine, Including Use of Herbs, Spices, and Botanical Products
- Cultural or Religious Preferences with Special Diets or Practices
- Vegetarian Diets (see also Table 2-4)
- Mouth: Dental Problems, Periodontal Diseases, Dentures (Ill-Fitting), Missing or Loose Teeth, Caries, Oral Hygiene and Dental Care, Increased or Decreased Salivation, Dryness, Lesions (see also Tables 2-5 and 2-6)
- Problems with Self-Feeding
- Vision: Cataracts, Visual Field Changes, Diplopia, Glaucoma, Macular Degeneration, Blindness (see also Table 2-7)
- Skin: Texture or Color Changes, Dryness, Ecchymoses, Lesions, Masses, Petechiae, Pressure Ulcers (see also Table 2-8)
- Physical Signs of Nutrient Deficiencies
- Head/Face: Pain, Past Trauma, Syncope, Unusual or Frequent Headaches
- Ears: Hearing Problems, Discharge, Infections, Tinnitus, or Vertigo
- Food Allergies or Intolerances
- Food-Borne Illnesses

Possible Nutrition Diagnoses

- Inadequate intake of bioactive substances?
- Excessive intake of bioactive substances?
- Harmful beliefs about food and nutrition?
- Inadequate oral food and beverage intake (if foods served are unfamiliar or forbidden)?
- Harmful beliefs about food and nutrition (such as pica)?
- Inadequate protein intake?
- Inadequate mineral (iron, calcium, zinc) or vitamin intakes (B_{12}, D)?
    - Disordered eating pattern (unusual diet excluding multiple food groups)?
    - Underweight or involuntary weight loss?
    - Excessive fiber intake (phytates)?
    - Inadequate intake of fat (omega 3 fatty acids)?
    - Difficulty chewing?
        - Inadequate oral food and beverage intake?
        - Difficulty swallowing?
        - Involuntary weight loss?
        - Excessive carbohydrate intake (sugars, sweets, beverages)?

- Inadequate vitamin or mineral intakes?
- Self-feeding difficulty (functional, physical, psychological)?
- Malnutrition?
- Inadequate oral food and beverage intake?
- Involuntary weight loss?
- Altered nutrition-related lab values?
- Inadequate protein intake?
- Inadequate fluid intake?
- Underweight?
- Inadequate protein intake or increased nutrient needs (protein)?
- Inadequate vitamin intake (list specifics)?
- Increased nutrient needs (vitamins)?
- Excessive sodium intake?
- Inadequate oral food and beverage intake (from nausea, anorexia)?
- Intake of unsafe food (allergens)?
- Altered GI function (diarrhea)?
- Intake of unsafe food (pathogens)?

For More Information

- American Dietetic Association—Nutrition Education for the Public
  http://www.nepdpg.org/
- Centers for Disease Control and Prevention—Index for Consumer Questions
  http://www.cdc.gov/health/diseases.htm
- Evidence-Based Practice Centers
  http://www.ahrq.gov/clinic/epcquick.htm
- Federal Trade Commission
  http://www.ftc.gov/
- Health Finder
  http://www.healthfinder.gov/
- Health Fraud and Quackery
  http://www.quackwatch.com/
- Health Statistics
  http://www.cdc.gov/nchswww/
- Healthy People (2010, 2020)
  http://www.healthypeople.gov/
- Human Anatomy Online
  http://www.innerbody.com/
- International Food Information Council—Functional Foods
  http://www.ific.org/nutrition/functional/index.cfm
- PubMed
  http://www.ncbi.nlm.nih.gov/PubMed/
- USDA: Food Composition Tables
  http://www.nal.usda.gov/fnic/foodcomp/Data/HG72/hg72.html

COMPLEMENTARY OR INTEGRATIVE NUTRITION

NUTRITIONAL ACUITY RANKING: LEVEL 2 (NUTRITIONAL ADVISING)

DEFINITIONS AND BACKGROUND

The philosophy that food can be health promoting beyond its nutritional value has gained acceptance within the public arena. Functional foods are so named because whole foods and fortified, enriched, or enhanced foods have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels (American Dietetic Association, 2009). Fish provides fish oils; fermented dairy products have probiotics; and beef has conjugated linoleic acid. Oats provide beta-glucan, soy provides isoflavones, flaxseed provides lignins and alpha-linolenic acid, garlic provides organosulfur compounds, broccoli and cruciferous vegetables provide isothiocyanates and indoles, citrus fruits provide liminoids, cranberry provides polymeric compounds, tea provides cachectin, and wine provides phenolics (American Dietetic Association, 2009).

Many plants and herbs contain biologically active phytochemicals with potential for disease prevention. Patients may use herbal medicines but not tell their healthcare providers (van der Voet et al, 2008). About one third of Americans take a vitamin–mineral supplement daily (Thomson et al, 2005). Nutrition is an integral part of many complementary therapies for cancer, arthritis, chronic pain, human immunodeficiency (HIV) virus, and gastrointestinal (GI) problems. Dried culinary herbs (e.g., oregano, sage, peppermint, garden thyme, lemon balm, clove, allspice, and cinnamon) contain very high concentrations of antioxidants (i.e., >75 mmol/100 g) and contribute significantly to the total intake of plant antioxidants by many people (Dragland et al, 2003).

Dietitians are uniquely qualified to translate sound scientific evidence into practical applications, yet many are not confident about the roles of herbs in prevention and treatment of illnesses. Education and training are important for the dietetic practitioner in preparing to answer questions about complementary nutrition. Dietitians should be able to describe implications of FDA structure/function claims, explain how to read labels, identify sound resources, associate common dietary supplements and their appropriate uses, and assess the science behind the supplement claims (Thomson et al, 2005).

Dietetics professionals are trained to assess dietary adequacy and the need for nutrient modifications (American Dietetic Association, 2005). Therefore, this text focuses on herbs, spices, and botanical products and does not cover the additional concepts and practices of homeopathy, acupuncture, traditional Chinese or Indian medicine. While some individuals need dietary supplements because of disease states, certain life stages, or chronic conditions, it is important to respect those cultural patterns and habits in which herbs and botanicals are used as medical or dietary enhancements. Clinicians should be aware of all the dietary supplements that their patients consume, and help their patients make informed decisions (Sadovsky et al, 2008). Table 2-1 lists questions to ask and Table 2-2 lists products that are used. Consider any adverse effects and discuss as needed.

TABLE 2-1 Herbal, Botanical, and Dietary Supplement Intake

1. **Identify types of supplements that you use:** ___None ___Multivitamin/mineral supplement ____Vitamin C ____Calcium/Vitamin D ___Protein supplement ___Fiber supplement ___Fish oil ___Herbal supplement (such as aloe, black cohosh, calcium, ginseng, gingko biloba, valerian) specify:_____
2. **For how long?** ___1 month or less ___3–6 months ___6–12 months ___>1 year
3. **How long will you use these supplements?** ___Indefinitely ___1–6 months ___6–12 months
4. **Why do you take this supplement(s)?** ___Prevention against disease ___General wellness ___Energy ___Weight loss ___Other reason (specify) _____To help treat a disease. If so, what are your medical symptoms? _____and how long have you had this medical condition? ___<week ___1–3 months ___3–12 months ___>1 year
5. **How have symptoms improved since you started taking this supplement?** ___Feel better ___More energy ___Fewer symptoms ___Other (explain):_____
6. **List any allergies to medications, foods, plants, or flowers** _____
7. **List any additional illnesses or medical conditions** _____**Women: pregnant or breastfeeding?** _____No ___Yes
8. **List other over-the-counter and prescription medications (such as aspirin, diuretics, heart medicines, fish oil, oral contraceptives) that you take** _____
9. **How much alcohol do you drink in a day?** ___None ___1 glass ___2 glasses ___More than 2 glasses
10. **How much do you smoke in a day?** ___None ___Less than one pack ____One pack or more
11. **Name any diet or eating plan you follow**_____How long?_____Was this prescribed for you? ___No ___Yes

Adapted from: American Dietetic Association. *Sports nutrition: a guide for the professional working with active people.* Chicago: American Dietetic Association, 2000; and American Dietetic Association. *Special report from the Joint Working Group on Dietary Supplements*. Chicago: American Dietetic Association, 2000. Used with permission.

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects

Herb, Botanical, Spice	Common Uses	Adverse Effects
Alfalfa (*Medicago sativa*)	Used for diuretic properties in asthma, diabetes, thyroid gland malfunction, arthritis, high cholesterol, and peptic ulcers. Said to promote menstruation and lactation.	Rats fed with this are prone to colon cancer. Fatalities reported due to ingestion of contaminated Alfalfa.
Alpha Lipoic Acid	Used to prevent cancer, HIV, AIDS, and liver disease. Used to lower triglycerides by reducing endothelial dysfunction. Most studies have been done with rats; more human studies are needed. Contained in broccoli, spinach, and tomato.	Its antioxidant activity may antagonize the effects of chemotherapy.
Aloe Vera (*Aloe barbadensis*)	Topical administration of Aloe vera gel for burns is generally safe. It may help reduce radiation-induced skin changes, but clinical trials are inconsistent.	FDA rules that it is not safe as a stimulant laxative; causes strong GI cramping. Chronic use can lead to loss of potassium. Do not use with diuretics, corticosteroids, or antihyperglycemic or cardiovascular agents.
Arnica (*Arnica montana*)	Used as a topical ointment for bruises, osteoarthritis in homeopathy preparations.	If taken orally, causes hypotension and shortness of breath; can be fatal.
Artemesia (*Wormwood*)	Used as an antimalarial; also used in cancer, fever, infections.	GI upset is a common side effect; causes hyperacidity.
Avlimil	Used to alleviate symptoms of female sexual dysfunction. Contains cloves, capsicum, black cohosh, ginger, and licorice.	Contraindicated in women having hormone-sensitive cancers. Stomach upset is an adverse reaction.
Ayurveda	Used in diabetes, rheumatoid arthritis (RA), Parkinson's disease, obesity, cancer, anemia, edema, and postpartum complications of pregnancy. Meditation helps in reducing anxiety, lowering blood pressure, and enhancing general well-being. The herbs show antioxidant, antitumor, antimicrobial, hypoglycemic, and anti-inflammatory properties.	Lead poisoning is a potential complication.
Barberry	Used as a coagulant herb.	May inhibit effects of anticoagulant medications such as warfarin.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Bilberry (*Vaccinium myrtillus*)	Used in Europe as an antioxidant to prevent diabetic retinopathy; improves visual acuity and retinal function. Used for cataracts, cancer, circulatory disorders, diabetic retinopathy, glaucoma, macular degeneration, hemorrhoids, and varicose veins. Relative of blueberry. Do not use with anticoagulants or antiplatelet medications. No adverse reactions reported.	Exhibits antiplatelet activity. May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Bitter Melon (*Momordica charantia*)	Used in cancer prevention, diabetes, fever, HIV, infections, menstrual disorders.	Contraindicated in children and pregnant women because it causes bleeding, contraction of the uterus, and abortion. Adverse reactions include hypoglycemia and hepatotoxicity, headache, fever, abdominal pain, and coma.
Black Cohosh (*Cimicifuga racemosa*)	Used with hot flashes, headaches, vaginal dryness, mood swings, cough, dysmenorrhea, RA, and sedation. It functions as an antispasmodic, sedative, or relaxant. Controversial whether black cohosh possesses estrogenic activity.	May cause hypotension, vomiting, headache, dizziness, GI distress, and limb pain. May increase the toxicity of doxorubicin and docetaxel or interact with drugs that are metabolized by CYP3A4 enzyme. **Warning: should not be confused with blue cohosh** (*Caulophyllum thalictroides*), **which is toxic** and may be used in attempts to induce abortion.
Borage Oil (*Borago officinalis*)	Used for RA, infantile seborrheic dermatitis, cough, chest congestion, and menopausal symptoms.	Contains pyrrolizidine alkaloid and amabiline, which are hepatotoxic. Unsafe during pregnancy due to teratogenic effects and premature labor. Adverse effects include constipation and hepatotoxicity after chronic administration.
Boswellia (*Boswellia serrata*)	Used for arthritis, asthma, colitis, inflammation, and menstrual cramps.	Long-term affects on humans are unknown, but it has cytotoxic activity.
Brewer's Yeast	Used as a natural source of chromium.	Avoid supplement use with MAO inhibitors such as Nardil, Parnate.
Bromelain, from pineapple stem (*sulfhydryl proteolytic enzyme*)	Used for arthritis, bruises, burns, cancer prevention and treatment, edema, indigestion, and circulatory disorders. Exhibits antiplatelet activity.	Diarrhea, GI disturbances, allergic reactions. May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Buckthorn Bark	Used as laxative herb to speed digestion, which reduces absorption time of drugs.	Chronic use results in a loss of potassium, thereby strengthening effects of cardiac glycosides and antiarrhythmic agents. Use with thiazide diuretics, corticosteroids, or licorice root increases potassium loss.
Bupleurum (*Bupleurum chinense, B. scoizone—raefolium*)	Used for colds, fever, infections, cirrhosis, hepatitis, liver disease, malaria, and cancer treatment.	**Warning: may be associated with interstitial pneumonitis** as an ingredient of shosaiko. Adverse reactions include nausea, vomiting, edema, GI disturbance.
Burdock (*Arctium majus*)	Used for arthritis, HIV, AIDS, psoriasis, diabetes, eczema, and anorexia; no human studies on these proposed claims. Promotes urination.	Contraindicated in pregnancy, lactation or allergy to chrysanthemum. **Warning: burdock tea sometimes is contaminated** with belladonna alkaloids.
Butcher's Broom (*Ruscus aculeatus*)	Used for hemorrhoids, varicose veins, circulatory diseases, lymphedema, leg cramps, constipation, and inflammation.	Diarrhea.
Calendula (*Calendula officinalis*)	Used for conjunctivitis, eczema, GI disturbance, inflammation, menstrual cramps, and radiation therapy.	Contraindicated in pregnancy and lactation. Possible allergic reactions.
Capsicum, Capsaicin (*Capsicum frutescens* and *C. annuum*)	Used as a circulatory stimulant to aid in digestion. Used externally to relieve pain, as from arthritis, circulatory disorders, and diabetic and herpes zoster neuropathy. Suggested to lower high cholesterol or to lessen motion sickness, muscle pain, or toothache.	Avoid contact with eyes and irritated or broken skin. Burning skin, urticaria, and contact dermatitis. Drug interactions: increases the incidence of cough associated with ACE inhibitors.
Cascara (*Rhamnus purshiana*)	Used for cancer treatment and constipation. Often found in over-the-counter laxatives. **FDA has ruled that cascara is not safe as a stimulant laxative.**	Contraindications: should not be used in intestinal obstruction, undiagnosed abdominal symptoms, and inflammatory bowel disease. Adverse reactions include vomiting, intestinal cramps; excessive use can cause diarrhea, weakness, or cholestatic hepatitis. Drug interactions: excess loss of K^+ with digoxin that potentiates cardiac effects; avoid use with cardiovascular agents.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Cayenne	Used for muscle spasms and relief of pain in arthritis. Large doses may lead to chronic gastritis and kidney or liver damage. Exhibits anticoagulant activity.	May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding; avoid with anticoagulants or antiplatelet medications.
Chamomile (*Matricaria recutita*)	Used for colic, GI disturbance, hemorrhoids, infections, skin ulcers, mucositis. Chamomile soothes indigestion, flatulence. Topical and oral administration is safe except in patients with allergies to ragweed or chrysanthemum.	Contact dermatitis or anaphylaxis in those allergic to ragweed or chrysanthemum. Drug interactions: increases anticoagulant effects due to its natural coumarin content; avoid with warfarin.
Chasteberry (*Vitex agnus castus*)	Used for premenopausal symptoms, dysmenorrhea, or menopause.	GI upset, nausea, rash, urticaria, and headache. Should not be taken with hormone replacement therapy or oral contraceptives; an itchy rash can occur. It may interact with dopamine antagonists.
Chinese Asparagus (*Asparaguscochinchinensis*)	Used for cancer treatment, constipation, cough, and hepatitis.	No adverse reactions or drug interactions reported.
Chitosan	Used as an ingredient in many weight loss supplements, with claims to bind and trap dietary fat.	It is clinically insignificant (Gades and Stern, 2005).
Cholesterol Spinach (*Gynura crepioides*)	Used for control of high cholesterol; no scientific evidence.	Contraindications: immunocompromised patients due to the possibility of contamination.
Chondroitin	Used to support healthy connective tissue and synovial fluid that lubricates joints. Improves functional status of people with hip or knee osteoarthritis, relieves pain, and reduces joint swelling and stiffness. Used with glucosamine in many products. Third most widely used supplement by elderly (Wold et al, 2005).	
Chromium Picolinate	Often used by athletes. May have some merit in diabetes management. Naturally found in mushrooms, nuts, bread, yeast.	Chronic use may lead to impaired iron and zinc metabolism, GI intolerance, nephritis, or chromosomal damage.
Cinnamon	Increases sensitivity of insulin to help manage diabetes (Anderson et al, 2004).	
Chrysanthemum (*Chrysanthemum morifolium*)	Used for angina, hypertension, fever, common cold. No human studies.	Contraindications: those with allergy to ragweed. Adverse reactions include contact dermatitis, photosensitivity.
Coenzyme Q10	Used for patients with heart failure or early signs of Parkinson's disease.	Coenzyme Q10, superoxide dismutase (SOD), S-adenosyl-L-methionine methionine (SAM-e), and other products have not been proven to reduce the effects of aging.
Coleus or Forskolin	Exhibits antiplatelet activity.	May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Cone Flower (*Echinacea purpurea, E. pallida, E. augustifolia*)	Used for common cold, immunostimulation, infections, viral infections, wound healing.	Contraindications: patients with autoimmune disorders (systemic lupus erythematosus, RA, multiple sclerosis, tuberculosis, HIV). Adverse reactions include headache, dizziness, nausea, rash, dermatitis, anaphylaxis.
Cranberry	Used to prevent urinary tract infection caused by *Escherichia coli* bacteria, especially after menopause.	
Creatine	Used to increase strength in some older individuals and in athletes. More studies are needed.	Heavy use may lead to cardiomyopathy, hypertension, renal impairment.
Curcumin and Curry	Used for antioxidant effects in cystic fibrosis, cognitive function in Alzheimer's disease, cancer prevention, and other conditions.	
Dandelion (*Taraxacum mongolicum*)	Used for diabetes, lactation stimulation, promote urination, rheumatoid arthritis, liver disease. Used as salad greens and in teas. Only a few clinical studies.	Allergic reactions, contact dermatitis, dyspepsia. Contraindication in patients with obstruction of the bile duct or gallbladder. Drug interactions: additive effect on hypoglycemic activity.
Da Qing Ye (*Isatis tinctoria*)	Used for cancer treatment, diarrhea, GI disorders, hepatitis, HIV and AIDS, respiratory infections.	Adverse reactions include nausea, vomiting, hematuria following injection.
Devil's Claw (*Harpagophytum procumbens*)	Used for analgesic, anti-inflammatory, osteoarthritis, muscle pain, GI disturbances.	Contraindication in pregnancy. Adverse reactions include dyspepsia, diarrhea, bradycardia.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Dong Quai (*Angelica sinensis*)	Used as Chinese tonic for menstrual cramps, peripheral vasodilator, and pain reliever. It has not shown effectiveness for reducing hot flashes.	Exhibits anticoagulant activity. May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding. It should not be used in pregnancy. Increased doses are carcinogenic. Adverse effects include bloating, loss of appetite, diarrhea, photosensitivity, gynecomastia.
Echinacea (see *Cone Flower*)	Used as an immune system stimulant. Echinacea is no more effective for upper respiratory tract infections than placebo. Avoid taking for longer than 2 months at a time.	Avoid with corticosteroids, cyclosporine, or immunosuppressants. It may trigger allergies since it is related to the ragweed family (as are butterbur, chamomile, goldenrod, and yarrow).
Eucalyptus	Used for asthma, coughs, arthritis in small doses.	Overdoses can be fatal.
Evening Primrose Oil (*Oenothera biennis*)	Used for RA, mastalgia, eczema, fatigue, diabetic neuropathy, premenstrual syndrome, menopausal symptoms, cancer treatment. Contains essential fatty acid known as gamma linolenic acid (GLA), which may be useful in cardiac or arthritic conditions.	Contraindication: pregnant women. Adverse reactions are headache, nausea, GI upset. Drug interactions: may lower the seizure threshold in patients taking phenothiazines. Avoid use also with chlorpromazine, fluphenazine, mesoridazine, anticoagulants or antiplatelet medications.
Fenugreek (*Trigonella foenum-graecum*)	Used for laxatives, lactation stimulation, diabetes, high cholesterol, wounds, alopecia, arthritis, GI disturbance, induce child birth.	Contraindication: infants and pregnant women. Adverse reactions: flatulence, diarrhea, bleeding, bruising, hypoglycemia.
Feverfew (*Tanacetum parthenium*)	Used for migraine, psoriasis, arthritis, dysmenorrhea. DISCONTINUE 2 WEEKS BEFORE SURGERY	Avoid use with nonsteroidal anti-inflammatory drugs (NSAIDs) because they negate its usefulness (Miller, 1998). Avoid use with warfarin, antiplatelet, or migraine headache medicines. Contraindicated in those who are allergic to ragweed or marigold. Adverse reactions are mouth ulcers. Withdrawal causes anxiety, muscle stiffness, and pain.
Flaxseed (*Linum usitatissimum*)	Used for cancer prevention, constipation, high cholesterol, menopausal symptoms, periodontal diseases.	Exhibits antiplatelet activity. May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding. Avoid with radiation therapy.
Folk Remedy Oils	Used for childhood ailments in Mexican culture.	May cause pneumonia in infants and children.
Forskolin (*Coleus forskohlii*)	See Coleus.	
Gamma Linolenic Acid (GLA)	Used for reducing signs of PMS or menopause. Black currant oil contains GLA.	Avoid with anticonvulsants or anabolic steroids. Liver toxicity may occur.
Garcinia cambogia (hydroxycitric acid)	Used as ingredient of many weight loss products.	
Garlic	Used to help lower cholesterol. Antibacterial, antifungal, antiviral, and hypotensive benefits have also been noted. Fourth most widely used supplement by elderly (Wold et al, 2005). DISCONTINUE 2 WEEKS BEFORE SURGERY	Garlic appears to induce cytochrome P450 3A4 and may enhance metabolism of many medications such as cyclosporine and saquinavir. Avoid using capsules with warfarin and with diabetes medications (may cause drop in blood glucose).
Ginger (*Zingiber officinale*)	Used as a treatment for nausea, motion sickness, vomiting, anorexia, drug withdrawal, RA.	Adverse reactions include heartburn, dermatitis, CNS effects, depression, arrhythmias. Drug interactions: increases risk of bleeding if used with anticoagulant or antiplatelet medications. Additive effects with hypoglycemic drugs and histamine antagonists.
Gingko Biloba	Used to improve blood flow to the brain; to help with memory, hearing loss, dementias, circulatory disturbance, Raynaud's disease, sexual dysfunction, stress, tinnitus, asthma. Second most widely used supplement by elderly (Wold et al, 2005). DISCONTINUE 2 WEEKS BEFORE SURGERY	Gingko biloba may cause allergic skin reactions or bleeding. Avoid use with warfarin, antihyperglycemic agents, vitamin E, or aspirin. Warning: discontinue before surgery. Adverse reactions include headache, dizziness, GI upset, diarrhea, and seizures in patients predisposed to seizures or on medications that lower seizure threshold.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Ginseng (*panax*)	American ginseng (*panax quinquefolius*) is often used for stress adaptation, cognitive or performance enhancement, impotence, a digestive aid, protection against cancer. Siberian ginseng (*Acanthopanax senticosus*) is used for lessening chemotherapy side effects; for health maintenance, strength, stamina, and immunostimulation. DISCONTINUE 2 WEEKS BEFORE SURGERY	It should not be taken with warfarin, insulin, oral hypoglycemics, CNS stimulants, caffeine, steroids, hormones, antipsychotics, aspirin, cardiovascular agents, warfarin, or other antiplatelet drugs. May interfere with digoxin action (Miller, 1998). Ginseng may add to the effects of estrogens or corticosteroids and can elevate BP. Contraindicated in hypertension and in perimenopausal, pregnant or lactating women.
Glehnia (*Glehnia littoralis*)	Used for bronchitis, chest congestion, whooping cough.	Photosensitivity may occur due to psoralens component. Contraindicated in radiation therapy.
Glucosamine Sulfate	Used to build new cartilage, rebuild old cartilage, lubricate joints, mount a healthy inflammatory response, and ease symptoms of osteoarthritis. It is often taken with chondroitin. Most widely used supplement by elderly (Wold et al, 2005).	Side effects are mild.
Gotu Kola (*Centella asiatica*, *Hydrocotyle asiatica*)	There are wide variations in terpenoid concentrations depending on the location in which gotu kola is grown. Used for burns, cancer treatment, circulatory disorders, GI disorders, hypertension, memory loss, psoriasis, scars, sedation, varicose veins. Gotu kola should not be confused with kolanut; gotu kola does not contain any caffeine and has not been shown to have stimulant properties. Products should be standardized as to asiaticoside, asiatic acid, madecassic acid, and madecassoside content.	Adverse effects: contact dermatitis, pruritus, photosensitization, and headache; reduced fertility may occur in women wishing to become pregnant. With toxic levels, hyperglycemia, hyperlipidemia, and sedation have occurred.
Green Tea	Used for activation of thermogenesis, fat oxidation, or both (Dulloo et al, 1999). Green tea is popular in several cultures. Both black and green tea may be preventive for cancers and strokes; they are also a good source of fluoride. Green tea contains a class of polyphenols called catechins, which consist mainly of epigallocatechin gallate (EGCG), epicatechin gallate, and gallocatechin gallate with various physiological and pharmacological properties. Green tea extract (GTE) may improve endurance capacity and may support weight loss (Nagao et al, 2005). GTE boosts exercise endurance by using fat as energy source, accompanied by higher rates of fat oxidation. Results come from the equivalent of about 4 cups of tea a day.	Avoid use with MAO inhibitors and warfarin since green tea contains vitamin K. Avoid use in pregnancy and infants.
Guggul	Used to treat osteoarthritis and bone fractures; suppresses the nuclear factor-κB activation induced by various carcinogens (Ichikawa and Aggarwal, 2006). Guggul may induce CYP3A4 activity.	Not enough scientific evidence to support the use of guggul for any medical condition. Guggul may cause stomach discomfort or allergic rash. It should be avoided in pregnancy and lactation and in children.
Hawthorn (*Crataegus monogyna*)	Used for angina, atherosclerosis, heart failure, HTN, indigestion. It seems to be safe for long-term use.	Contraindications: pregnancy, lactation. Adverse reactions: nausea, sweating, fatigue, hypotension, arrhythmia. Because hawthorn lowers blood pressure and cholesterol levels, never take with digoxin. In high doses, it can cause hypotension and sedation and should be monitored carefully. Avoid use with cardiovascular agents.
Horseradish	Used as a natural decongestant.	
Horse Chestnut	Exhibits anticoagulant activity.	May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Huang Lian (*Coptis chinensis*)	Used for diarrhea, hypertension, bacterial and viral infections, ear infections, and cancer treatment.	Contraindications in jaundiced neonates. Adverse reactions: nausea, vomiting, dyspnea. Toxicity: seizures, hepatotoxicity, cardiac toxicity.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Indirubin (*Indigofera tinctoria*)	Used for cancer treatment, inflammation. There are limited clinical data	Adverse reactions: nausea, vomiting, abdominal pain. Long-term treatment has caused pulmonary arterial hypertension and cardiac insufficiency
Juniper	Used as a diuretic or for indigestion in some cultures.	Avoid in pregnancy and kidney disease.
Karela	Used to lower blood glucose.	Because it effect blood glucose levels, it should not be used by patients with diabetes mellitus.
Kava	May cause drowsiness, dizziness, and intoxication.	Avoid with sedatives or hypnotics.
Kudzu (*Pueraria mirifica*, *P. thunbergiana*, *P. montana* var. *lobata*, *P. montana* var. *thomsonii*)	Used for estrogenic effects. Promoted for alcoholism, common cold, diabetes, eye pain, fever, menopausal symptoms, neck pain.	Avoid in hormone-sensitive cancers, tamoxifen use, hypersensitivity to kudzu, and estrogen receptor–positive (ER+) breast cancer.
Kyushin	Used as a cardiotonic medicine in China.	Kyushin may interfere with digoxin.
Licorice (*Glycyrrhiza glabra*, *G. uralensis*)	Used for bronchitis, chest congestion, constipation, GI disorders, hepatitis, inflammation, menopausal symptoms, microbial infection, peptic ulcers, primary adrenocortical insufficiency, prostate cancer. Active ingredient (glycyrrhizin) has an anti-inflammatory role.	Avoid in renal or liver dysfunction, pregnancy and breast-feeding. Licorice can offset the pharmacological effect of spironolactone or digoxin. Large doses can produce headache, lethargy, or high blood pressure. May increase sodium retention and potassium losses when used with thiazide diuretics. Avoid use in cirrhosis, hypertension, cholestatic liver disease, hypokalemia, kidney failure.
Lycium (*Lycium barbarum*; *L. chinense*; *L. europeaum*)	Used for anemia, burns, cancer treatment, cough, inflammation, pain, sedation, skin infections, visual acuity.	May prolong bleeding time in some individuals.
Mayapple	Common in Native American medicine. Used for venereal warts (condyloma acuminata); it contains podophyllotoxins.	
Meadowsweet	Exhibits antiplatelet activity.	May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Melatonin	Used as a sleep aid or a jet lag adjuster	Avoid use with CNS depressants such as alcohol, barbiturates, corticosteroids, or immunosuppressants.
Milk Thistle (*silymarin*)	Used for alcoholic liver disease, cirrhosis, infectious hepatitis, drug-induced hepatitis. Best administered by injection. Serves as a natural antidote for death-cap mushroom poisoning.	It may have a mild laxative effect or can cause uterine or menstrual stimulation.
Mint	Used in oil form for colds, bronchitis, fever, indigestion.	Mild GI distress may result. Worsens gastroesophageal reflux disease (GERD) or hiatal hernia symptoms.
Motherwort	Exhibits antiplatelet activity.	May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Mushrooms, Edible	Used to prevent hormone-related cancers (breast, prostate). AHCC is obtained from mycelia of several species of basidiomycetes mushrooms. *Agaricus blazei*, native to Brazil and Japan, is used to treat arteriosclerosis, hepatitis, hyperlipidemia, diabetes, dermatitis, and cancer. Oral administration of *Agaricus* extract may improve natural killer cell activity and quality of life in cancer patients undergoing chemotherapy.	May enhance resistance to *Klebsiella pneumoniae* due to its antioxidant effects.
N-Acetyl-L-Cysteine (NAC)	Used to fight aging, alleviate allergies, and fight viruses. It may work as an antioxidant to protect against sun damage and skin lesions. May be useful in managing addictions.	
Oregano	Used for antioxidant effect. Destroys *Helicobacter pylori* and *Giardia*.	
Oregon Grape Root	Coagulant herb.	May inhibit effects of anticoagulant medications such as warfarin and potentiate bleeding.
Parsley	Used for flatulence, indigestion, topical antibiotic. Breath freshener after a meal.	Avoid use in pregnancy as it may stimulate uterine contractions. May work as a diuretic in large doses.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Peppermint	Used to relieve excess gas as a digestive aid (Koretz and Rotblatt, 2004). It has antispasmodic action which can be useful for irritable bowel syndrome and GI cramping.	
Policosanols	Used to protect against cancers, cardiovascular disease, and obesity (Awika and Rooney, 2004) by reducing platelet aggregation and hepatic synthesis of cholesterol (Varady et al, 2003). Policosanols are phytochemicals extracted from sugar cane.	
Poplar	Exhibits antiplatelet activity.	May enhance effects of anticoagulant medications such as warfarin and potentiate bleeding.
Probiotics (Good bacteria such as *Lactobacillus* and *Lactobacillus acidophilus*)	Used in inflammatory bowel disease and other GI disorders or to replenish gut flora after antibiotic use. May reduce presence of harmful bacteria in the gut and may decrease vaginal infections. Select yogurt and products made with live cultures.	
Psyllium	Use as a laxative to alleviate chronic constipation.	Avoid use with cardiovascular agents.
Red Clover	Used for hot flashes because it contains isoflavones. It may also be used for coughs, eczema, and psoriasis.	Evidence suggests that it has limited effectiveness (Krebs et al, 2004).
Rhodiola (*Rhodiola rosea*), arctic root	Used for depression, fatigue.	Side effects are insomnia and irritability.
Rhubarb or Da-Huang (*Rheum palmatum*, *R. officinale*)	Used for cancer treatment, constipation, fever, hypertension, immunosuppression, inflammation, microbial infection, peptic ulcers.	Avoid prolonged stimulant laxative use over 7 days without medical supervision. Patients with arthritis, kidney or hepatic dysfunction, history of kidney stones, inflammatory bowel disease, or intestinal obstruction should not take this herb. Rhubarb may cause uterine stimulation; avoid in pregnancy. Reported effects include abdominal cramps, nausea, vomiting, diarrhea with possible hypokalemia, anaphylaxis, and renal and hepatic damage.
Rice Bran Oil	It contains tocotrienols, powerful antioxidants in the vitamin E family that protect against coronary heart disease and some forms of cancer.	
Rosemary	Used for antioxidant and anticarcinogenic potential. Often used for lowering blood pressure.	Do not use in pregnancy in large doses.
Royal Jelly	It is a milky substance secreted by young worker honey bees. Apalbumin 1 (Apa1) is the major royal jelly and honey glycoprotein and has various biological properties, such as cancer prevention. It seems to stimulate macrophages to release TNF-α.	Avoid use with asthma; may cause allergic reactions.
Saw Palmetto	Used with benign prostatic hyperplasia to increase urine flow. Tannic acids are present.	Saw palmetto should not be taken with oral contraceptives, estrogens, or anabolic steroids. Can cause GI upset in rare cases.
Schisandra (*Schisandra chinensis*)	Used for asthma, cough, influenza, diarrhea, indigestion, liver disease, premenstrual syndrome, strength, and stamina.	Adverse reactions include depression and heartburn.
Senna	Used as a laxative herb; it contains anthraquinone, which stimulates bowel contractions. Safe for constipation, but dependence or obstruction can occur with long use. Psyllium and other naturally high-fiber foods (such as prunes), extra fluids, and exercise are better choices.	Laxative herbs speed digestion, which reduces absorption time of drugs. Chronic use results in a loss of potassium, thereby strengthening effects of cardiac glycosides and antiarrhythmic agents. Simultaneous use of thiazide diuretics, corticosteroids, or licorice root increases potassium loss. Because fluid and electrolyte losses may be severe, avoid during pregnancy and lactation.
Sheep Sorrel (*Rumex acetosella*)	Used for cancer treatment, diarrhea, scurvy, fever, inflammation.	Contraindications: patients with kidney stones should not use this herb. Adverse reactions: abdominal cramps, gastroenteritis, diarrhea leading to hypokalemia, adrenal and liver damage.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Shepherd's Purse	Coagulant herb.	May inhibit effects of anticoagulant medications such as warfarin and potentiate bleeding.
Slippery Elm (*Ulmus rubra*)	Used for bronchitis, cancer treatment, cough, diarrhea, fever, inflammation, peptic ulcer, skin abscess, skin ulcers, sore throat.	Adverse reactions: none known, but no human studies have been done to evaluate its actions.
Spirulina (Blue-green algae)	Used to treat cancers, viral infections, weight loss, oral leucoplakia, increased cholesterol, attention-deficit hyperactivity disorder (ADHD). Sold as an immune enhancer or to lower cholesterol levels.	Expensive as a protein source. Adverse effects are uncommon unless contaminated; if contaminated, it is hepato-, nephro-, and neurotoxic. Adulterated form can cause allergies or gastroenteritis.
Stillingia (*Stillingia sylvatica*)	No clinical data to support its uses in bronchitis, chest congestion, cancer treatment, hemorrhoids, constipation, skin abscess, laryngitis, spasm, syphilis.	Warning: the diaterpene esters in this herb are irritants to the skin and mucous membranes. Adverse reactions: vertigo, burning sensation over the mucous membrane, diarrhea, nausea, vomiting, pruritus, skin eruptions, cough, fatigue, and sweating.
St. John's Wort (*Hypericum perforatum*)	Laboratory reports have suggested but not confirmed that the mechanism of action for St. John's wort may involve monoamine oxidase (MAO) inhibition, SSRI reuptake inhibition, increased melatonin production, and others. Used to alleviate anxiety and nervousness; does not alleviate depression. This herb has been shown to induce the drug-metabolizing enzyme cytochrome p4503A4 and has the potential to interact with many medications. DISCONTINUE 2 WEEKS BEFORE SURGERY	It can inhibit iron absorption. May enhance effects of narcotics and selective serotonin reuptake inhibitors (SSRIs). Increases side effects of photosensitizing drugs, alcohol, and melatonin. Avoid use with statins, blood pressure medications, donepezil, antidepressants and other CNS medications, and chemotherapy.
Tannins and Saponins (*Acacia pennata*, *Hibiscus spp.*, *Lasianthicaafricana Gouanialupiloides*)	Used for dental hygiene and to treat gingivitis.	
Tea Tree Oil	Used for acne treatment, wound healing, or as an antiseptic for thrush (as in HIV infection). Natural fungicide.	Topical use only; toxic if consumed. Allergy is possible in sensitive individuals.
Tribulus terrestris	Used by athletes. Contains steroidal glycosides and saponins that cause secretion of luteinizing hormone, testosterone.	It is phototoxic, cytotoxic, and neurotoxic.
Tryptophan	Used to promote sleep or to correct depression.	L-tryptophan is the precursor to serotonin. It should not be used with MAO inhibitors, antidepressants, or serotonin receptor antagonists; it can exaggerate psychosis.
Turmeric (*Curcuma longa*)	Used for immune system enhancement, correcting anorexia, carcinoma prevention, reducing infections (such as reducing *H. pylori*) and inflammation, kidney stones.	Warning: breast cancer patients on cyclophosphamide should restrict intake because it inhibits the antitumor action of chemotherapeutic agents. Contraindications: patients with bile duct obstruction, gallstones, GI disorders.
Ukrain (*Chelidonium majus* alkaloid-theophosphoric acid derivative)	Used for cancer prevention and treatment, hepatitis, HIV and AIDS, immunostimulation.	Warning: it is not regulated by FDA. Adverse reactions: soreness at the injection site, nausea, diarrhea, dizziness, fatigue, drowsiness, polyuria, hematological side effects, and tumor bleeding have been reported.
Valerian (*Valeriana officinalis*, *Valerianae radix*, garden heliotrope)	Used for insomnia, anxiety, colic, menstrual cramps, migraine treatment, sedation, spasms, stomach and intestinal gas. Effective as a sleep aid and is not habit forming. DISCONTINUE 2 WEEKS BEFORE SURGERY	Headache, uneasiness, cardiac disturbances, morning drowsiness, and impaired alertness can occur. Benzodiazepines, sedatives, alcohol, antipsychotics, and antidepressants should not be used at the same time because of the risk of additional sedation. Long-term use can cause headaches, sleeplessness, cardiac dysfunction, hepatotoxicity. Patients should be warned not to drive or operate dangerous machinery when taking valerian. Valerian should be stopped about 1 week before surgery because it may interact with anesthesia.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Vanadium (*vanadyl sulfate*)	Used to mimic insulin; it may restore plasma DHEA and seems to improve insulin action. There may be a role for its use in the metabolic syndrome. Found in mushrooms and shellfish.	May cause GI bleeding.
Vitex (chaste tree)	Used for relief of menstrual disorders. Fruits are used; approved for use in Germany.	
White Willow	Used for fever, headache, pain, and rheumatic complaints. Aspirin is derived from white willow.	GI irritation or stomach ulcers can occur with long-term use; similar reactions as aspirin. Avoid use with alcohol, methotrexate, phenytoin, and valproate. Do not use in pregnancy or lactation.
Wild Yam (*Dioscorea villosa*)	Used for amenorrhea, dysmenorrhea, colic, cough, GI symptoms, rheumatoid arthritis, menopausal symptoms, urinary tract disorders, sexual dysfunction, spasms.	Efficacy of hormonal actions is not proven. Topical creams that say that they contain yam extracts as a source of natural progesterone are not accurate.
Willow Bark (*Salix alba*)	Used for fever, headache, inflammation, influenza, muscle pain.	Adverse reactions: nausea, vomiting, GI bleed, tinnitus, renal damage. Drug interactions: increases risk of bleeding with anticoagulants and GI bleed with NSAIDs.
Witch Hazel	Used as astringent with bruises or varicose veins. Approved for use with hemorrhoid products.	Not for oral use.
Yew (*Taxus baccata*, *T. wallachiana*, *T. media*)	Used in treatment of some breast tumors. Cultivated varieties are being used to prepare triterpenoid precursors which are used to create paclitaxel and docetaxel, which in turn, have an antiestrogenic effect.	
Zinc	Used to prevent viral illness, enhance performance, and correct male infertility.	It should not be taken with immunosuppressants, fluoroquinolones, or tetracycline. Large doses may also conflict with copper metabolism.
Hazardous Products	These products should never be consumed.	
Aristolochic acid (*Aristolochia*, birthwort, snakeroot, snakeweed, snagree root, sangrel, serpentary, wild ginger)	**Definitely Hazardous**	Documented human cancers. Also linked to kidney failure.
Belladonna	**Definitely Hazardous**	Causes GI pain and spasms; contains toxic alkaloids, which can cause coma and death.
Very Likely Hazardous	***These are banned in other countries, have an FDA warning, or show adverse effects in studies.***	
Androstenedione (4-androstene-3, 17-dione, andro, androstene)	**Very Likely Hazardous**	Increased cancer risk and decrease in "good" HDL cholesterol have been reported.
Chaparral (*Larrea divaricata*, creosote bush, greasewood, hediondilla, jarilla, larreastat)	**Very Likely Hazardous** Often used for anti-inflammatory and anticancer effects, arthritis, carcinoma treatment, inflammation, spasm.	Abnormal liver function and hepatitis or even cirrhosis have been linked to use.
Comfrey (*Symphytum officinale*, ass ear, black root, blackwort, bruisewort, *Consolidae radix*, consound, gum plant, healing herb, knitback, knitbone, salsify, slippery root, *Symphytum radix*, wallwort)	**Very Likely Hazardous** Used for bronchitis, cancer treatment, rheumatoid arthritis, wound healing.	Abnormal liver function or damage, often irreversible. It contains pyrrolizidine alkaloids and causes hepatic veno-occlusive disease or death. Avoid in infants, pregnancy, lactation. FDA has asked all manufacturers to remove products containing comfrey because it is hepatotoxic.
DHEA	**Very Likely Hazardous** Used as an immune enhancer or to prevent heart disease. No evidence that it works.	Can actually aggravate heart disease and have effects like steroids; may promote cancers in breast, prostate, or ovaries.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Ephedra (ma huang)	**Very Likely Hazardous** Often used in weight loss products. Banned by FDA. DISCONTINUE 2 WEEKS BEFORE SURGERY	Contains cardiac toxins linked to dozens of deaths. Ephedra can cause stroke, insomnia, hypertension, or heart attack. Avoid taking with caffeine, sedatives, antipsychotics, antidepressants, antihyperglycemic agents, decongestants, and cardiovascular agents.
Germander (*Teucrium chamaedrys*, wall germander, wild germander)	**Very Likely Hazardous** Germander contains flavanoids.	Abnormal heart and liver function have been linked to use.
Goldenseal (*Hydrastis canadensis*)	**Very Likely Hazardous** Used for anorexia, heart disease, coughs, upset stomach, menstrual problems, and arthritis. It has long been used by Native Americans for antiseptic and wound-healing properties. DISCONTINUE 2 WEEKS BEFORE SURGERY	GI complaints are common side effects. With toxicity: stomach ulcerations, constipation, convulsions, hallucinations, nausea, vomiting, depression, nervousness, bradycardia, respiratory depression, seizures. It can raise blood pressure, complicating treatment for those taking beta-blockers. For patients taking medication to control diabetes or kidney disease, this herb can cause dangerous electrolyte imbalance. Patients with hypertension or cardiovascular disease and women who are pregnant should not take this herb.
Kava (*Piper methysticum*, ava, awa, gea, gi, intoxicating pepper, kao, kavain, kawapfeffer, kew, long pepper, malohu, maluk, meruk, milik, rauschpfeffer, sakau, tonga, wurzelstock, yagona, yangona)	**Very Likely Hazardous** Used as a stimulant.	Abnormal liver function has been linked to use.
Kelp	**Very Likely Hazardous**	If ingested as a source of iodine, it may interfere with thyroid replacement therapies. May worsen hyperthyroidism.
Red yeast rice	**Very Likely Hazardous** The fermented product of rice on which red yeast has been grown. A dietary staple in Asian countries to lower total cholesterol levels (Heber et al, 1999).	It has been removed from the market in the United States. Avoid use with grapefruit juice or niacin.
Likely Hazardous	***These have adverse event reports or theoretical risks.***	
Astragalus	**Likely Hazardous** Used in Chinese and Indian medicine for its immune enhancement.	Do not take with antihyperglycemic agents. Not recommended for use, especially in immunosuppressed patients.
Bitter orange (*Citrus aurantium*, green orange, kijitsu, neroli oil, Seville orange, shangzhou zhiqiao, sour orange, zhi oiao, zhi xhi)	**Likely Hazardous**	High blood pressure and increased risk of heart arrhythmias, heart attack, and stroke are risks associated with use.
Borage	**Likely Hazardous**	May cause liver toxicity or even cancers.
Horse chestnut (*Aesculus hippocastanum*; aescin 50 mg)	**Likely Hazardous** Studies have shown clinical efficacy in chronic venous insufficiency, but no data support the reversal of varicose veins.	Patients with compromised renal or hepatic functions should not consume horse chestnut. It may also interact with anticoagulants and increase the risk of bleeding.
Kombucha tea	**Likely Hazardous** It is sometimes suggested for acne or insomnia or in AIDS.	Can cause liver damage or intestinal problems or death.

(continued)

TABLE 2-2 Herbs, Botanicals, Spices, Commentary and Adverse Effects *(continued)*

Herb, Botanical, Spice	Common Uses	Adverse Effects
Lobelia (*Lobelia inflata*, asthma weed, bladderpod, emetic herb, gagroot, lobelie, Indian tobacco, pukeweed, vomit wort, wild tobacco)	**Likely Hazardous**	Difficulty breathing and rapid heart rates are associated with lobelia. Large doses can lead to rapid heartbeat, paralysis, coma, or death. Avoid in children, infants, pregnant women, smokers, and people with cardiac diseases.
Mistletoe/Eurixor (*Viscum album*)	**Likely Hazardous** Used for arthritis, cancer treatment, hepatitis, HTN, spasm, immunostimulation.	Warning: berries and leaves are highly poisonous. Contraindication in pregnancy. Adverse reactions include fever, headache, chest pain, bradycardia, hypotension, coma.
Organ/glandular extracts (brain/adrenal/pituitary/placenta/other gland "substance" or "concentrate")	**Likely Hazardous**	Theoretical risk of mad cow disease, particularly from brain extracts.
Passion flower	**Likely Hazardous** Sometimes recommended for sedative use.	It can cause seizures, hypotension, hallucinations.
Pennyroyal oil (*Hedeoma pulegioides*, lurk-in-the-ditch, mosquito plant, piliolerial, pudding grass, pulegium, run-by-the-ground, squaw balm, squawmint, stinking balm, tickweed)	**Likely Hazardous**	Liver and kidney failure, nerve damage, convulsions, abdominal tenderness, and burning of the throat are risks; deaths have been reported.
Poke root	**Likely Hazardous**	May cause low blood pressure and respiratory depression. Extremely toxic.
Sassafras (*Sassafras albidum*)	**Likely Hazardous** Used for detoxification, inflammation, health maintenance, rheumatoid arthritis, mucositis, sprain, syphilis, urinary tract disorders.	Produces sweat and contains safrole, which is banned as a carcinogen. Warning: risk of liver cancer with prolonged use, so it is not safe to use. Adverse reactions: hot flashes, diaphoresis, hallucinations, hypertension, tachycardia, liver cancer, and death.
Skullcap (*Scutellaria lateriflora*, *S. baicalensis*, baikal, blue pimpernel, helmet flower, hoodwort, mad weed, mad-dog herb, mad-dog weed, quaker bonnet, scutelluria, scullcap)	**Likely Hazardous** Used for epilepsy, hepatitis, infections, cancer.	Toxicity causes stupor, confusion, seizures. Adverse reactions include hepatotoxicity and pneumonitis.
Wheat grass (*Triticum aestivum*)	**Likely Hazardous** Used for carcinoma treatment, chronic fatigue syndrome, immunostimulation, ulcerative colitis. An antioxidant.	Adverse reactions: nausea because of contamination. No safety guidelines available.
Yohimbe (*Pausinystalia yohimbe*, johimbi, yohimbehe, yohimbine, yohimbe bark)	**Likely Hazardous** May be used for male impotence. It causes CNS stimulation and vasodilation. In high doses, it is an MAO inhibitor. It is to be avoided in individuals with hypotension, CHF, diabetes, and kidney and liver diseases.	Blood pressure changes, heartbeat irregularities, heart attacks, and paralysis have been reported. Yohimbe is not effective for male impotence and can cause side effects such as hypertension and kidney failure; it can also aggravate bipolar disorder or decrease antidepressant effectiveness.

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2. Office of Dietary Supplements. Accessed March 21, 2009, at http://ods.od.nih.gov/Health_Information/Information_About_Individual_Dietary_Supplements.aspx.
3. Kumar NB, et al. Perioperative herbal supplement use in cancer patients: potential implications and recommendations for presurgical screening. *Cancer Control.* 12:149, 2005.

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Clinical/History

- Use of vitamin/mineral supplements
- Herbs and botanical products—amount, frequency
- Special diets or nutrition support
- Dietary pattern for food and alcohol
- Over-the-counter and prescribed medications
- Knowledge of food and nutrition
- Family or genetic history

Lab Work

- Hemoglobin and hematocrit (H & H)
- Serum Fe
- Glucose
- Na^+, K^+, Cl^-
- Ca^{++}, Mg^{++}
- Albumin (Alb)
- T3, T4, TSH
- Blood urea nitrogen (BUN)
- Creatinine (Creat)
- Homocysteine (tHcy)
- Cholesterol (Chol), triglycerides (TG)
- Other values as determined by products consumed

INTERVENTION

OBJECTIVES

The White House Commission on Complementary and Alternative Medicine Policy Executive Summary (2002) supported the following guiding principles for counseling individuals:

- Apply a "wholeness orientation" in health care delivery. Health involves all aspects of life—mind, body, spirit, and environment.
- Evaluate for evidence of safety and efficacy. Promote the use of science and appropriate scientific methods to help identify safe and effective CAM services and products.
- Identify the healing capacity of the individual person. People have a remarkable capacity for recovery and self-healing; support and promote this capacity.
- Respect individuality, recognizing that each person is unique and has the right to health care that is appropriately responsive to him or her, respecting preferences and preserving dignity.
- Recognize patient rights. Each has the right to choose treatment; to choose freely among safe and effective care or approaches; and to choose among qualified practitioners who are accountable for their claims and actions and responsive to the person's needs.
- Support health promotion, self-care, and early intervention for maintaining and promoting health.
- Develop partnerships. Good health care requires teamwork among patients, health care practitioners (conventional and CAM), and researchers committed to creating optimal healing environments and to respecting the diversity of all health care traditions.
- Educate about prevention, healthy lifestyles, and the power of self-healing.
- Disseminate comprehensive and timely information. The quality of health care can be enhanced by promoting efforts that thoroughly and thoughtfully examine the evidence on which CAM systems, practices, and products are based and make this evidence widely, rapidly, and easily available.
- Integrate public involvement. The input of informed consumers and other members of the public must be incorporated in setting priorities for health care and health care research and in reaching policy decisions.

SAMPLE NUTRITION CARE PROCESS STEPS

Harmful Beliefs about Food or Nutrition-Related Topics

Assessment Data: Food records; adverse side effects with specific products and amounts taken; blood pressure (BP), lab reports for serum electrolytes.

Nutrition Diagnoses (PES): Harmful beliefs/attitudes about food or nutrition-related topics related to intake of unsafe substances as evidenced by intake of ephedra in products otherwise removed from the market by FDA and complaints of rapid heartbeat and undesirable changes in BP.

Intervention: Education about appropriate use of herbs and botanical products; dangers of consuming substances with unknown side effects. Counseling about desired foods and use of evidence-based complementary products.

Monitoring and Evaluation: Improved quality of life and reduced symptoms; improvements in heart rate and BP.

FOOD AND NUTRITION

- Promote the appropriate use of herbal and botanical products that have shown efficacy and safety. The best strategy for promoting optimal health and for reducing chronic disease is to choose a wide variety of foods (American Dietetic Association, 2005).
- Functional foods are available that have health benefits beyond basic nutrition (e.g., omega-3–enriched eggs, stanol- and sterol-fortified soft chews and related margarines, or high-flavanol chocolate snacks). Use relevant products and recipes.
- Special attention may be needed for intake of iron and folic acid for females in teen and childbearing years; vitamin B_{12} for adults over age 50; and vitamin D for older adults, those with dark skin, and those exposed to ultraviolet radiation (American Dietetic Association, 2005).

Common Drugs Used and Potential Side Effects

- Plants have been used throughout history to improve health. Modern medicines often come from plants (e.g., aspirin from willow bark). Therefore, herbs used for health purposes are drugs and chemicals that affect the human body (O'Hara et al, 1998).

- About 15 million Americans are at risk for drug–supplement interactions (Boullata, 2005). Natural health products often interfere with medications, and caution is necessary.

Herbs, Botanicals, and Supplements

- Many cultures use herbs and botanicals as part of their meal patterns, rituals, and celebrations. Remember that plant products are not necessarily safe, even if they are "natural" or "organic."
- Individual reports of safety for any herbal product are not reliable; some people who use a herb will feel better even if there is no evidence of its efficacy (the placebo effect).
- The use of dietary supplements may be associated with adverse events (Sadovsky et al, 2008). Although there are new regulatory requirements for dietary supplements, these products do not require FDA approval, submission of efficacy and safety data prior to marketing, or prospective, randomized clinical trials (Sadovsky et al, 2008). Check www.consumerlab.com to identify brand names that are reliable before making recommendations.
- Herbs commonly used by children enrolled in the Women-Infants-Children (WIC) program children include aloe vera, chamomile, garlic, peppermint, lavender, cranberry, ginger, echinacea, and lemon, as recommended by family or friends (Lohse et al, 2006). Identify those that are used and monitor for potential side effects. Because herbs with safety issues, such as St. John's wort, dong quai, and kava, may also be used, herbal education is highly recommended for WIC clinics, especially for Latinos (Lohse et al, 2006).

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Demonstrate respect for the beliefs, values, and practices of the patient and family members. Discuss CAM in a nonjudgmental way; encourage sharing the information with their primary physician.
- Discuss evidence that is known about different types of herbs and botanical products. Counsel that herbs are considered dietary supplements and not medicines, that FDA has no oversight on ingredients or safety and efficacy, and that there is no guarantee that the herb will work.
- Many physicians are not aware of the frequency of use and adverse events related to dietary supplements (Ashar et al, 2007).
- Alcohol interacts with many medications and possibly with herbs. Mix with caution.

Patient Education—Food Safety

- Discuss food handling, preparation, and storage of herbs and botanical products.
- Because bacteria are commonly found on foods such as green onions (scallions), cilantro, and imported produce, wash all fresh fruits and vegetables.
- Store spices as directed and discard after shelf-life expiration. Spices such as paprika are easily contaminated.

For More Information

- American Botanical Council
  http://www.herbalgram.org/
- American Council on Science and Health
  http://www.acsh.org/
- American Dietetic Association
  http://www.eatright.org/
- American Herbal Products Association
  http://www.ahpa.org/
- Alternative Medicine Foundation
  http://www.amfoundation.org/
- Botanical Dietary Supplements
  http://ods.od.nih.gov/factsheets/BotanicalBackground.asp
- CAM on PubMed—Searchable database
  http://www.nlm.nih.gov/nccam/camonpubmed.html
- Cochrane Collaboration—Complementary Medicine
  http://www.compmed.umm.edu/cochrane/index.html
- Complementary and Integrative Medicine
  http://www.mdanderson.org/departments/cimer/
- Consumer Lab.com
  http://www.consumerlab.com/
- Dietary Supplements
  http://www.cfsan.fda.gov/~dms/supplmnt.html
- Drug Digest
  http://www.drugdigest.org/wps/portal/ddigest
- Facts about Dietary Supplements
  http://www.cc.nih.gov/ccc/supplements/intro.html
- Federal Trade Commission (FTC)
  http://www.ftc.gov/
- Food and Nutrition Information Center—Dietary Supplements
  http://fnic.nal.usda.gov/nal_display/index.php?tax_level=1&info_center=4&tax_subject=274
- Herbal Monographs and Frequently Asked Questions on Herbs from RxList.com
  http://www.rxlist.com/alternative.htm#herbal_mon
- HerbMed—Interactive, electronic herbal database
  http://www.herbmed.org/
- Herb Research Foundation
  http://www.herbs.org/
- Herbs and Cultural Uses
  http://asiarecipe.com/herb.html
- Herbs Database
  http://nccam.nih.gov/health/herbsataglance.htm
- Intelihealth, Vitamin and Nutrition Resource Center
  http://www.intelihealth.com/IH/ihtIH/WSIHW000/325/325.html
- Institute of Food Technologists
  http://www.ift.org/
- International Food Information Council—Functional Foods
  http://www.ific.org/nutrition/functional/index.cfm
- Labels Database
  http://dietarysupplements.nlm.nih.gov/dietary/
- Mayo Clinic
  http://www.mayoclinic.com/health/alternative-medicine/CM99999
- MEDLINE, Vitamin and Mineral Supplements
  http://www.nlm.nih.gov/medlineplus/vitaminandmineralsupplements.html
- National Center for Complementary and Alternative Medicine (NCCAM)
  http://altmed.od.nih.gov/
- NIH Herbal Listing:
  http://www.nlm.nih.gov/medlineplus/druginfo/herb_All.html
- National Institutes of Health, Office of Dietary Supplements
  http://ods.od.nih.gov/
- Rosenthal Center for Complementary and Alternative Medicine
  http://www.rosenthal.hs.columbia.edu/index.html
- Sloan-Kettering Herbs and Cancer
  http://www.mskcc.org/mskcc/html/58481.cfm
- Special Nutritionals Adverse Event Monitoring System—Searchable database from the FDA
  http://www.fda.gov/medwatch/how.htm

- Tufts University Nutrition
  http://www.tufts.edu/med/ebcam/nutrition/
- University of Illinois Botanical Supplement Research
  http://www.uic.edu/pharmacy/centers/uic_nih_botanical_dietary_supplement_research/index.php
- U.S. Pharmacopeia
  http://www.usp.org/
- USP Verified Program
  http://www.uspverified.org/

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Nagao T, et al. Ingestion of a tea rich in catechins leads to a reduction in body fat and malondialdehyde-modified LDL in men. *Am J Clin Nutr.* 81:122, 2005.

Sadovsky R, et al. Patient use of dietary supplements: a clinician's perspective. *Curr Med Res Opinion.* 24:1209, 2008.

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White House Commission on Complementary and Alternative Medicine Policy. Final report. Accessed November 1, 2000, at http://www.whccamp.hhs.gov.

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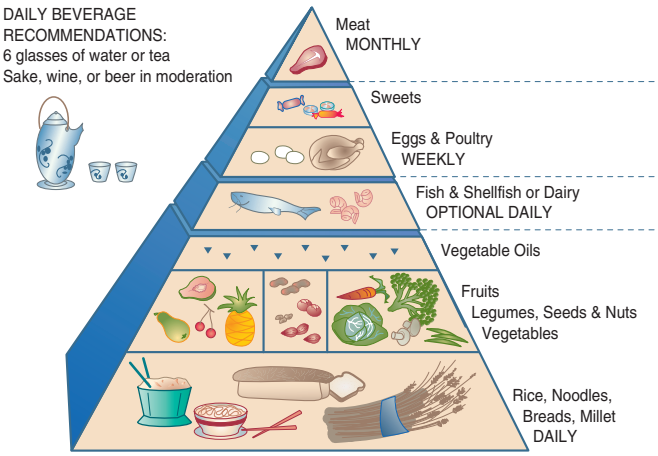
CULTURAL FOOD PATTERNS, VEGETARIANISM, RELIGIOUS PRACTICES

CULTURAL FOOD PATTERNS

NUTRITIONAL ACUITY RANKING: LEVEL 2 (DIETARY ADAPTATIONS, ADVISEMENT)



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DEFINITIONS AND BACKGROUND

Varied dietary intakes by age, culture, gender, and years in the United States are common. Assessment of a patient's cultural food preferences is essential to determine adequacy of nutritional intake. Nutrition planning will be more effective if tailored to the individual (Sucher and Kittler, 2007). Disease prevention strategies must use available knowledge about individual cultures.

Soon, over half of the U.S. population will consist of people from different cultural backgrounds (Goody and Drago, 2010). The process by which immigrants adopt the dietary practices is multidimensional, dynamic, complex, varying by personal, cultural, and environmental factors (Unger et al, 2004). Adoption of U.S. dietary patterns that are high in fat and low in fruits and vegetables is not positive. Neighborhood grocery stores may have limited availability of fresh produce, making healthy choices a struggle (Larson et al, 2009).

Dietetics practitioners can use the information to study nutrition education efforts directed toward ethnic-specific groups. It is important to become aware of diverse traditions and preferred food resources. Clinicians should be able to offer a wide variety of self-management support systems to meet the needs of diverse patient populations that vary by race/ethnicity, language proficiency, and health literacy (Sarkar et al, 2008).

The Joint Commission has set the standard for meeting individual needs for cultural and religious preferences. Whereas most hospitals attend to the religious (97%), dietary (85%), and psychosocial (78%) cultural needs of patients, fewer institutions respond to patients' cultural needs related to health literacy (57%); complementary/alternative medicine (43%); cultural brokers, folk remedies, traditions, rituals and traditional healers (Stein, 2009). It is important to reinforce positive traditional habits while encouraging inclusion of new, healthy ones.

SAMPLE NUTRITION CARE PROCESS STEPS

Unintentional Weight Loss

Assessment Data: Food records indicating lack of appetite for new foods; weight records; low blood glucose and Chol levels.

Nutrition Diagnoses (PES): Unintentional weight loss related to limited access to preferred foods as evidenced by 15# weight loss since moving to this country 6 months ago with a current BMI of 17.

Intervention: Education about where to find ethnic food choices for protein choices, whole grains, fruits and vegetables. Counseling about culturally appropriate choices that are accessible in neighborhood or area stores.

Monitoring and Evaluation: Improved BMI and weight for height; lab reports showing improvement in glucose and Chol.

ASSESSMENT, MONITORING, AND EVALUATION

Race/ethnicity
Language proficiency
Health literacy
Cultural food preferences
Traditional dietary habits

INTERVENTION

OBJECTIVES

- Be aware of personal cultural values but avoid imposing them on others. For example, the desire to be thin is more common among Caucasians than people from many other ethnic backgrounds.
- Assess values, attitudes, beliefs, practices, and rituals of the client before attempting to discuss any lifestyle changes. Observe and interact appropriately.
- Provide individualized patterns when they differ from the local standard. Be prepared to understand the differences from a "typical American" diet.
- Determine which habits, if any, are detrimental for a healthy lifestyle. Review patterns or foods that aggravate existing or predisposed conditions for each person. Build on healthy practices.
- Correct dietary intake patterns for nutrient deficits, such as calcium and riboflavin where dairy products or milk are excluded or not tolerated. Identify other nutrients that are at risk for insufficiency.
- Offer suggestions for changes in food preparation (e.g., ways for reducing fat or salt) rather than changing the foods themselves, whenever possible.
- Each culture has functional foods and ingredients that have special attributes. Identify and acknowledge these foods or ingredients.
- Understand customs, festive occasions, fasting, ceremonial activities, and celebrations. Promote the traditions and welcome special events or activities, as appropriate for the setting.

FOOD AND NUTRITION

- Review and identify specific ethnic and religious food patterns. Table 2-3 lists a brief overview of religious dietary patterns and common practices. More extensive information can be found on the internet and in many cookbooks.
- The WIC food package was updated to include foods to help families from diverse backgrounds. Most participants prefer whole versus low-fat milk; whole grain products and peanut butter are preferred over beans or soy foods (Black et al, 2009).
- *African/African American patterns.* Foods such as peanuts, peppers, and corn are traditional, as are fruits, vegetables, meats, and milk. Starch is a main consideration in the diet. Access to healthy foods such as fruits, vegetables, and whole grains should be noted as some community resources may be limited (Franco et al, 2009). In the South, dietary habits may include healthy foods prepared with unhealthy ingredients (such as fried chicken, greens prepared with lard). Spices and seasonings may vary. Alterations in recipes may be needed for taste and acceptance if healthier choices are offered.
- *Asian patterns.* Asian diets vary from one country to another. Diets may be low in calcium and riboflavin because milk often is not tolerated or consumed. Encourage use of tofu, green vegetables, and fish containing small bones. Diet may be high in sodium if monosodium glutamate (MSG) and soy sauces are used. The traditional Chinese diet contains 80% grains, legumes, and vegetables. Stir-frying, deep fat frying, and steaming are common cooking methods. Pork is the preferred meat. Hot peppers may be used daily. "Hot" and "cold" foods may be used during pregnancy or illness but these terms do not refer to food temperatures. Korean Americans tend to have a greater intake of carbohydrates, vitamins A and C than of saturated and total fat or Chol (Goody and Drago, 2010).
- *Hmong (Southeast Asian) patterns.* Milk is seldom used, related to lactose intolerance; calcium intake may be low. Fish, chicken, and pork are common entrees. Rice may be eaten at nearly every meal. A highly salted fish sauce is used. Snacking is rare in the family diet. Anemia may result from parasite infestation in those individuals who have been refugees. Like Chinese patterns, hot–cold patterns are often observed. A website for Vietnamese food is available at http://www.ivietbusiness.com/vietnamese-food-recipe.htm
- *Hispanic/Latino patterns.* Whole milk is used rarely, but cheese is a common additive to meals. Chili peppers, mangos, and avocados are the primary fruits and vegetables consumed. The main starch is corn or flour tortilla. Rice is the major contributor of energy among the elderly. The diet may be high in sugar and saturated fat (lard). A common main dish is beans with rice. Hot and cold foods are concepts commonly found. Salsa or sofrito seasonings are used frequently. Obesity, type 2 diabetes, hypertension, cardiovascular disease, dental caries, snacking, and undernutrition may be problems. Most Hispanic countries use folk remedies, such as garlic to treat hypertension and cough; chamomile to treat nausea, gas, colic, and anxiety; and peppermint to treat dyspepsia.

TABLE 2-3 Common Religious Food Practices

	Seventh-Day Adventist	Buddhist	Eastern Orthodox	Hindu	Jewish	Mormon	Moslem	Roman Catholic
Beef	A	A		X				
Pork	X	A		A	X		X	
All meat	A	A	R	A	R		R	R
Eggs/dairy	O	O	R	O	R			
Fish	A	A	R	R	R			
Shellfish	X	A	O	R	X			
Alcohol	X			A		X	X	
Coffee/tea	X					X	A	
Meat and dairy at same meal					X			
Leavened foods					R			
Ritual slaughter of meats					+		+	
Moderation	+	+					+	
Fasting[a]		+	+	+	+	+	+	+

[a]Fasting varies from partial (abstention from certain foods or meals) to complete (no food or drink).
X, prohibited or strongly discouraged; A, avoided by the most devout; R, some restrictions regarding types of foods or when a food may be eaten; O, permitted, but may be avoided at some observances; +, practiced.

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http://asiarecipe.com/religion.html.
http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Food_culture_and_religion?open.

- *Indian/Pakistani patterns.* India has some of the most diverse populations and diets in the world. In India, rates for oral and esophageal cancers are high. Indian immigrants in the United States are largely Hindus; Pakistani immigrants are mostly Muslims. Vegetarianism is a primary practice among Indians, deriving from religious beliefs in which the cow is sacred. Lentils and legumes are a primary source of protein; sometimes milk, eggs, fish, shrimp are consumed. Sattvic foods are believed to create a healthy life; these include milk products (except cheese made from rennet), rice, wheat, and legumes. Rajasic foods are believed to contribute to aggression; these include meats, eggs, and rich or very salty foods. Tamasic foods are believed to contribute to slothfulness or dullness; these include garlic, pickled foods, stale or rotten foods, and alcohol used for pleasure or to excess. Lack of portion control may be a factor in diabetes, which is common (Goody and Drago, 2010). Combination foods include biryani (grain, meat), samosas (grain, vegetable, meat, fat), kheer "rice pudding" (grain, milk), and curry (meat, vegetable). Turmeric (curcumin) is an ingredient in Indian curry spice that has strong antioxidant properties.
- *Mediterranean diet pattern (MDP).* The MDP reflect the habits of populations of Italy, Crete, and Greece. Olive oil; fish, poultry, and eggs rather than beef; breads, fruits, and vegetables in abundance; and lots of beans/legumes, yogurt, and cheeses make up this pattern. Exercise and wine are also mainstays. MDP is more often found among older people and people in rural areas, among males more than females, and among people who are more physically active (Tur et al, 2004). A Mediterranean-style diet rich in whole grains, fruits, vegetables, legumes, walnuts, and olive oil is effective in reducing both the prevalence of the metabolic syndrome and cardiovascular risks. Urban young people should be encouraged to return to this pattern.
- *Middle Eastern patterns.* Countries usually include Egypt, Iran, Jordan, Lebanon, Saudi Arabia, and Turkey. Lamb and beef are consumed; pork is eaten only by Christians. Yogurt and cheese provide calcium sources as lactose intolerance is prevalent. Because olive oil is commonly used, lower BP is often found (Goody and Drago, 2010).
- *Native American patterns (American Indian and Alaskan Native).* Food has great religious and social significance and is commonly part of many celebrations. Fried foods, fried bread, corn, mutton, and goat are frequently used by American Indians, whereas seafood and game are more common among Alaskan natives. Obesity and type 2 diabetes are very common (Goody and Drago, 2010). For recipes, see website http://www.kstrom.net/isk/food/recipes.html. More information is available at http://www.usda.gov/news/pubs/indians/open.htm

Common Drugs Used and Potential Side Effects

- Drugs may interact with various herbs botanicals and supplements. Individualize care and counseling.
- In the Multi-Ethnic Study of Atherosclerosis, white, African-American, Hispanic, and Chinese-American participants aged 45–84 years were studied; some met DRI guidelines for calcium, vitamin C, and magnesium but

effects of supplementation varied according to ethnicity and sex (Burnett-Hartman et al, 2009). Counselors should always ask about use of vitamin–mineral supplements.

Herbs, Botanicals, and Supplements

- Knowledge of integrative medicine incorporates herbal and botanical products that are used for preventive or medicinal purposes. Different cultures apply different herbs and practices in folk medicine.
- Many cultures use herbs and botanicals as part of their meal patterns, rituals, and celebrations. Identify those that are used and monitor for potential side effects. See the first part of this chapter, which describes complementary medicine products.

NUTRITION EDUCATION, COUNSELING, CARE MANAGEMENT

- Culturally appropriate counseling and awareness of religious practices are important for improving health issues, such as obesity and intake of fruits and vegetables (Goody and Drago, 2010). Different methods may be needed for dietary modification for obesity, diabetes, and hypertension, taking into account differences in cultural understanding and food practices. First, demonstrate respect for the beliefs, values, and practices of the patient and family members.
- Interpreters may be needed. Bilingual staff or community volunteers are helpful. Speak directly to the individual and not to the interpreter during sessions to show respect.
- Alternative solutions to dietary patterns must be gently offered. There is no "one right way" for dietary patterns. Understanding background, health problems, statistics, social issues, and disease patterns is useful when providing multicultural education.
- Build relationships through sensitivity and communication. Remove assumptions and stereotypes; cultures are changing, growing, and dynamic.
- Family beliefs and behaviors may sabotage a client's efforts; be aware and be helpful. Develop an intuitive counseling style, reading body language, eye contact, and other behaviors.
- Offer tips on food selection, preparation, and storage; identify available resources, ethnic stores, and agencies.
- Interpreting food labels and preparing unfamiliar foods can be part of the educational session.
- Body language differs between cultures. For example, Hispanic/Latino cultures prefer being close to others in space; sitting within 2 feet demonstrates interest. Oriental cultures may prefer a greater distance to demonstrate respect.

Patient Education—Food Safety

- Discuss food handling, preparation, and storage within a cultural context.
- When traveling, avoid tap water and ice made from tap water, uncooked produce such as lettuce, and raw or undercooked seafood.
- Avoid raw or partially cooked eggs, raw or undercooked fish or shellfish, and raw or undercooked meats because of potential foodborne illnesses.
- Do not use raw (unpasteurized) milk or products made from it. Avoid serving unpasteurized juices and raw sprouts.

For More Information

- Association for the Study of Food and Society
  http://www.food-culture.org/
- Center for Cross-Cultural Health
  http://www.crosshealth.com/links.htm
- Cultural and Ethnic Resources
  http://www.nal.usda.gov/fnic/pubs/bibs/gen/ethnic.pdf
- Cultural and Ethnic Food Pyramids
  http://www.semda.org/info/
- Eating Healthy with ethnic Foods
  http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/eth_dine.htm
- Ethnic Grocer
  http://www.ethnicgrocer.com/
- Food History Timeline
  http://www.foodtimeline.org/
- Food Habits and Anthropology
  http://www.foodhabits.info/
- Food and Nutrition Information Center, National Agricultural Library
  http://www.nal.usda.gov/fnic/
- Georgia State Nutrition Handouts
  http://monarch.gsu.edu/multiculturalhealth
- Joint Commission—Culture
  http://www.jointcommission.org/PatientSafety/HLC/about_hlc.htm
- Journal of Food and Culture
  http://www.gastronomica.org/
- National Center for Cultural Competence
  http://gucchd.georgetown.edu/nccc/index.html
- Ohio State University Extension Fact Sheets
  http://ohioline.osu.edu/hyg-fact/5000/index.html
- Oldways Cultural Food Pyramids
  http://www.oldwayspt.org/
- Religious Food Practices
  http://asiarecipe.com/religion.html#help
- Seventh Day Adventist Foodways
  http://www.sdada.org/position.htm
- USDA Food Pyramid—Ethnic and Cultural Versions
  http://www.nal.usda.gov/fnic/Fpyr/pyramid.html

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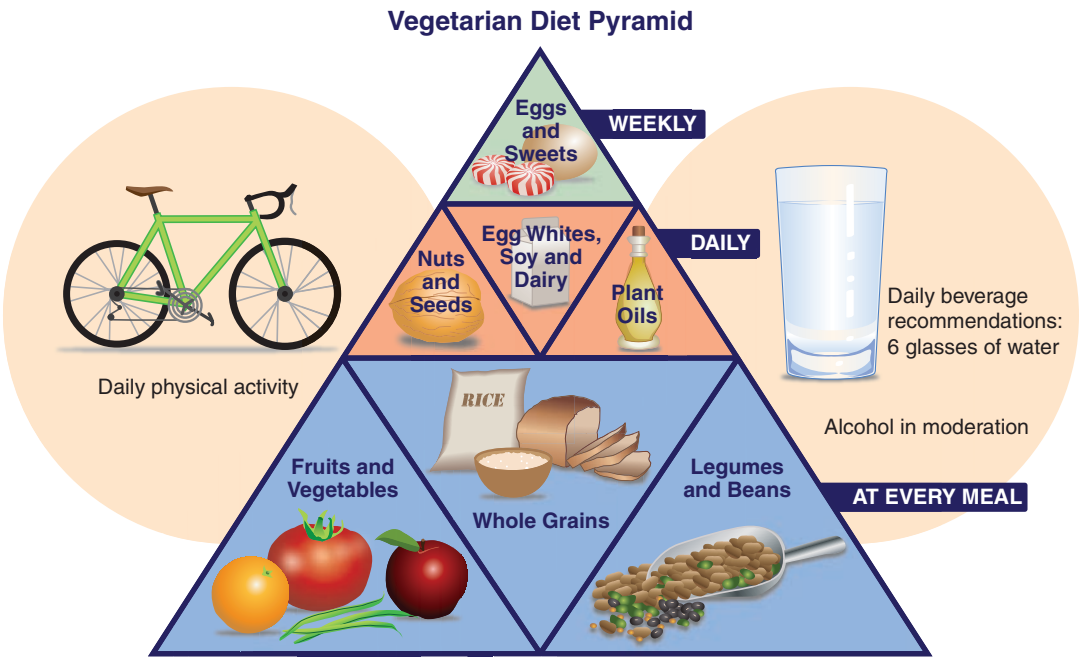
VEGETARIANISM

NUTRITIONAL ACUITY RANKING: LEVEL 2 FOR MEAL PLANNING



DEFINITIONS AND BACKGROUND

Vegetarian diets are plant-based with large amounts of cereals, fruits, vegetables, legumes, seeds, and nuts (Key et al, 2006). These diets generally omit meat, poultry, and fish. The vegan plan is a very strict vegetarian food pattern ("pure" vegetarianism); lacto is a vegetarian food pattern using milk; and lacto–ovo, a vegetarian food pattern using milk and eggs. While a Macrobiotic diet consists mainly of beans and whole grains, some individuals also consume fish. Conscious combining of complementary protein sources does not appear to be necessary on a regular basis (American Dietetic Association, 2003).

Vegetarian diets can be healthful when carefully planned. The Institute of Medicine recommends 25–35 g of fiber per day; vegetarian diets can easily provide this level. Individuals following vegetarian diets tend to have less obesity, constipation, diabetes, hypertension, diverticular disease, appendicitis, hiatal hernia, hemorrhoids, and varicose veins. Vegetarians usually consume less-saturated fats and Chol and often have more favorable lipid levels. Long-term vegetarians have a better antioxidant status and coronary heart disease risk profile than do apparently healthy omnivores; plasma ascorbic acid is a useful marker of overall health status (Szeto et al, 2004). Finally, there may be fewer kidney stones among vegetarians. A balanced diet with a moderate animal protein and purine content, an adequate fluid intake, and a high-alkali load with fruits and vegetables results in low risk of uric acid crystallization (Siener and Hesse, 2003).

Hindus, Seventh Day Adventists, Buddhists, and some other religious groups may suggest following a vegetarian lifestyle. Vegetarian diets are usually rich in carbohydrates, n-6 fatty acids, dietary fiber, carotenoids, folic acid, vitamin C, vitamin E and Mg, and relatively low in protein, saturated fat, long-chain n–3 fatty acids, retinol, vitamin B_{12} and Zn (Key et al, 2006). See Table 2-4 for guidance on nutrients that are at risk.

ASSESSMENT, MONITORING, AND EVALUATION

CLINICAL INDICATORS

Clinical/History

Height
Weight
BMI
Diet history

Lab Work

Mean cell volume (MCV)
Serum Fe and ferritin
Transferrin
Albumin (alb), transthyretin
chol, Trig
Glucose (gluc)
Serum folate
Serum B_{12}
tHcy
Ca^{++}, Mg^{++}
Na^{+}, K^{+}
Serum zinc
Alkaline phosphatase (alk phos)
Serum vitamin D