

Nutrition Counseling for Health Promotion

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OBJECTIVES

After completing this chapter, the reader will be able to:

- Evaluate the objectives outlined in *Healthy People 2020* nutrition and food safety issues.
- Analyze the leading diet-related causes of illness and death in the United States and the corresponding nutrients specific to each.
- Summarize and evaluate the rationale behind the recommendations contained in the *Dietary Guidelines for Americans 2015–2020*.
- Compare the number of servings and serving sizes recommended in MyPlate with serving sizes featured currently in the marketplace.
- Analyze US food aid programs for marginalized groups and older adults in the United States.
- Evaluate personal diet intakes over a 24-hour to 48-hour period using SuperTracker (<https://www.supertracker.usda.gov>) to learn how to plan diets for any stage in the life cycle.

KEY TERMS

Body mass index	Heart disease	Nutritional genomics
Botanicals	Hemolytic uremic syndrome	Obese
Cancer	Hemorrhagic colitis	Osteoporosis
Cardiovascular diseases	Herbals	Overweight
Cholesterol	High-density lipoprotein cholesterol	Pre-diabetes
Cirrhosis	Human immunodeficiency virus	Pre-hypertension
Coronary heart disease	Hyperglycemia	Prevalence
Diabetes mellitus	Hyperlipidemia	Salmonellosis
Dietary Approaches to Stop Hypertension (DASH)	Hypertension	Serving sizes
Dietary Guidelines Advisory Committee	Incidence	Stroke
Dietary Guidelines for Americans	Lacto-ovo vegetarian	Sugar
Dietary reference intakes	Low-density lipoprotein cholesterol	Teratogenic
Dyslipidemia	Metabolic syndrome	Trans fat
Fiber	Micronutrients	Triglyceride
Food insecurity	Microbiome	Type 2 diabetes
Food secure	MyPlate	Underweight
	Nutrition screening	Vegan
	Nutrigenomics	

THINK ABOUT IT

This format may be used to evaluate your own nutrition intake as well to obtain a diet history from a care recipient. Use <http://www.choosemyplate.gov>.

1. Ask the individual which food from each of the following food groups he or she has consumed in one 24-hour period. Use a set of household measuring utensils (cups and spoons) to make accurate estimations where possible. Start with this question: In the past 24 hours how many foods did you eat from each of the following groups?

Grains (6 ounces)	Vegetables (2½ cups)	Fruits (2 cups)	Dairy (3 cups)	Proteins (5½ ounces)	Oils, Added Sugars (Use as directed)
Whole or refined grains, cereals, pasta, rice	Whole, canned, fresh, frozen, or juice	Whole fruits, fresh, canned, frozen, sauces, juices	Milk, skim or low fat, cheese, yogurt; soy, rice, or almond milks	Meat, poultry, fish, beans, lentils, nuts	Butter, margarine, cream cheese, sour cream, shortening; sugar, candy, syrup, jelly; soda, alcohol

2. Use the measuring utensils to estimate amounts from each group and insert them in the corresponding boxes. Recommendations for each food group are listed.
3. Use this information to obtain the nutrition analysis using SuperTracker (<https://www.supertracker.usda.gov>) to explain how to improve the diet or make any other changes that may be of benefit.
4. Teach yourself and your clients how to convert grams of sugar into teaspoons. Use 5 g is equivalent to 1 teaspoon of sugar. These are close enough to provide a fair deal of accuracy. In 1 cup of a fruit juice (e.g., cranberry juice) you may get 35 g of sugar. This equals 7 teaspoons. Use this same calculation to check the amount of sugar in yogurt, cereals, and baked goods. As most people do not use the metric system, this method will help.

NUTRITION IN THE UNITED STATES: LOOKING FORWARD FROM THE PAST

Classic Vitamin-Deficiency Diseases

Food and nutrition have always been important to health. Until as recently as the 1940s, many nutrient-deficiency diseases, such as rickets, pellagra, scurvy, beriberi, xerophthalmia (eye fails to produce tears), and goiter, were still prevalent in the United States (Carpenter, 2000). Although these conditions still persist in some developing countries, they have virtually disappeared from developed areas of the world. The availability of an abundant food supply, the fortification of some foods with critical nutrients, and the implementation of better methods of determining and increasing the nutrient contents of foods have contributed to the decline of nutrient-deficiency diseases.

The introduction of iodized salt in the 1920s, for example, contributed greatly to elimination of iodine-deficiency goiter as a public health problem. Similarly, beriberi and pellagra disappeared after the discovery that inadequate thiamine and niacin levels respectively contribute to these diseases. Today, nutrient deficiencies are mostly seen as iron and calcium deficits, with osteoporosis and anemia respectively being the most common, as well as malnutrition related to obesity and its related comorbidities. The few cases of protein-energy malnutrition that are listed annually as causes of death generally occur as secondary results of severe illness or injury, premature birth, child neglect, problems of the homebound aged, alcoholism, or some combination of these factors. Although undernutrition still occurs in some groups of people in the United States, including those who are isolated or poor, these once-prevalent diseases of nutritional deficiency have been replaced by diseases of dietary excess and imbalance (Table 11-1).

Dietary Inadequacy

Calorie inadequacies can have devastating effects in children in developing countries leading to wasting and stunting syndromes.

Although not to the same degree, many impoverished areas in the United States show some degree of these imbalances.

Although there are differences as to their causes, eating disorders are also classified as calorie imbalances. These can be seen in any sex and age group, with some starting in elementary school children. For diagnostic purposes, there are four conditions: anorexia nervosa, bulimia nervosa, binge eating disorder, and disordered eating not otherwise specified. The latter may include binge eating, compulsive overeating, or overexercising with respect to the calories consumed.

Depending on the length of time and the age of the individual, the physiological consequences, especially for anorexia nervosa, are life threatening. Long-term complications may include alterations in the heart rate and blood pressure, depletion of lean mass, anemia, bone loss, amenorrhea, hypoglycemia, and psychological symptoms. Early diagnosis and treatment are critical to the success of recovery.

Dietary Excesses

Problems resulting from dietary imbalances (i.e., overconsumption of some food groups and inadequate consumption of other food groups) now rank among the leading causes of illness and death in the United States. As stated in 2015 by the US Department of Health and Human Services (USDHHS) and the US Department of Agriculture (USDA) in their *Dietary Guidelines for Americans 2015–2020* (USDHHS & USDA, 2015), “the US population, across almost every age and sex group, consumes eating patterns that are low in vegetables, fruits, whole grains, dairy, seafood, and oil and high in refined grains, added sugars, saturated fats, sodium, and for some age-sex groups, high in the meats, poultry, and eggs subgroup.”

Four leading causes of death directly associated with diet are coronary heart disease (CHD), some types of cancer, stroke, and diabetes mellitus (DM). Four other major causes of death—accidents, cirrhosis, suicide, and homicide—are often associated with excessive alcohol intake.

TABLE 11-1 Health Problems Related to Poor Nutrition

Health Problem ^a	Contributing Lifestyle and Nutrition Practices ^b
Anemia	Diet with inadequate iron, folate, or vitamin B12 intake (depending on type of anemia)
Cancer (breast, cervical, and colon)	Excessive calorie intake, belly fat; low fiber intake
Cirrhosis	Excessive alcohol intake
Constipation	Inadequate fiber or fluid intake; high fat intake; sedentary lifestyle
Dental caries	Excessive, frequent consumption of concentrated sweets or sugar-sweetened beverages; lack of fluoride; poor dental hygiene
Type 2 diabetes	Excessive calorie intake; excessive fat intake (in particular saturated fat, trans fat); sedentary lifestyle
Cardiovascular/heart disease	Excessive calorie intake; excessive fat intake (in particular saturated fat, trans fat); excessive sodium intake, inadequate fiber intake; sedentary lifestyle
Hypertension	Excessive sodium and insufficient potassium intake; excessive calorie intake; possible excess alcohol intake; sedentary lifestyle
Obesity	Excessive calorie intake; excessive fat intake; sedentary lifestyle
Osteoporosis	Low calcium intake; low vitamin D intake; excessive intake of protein, sodium, and caffeine; sedentary lifestyle; excessive alcohol intake
Underweight and growth failure	Inadequate calorie intake; poor diet

^aA number of health problems are caused or exacerbated by poor nutrition. Health care professionals strive to prevent or delay these health problems.

^bNot all may apply in every case.

Current statistics show that two in three American adults and one in three children are either **overweight** or **obese** (Flegal et al., 2010). Although adult levels of overweight/obesity on their own are alarming, excess weight among the young has been linked to health problems that until now were seen only in adults: high blood pressure, type 2 diabetes, and high cholesterol levels (White House Task Force on Childhood Obesity, 2010). Although there has been a slight leveling off as compared with earlier statistics (National Center for Health Statistics, 2010), the proportion of American children who are obese is currently 17% (Ogden et al., 2014).

Reducing the incidence of obesity in any age group is vital to overall health. Although excess weight or obesity is commonly viewed as an imbalance between energy intake and energy expenditure, other factors need to be considered, such as the environment, race, and socioeconomic status. For example, genes are involved in the process of energy balance as well as in differences in fat distribution by sex and age (Bray & Champagne, 2007). The more recent interest in the human **microbiome** has generated studies on microbial gut alterations, obesity (Kaplanm & Walker, 2012), and diabetes (Tai et al., 2015).

The fifth guideline of the *Dietary Guidelines for Americans 2015–2020* states: “Support healthy eating patterns for all: Everyone has a role in helping to create and support healthy eating patterns in multiple settings nationwide, from home to school to work to communities.” The guidelines acknowledge the importance of a coordinated, system-wide approach that engages all sectors of influence. Figure 11-1 demonstrates the complex layers of influence that shape a person’s food and physical activity choices. Creating and supporting a healthy eating pattern means that such influential factors have been taken into consideration and that healthy food options should be made available and should be accessible to all individuals. In support of this guideline, the Centers for Disease Control and Prevention (CDC) has proposed

strategies for both providing healthy food and preventing obesity in the United States (see Box 11-1: Innovative Practice for examples).

Encouraging healthy choices in diet, exercise, and weight control is also one of the major themes of *Healthy People 2020* (USDHHS, 2010a) (Figure 11-2). It also includes a new framework to include additional emphasis on health disparities and health inequities, as well as focus on future measures to help healthy choices be the easy choice wherever people live, work, learn, and play.

Because dietary factors contribute substantially to the burden of preventable illness and premature death, *Healthy People 2020* aims at directing American dietary patterns toward current recommendations, especially the *Dietary Guidelines for Americans 2015–2020* (USDHHS & USDA, 2015).

HEALTHY PEOPLE 2020: NUTRITION OBJECTIVES

The nutrition and weight status objectives of *Healthy People 2020* (Box 11-2: *Healthy People 2020*) reflect evidence-based science supporting the health benefits of consuming a nutritious diet and maintaining a healthy body weight. The objectives also emphasize that efforts to change diet and weight should address individual behaviors, as well as policies and environments that support these behaviors, in settings such as schools, work sites, health care organizations, and communities.

The report also contains 12 topics of leading health indicators, with “Nutrition, Physical Activity, and Obesity” being one of them. Although the importance of physical activity will be discussed in Chapter 12, combining physical activity with nutrition and obesity as one topic illustrates how interrelated they are. Details of the leading nutrition health indicators are listed in Box 11-2: *Healthy People 2020*.

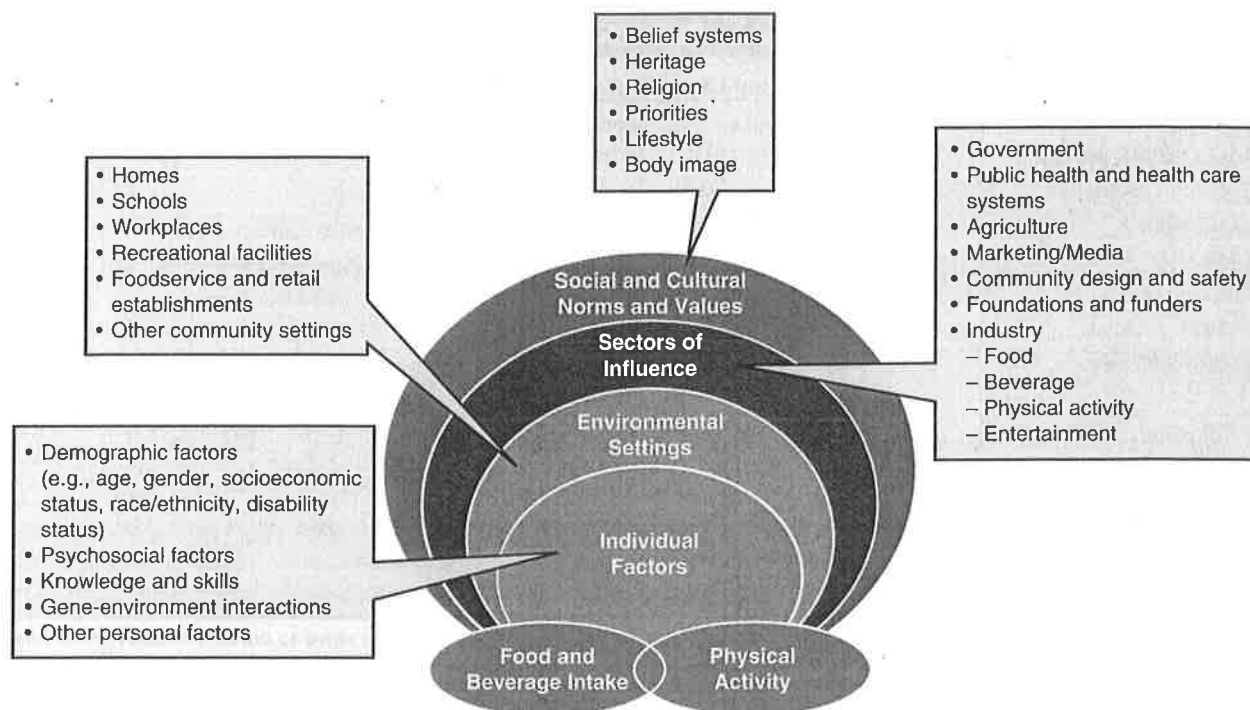


FIGURE 11-1 Social-ecological framework for food and physical activity decisions. (From US Department of Health and Human Services & US Department of Agriculture, [2015]. *Dietary guidelines for Americans 2015–2020* [8th ed.]. <http://health.gov/dietaryguidelines/2015/guidelines/>.)

BOX 11-1 INNOVATIVE PRACTICE

Summary of Recommended Community Strategies and Measurements to Prevent Obesity in the United States Related to Healthy Foods^a

Strategy 1

Communities should increase availability of healthier food and beverage choices in public service venues.

Suggested Measurement

A policy exists to apply nutrition standards that are consistent with the *Dietary Guidelines for Americans* to all food sold (e.g., meal menus and vending machines) within local government facilities in a local jurisdiction or on public school campuses during the school day within the largest school district in a local jurisdiction.

Strategy 2

Communities should increase availability of affordable healthier food and beverage choices in public service venues.

Suggested Measurement

A policy exists to affect the cost of healthier foods and beverages as defined by the Institute of Medicine (Koplan et al., 2005) relative to the cost of less healthy foods and beverages sold within local government facilities in a local jurisdiction or on public school campuses during the school day within the largest school district in a local jurisdiction.

Strategy 3

Communities should increase geographical availability of supermarkets in underserved areas.

Suggested Measurement

The number of full-service grocery stores and supermarkets per 10,000 residents located within the three largest underserved census tracts within a local jurisdiction.

Strategy 4

Communities should provide incentives to food retailers to locate in and/or offer healthier food and beverage choices in underserved areas.

Suggested Measurement

Local government offers at least one incentive to new and/or existing food retailers to offer healthier food and beverage choices in underserved areas.

Strategy 5

Communities should increase availability of mechanisms for purchasing foods from farms.

Suggested Measurement

The total annual number of farmer-days at farmers' markets per 10,000 residents within a local jurisdiction.

Strategy 6

Communities should provide incentives for the production, distribution, and procurement of foods from local farms.

Suggested Measurement

Local government has a policy that encourages the production, distribution, or procurement of food from local farms in the local jurisdiction.

Strategies to Support Healthy Food and Beverage Choices

Strategy 7

Communities should restrict availability of less healthy foods and beverages in public service venues.

BOX 11-1 INNOVATIVE PRACTICE—cont'd

Summary of Recommended Community Strategies and Measurements to Prevent Obesity in the United States Related to Healthy Foods^a

Suggested Measurement

A policy exists that prohibits the sale of less healthy foods and beverages (as defined by the IOM; Koplan et al., 2005) within local government facilities in a local jurisdiction or on public school campuses during the school day within the largest school district in a local jurisdiction.

Strategy 8

Communities should institute smaller portion size options in public service venues.

Suggested Measurement

Local government has a policy to limit the portion size of any entree (including sandwiches and entree salads) by either reducing the standard portion size of entrees or offering smaller portion sizes in addition to standard portion sizes within local government facilities within a local jurisdiction.

Strategy 9

Communities should limit advertisements of less healthy foods and beverages.

Suggested Measurement

A policy exists that limits advertising and promotion of less healthy foods and beverages within local government facilities in a local jurisdiction or on public

school campuses during the school day within the largest school district in a local jurisdiction.

Strategy 10

Communities should discourage consumption of sugar-sweetened beverages.

Suggested Measurement

Licensed child care facilities within the local jurisdiction are required to ban sugar-sweetened beverages, including flavored/sweetened milk, and limit the portion size of 100% juice.

Strategy to Encourage Breastfeeding

Strategy 11

Communities should increase support for breastfeeding.

Suggested Measurement

Local government has a policy requiring local government facilities to provide breastfeeding accommodations for employees that include both time and private space for breastfeeding (or pumping of milk) during working hours.

^aThe entire report includes 24 strategies and measurements to include those related to physical activity. Because physical activity is discussed in Chapter 12, this excerpt includes nutrition advice only. Institute of Medicine (IOM), Koplan, J.P., Liverman, C.T., & Kraak, V.I. (2005). *Preventing childhood obesity: Health in the balance*. Washington, DC: The National Academies Press; Khan, L. K., Sobush, K., Keener, D., Goodman, K., Lowry, A., Kakietek, J., et al. (2009). Recommended community strategies and measurements to prevent obesity in the United States. *MMWR. Recommendations and Reports*, 58(EE-7):1-26.

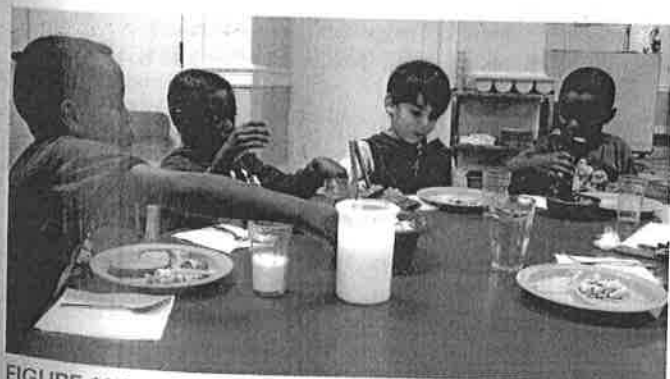


FIGURE 11-2 Children who eat with each other in an appropriate environment often eat more nutritiously and try a wider variety of foods than when eating alone or at home. (From Mahan, L. K., & Raymond, J. L. [2017]. *Krause's food & the nutrition care process* [14th ed.]. St Louis: Elsevier.)

Nutrition-Related Health Status

A variety of diet-related factors exact a heavy toll on the US population as the following key points illustrate (CDC, 2015; Food Research and Action Center [FRAC], 2011; National Prevention Council, 2011). The following statements give a broad-based view of the health status of Americans:

- Less than 18% of adults in each state surveyed consumed the recommended amount of fruit, and less than 14% consumed the recommended amount of vegetables (CDC, 2015).

- From 2007 to 2010, 60% of children consumed fewer cup equivalents of fruit than recommended, and 93% consumed fewer vegetables than recommended.
- Sixty-three percent of adults and 84% of adolescents consume at least one sugar-sweetened drink (e.g., soda, sport drinks, fruit drinks and punches, low-calorie drinks, sweetened tea) each day.
- Most American adults consume more than twice the recommended average daily sodium intake level (for healthy people). Nearly 80% of this sodium originates from packaged, processed, and restaurant foods.
- More than two-thirds of the adult population is overweight or obese. Approximately one in five children are overweight or obese by the time they reach age 6 years, and more than half of obese children become overweight at or before age 2 years.
- Low-income women are more likely than their higher-income counterparts to return to work earlier after childbirth and to be engaged in jobs that make it challenging for them to breastfeed. Babies who are breastfed may be less likely to become obese (USDHHS, 2011).
- Almost 50 million households (15%) experience **food insecurity** at least occasionally during the year, meaning that their access to adequate food is limited by a lack of money and other resources. Individuals and families who experience food insecurity may be more likely to be overweight or obese, potentially because of the relatively lower cost of calorie-dense foods (i.e., foods with a low nutrient density).

 BOX 11-2 HEALTHY PEOPLE 2020
Objectives Related to Nutrition and Food Safety, Healthier Food Access

- Increase the number of states with nutrition standards for foods and beverages provided to preschool children in child care.
- Increase the proportion of schools that offer nutritious foods and beverages outside school meals.
- Increase the number of states that have state-level policies that incentivize food retail outlets to provide foods that are encouraged by the *Dietary Guidelines for Americans*.
- (Developmental objective) Increase the proportion of Americans who have access to a food retail outlet that sells a variety of foods that are encouraged by the *Dietary Guidelines for Americans*.
- Reduce the proportion of adults with high total blood cholesterol levels.
- Reduce the mean total blood cholesterol levels among adults (for adults aged 20 years or older).
- Increase the proportion of adults with pre-hypertension who meet the recommended guidelines (for nutrition, BMI, saturated fat consumption, sodium intake, and moderate alcohol consumption).
- (Developmental objective) Increase the proportion of adults with hypertension who meet the recommended guidelines (for nutrition, BMI, saturated fat consumption, sodium intake, and moderate alcohol consumption).
- (Developmental objective) Increase the proportion of adults with elevated LDL cholesterol levels who have been advised by a health care provider regarding cholesterol-lowering management including lifestyle changes (such as cholesterol-lowering diet, weight control) and, if indicated, medication.
- (Developmental objective) Increase the proportion of adults with elevated LDL cholesterol levels who adhere to the prescribed LDL cholesterol-lowering management lifestyle changes (such as cholesterol-lowering diet, weight control) and, if indicated, medication.
- (Developmental objective) Increase the proportion of adults with CHD or stroke who have their LDL cholesterol level at or below recommended levels.

Health Care and Work Site Settings

- Increase the proportion of primary care physicians who regularly measure the BMI of their care recipients (both adults and children/adolescents).
- Increase the proportion of physician office visits that include counseling or education related to nutrition or weight (by diagnosis such as CVD, diabetes, hyperlipidemia, or obesity).
- (Developmental objective) Increase the proportion of work sites that offer nutrition or weight-management classes or counseling.

Weight Status

- Increase the proportion of adults who are at a healthy weight.
- (Developmental objective) Prevent inappropriate weight gain in youth and adults.

Food Insecurity

- Eliminate very low food security among children.
- Reduce household food insecurity and in so doing reduce hunger.

Food and Nutrient Consumption

- Increase the contribution of fruits to the diets of the population aged 2 years and older.
- (Leading health indicator) Increase the variety of vegetables in and their contribution to the diets of the population aged 2 years or older (increase the contribution of total vegetables, including dark green vegetables, orange vegetables, and legumes).
- Increase the contribution of whole grains in the diets of the population aged 2 years or older.
- Reduce the consumption of calories from solid fats and added sugars in the population aged 2 years or older.
- Reduce the consumption of saturated fat in the population aged 2 years or older.
- Reduce the consumption of sodium in the population aged 2 years or older.
- Increase the consumption of calcium in the population aged 2 years or older.
- Reduce iron deficiency among young children and females of childbearing age (children aged 1–2 years and aged 3–4 years, females aged 12–49 years).
- Reduce iron deficiency among pregnant females.

Objectives for Selected Diseases With Nutrition Components**Heart Disease and Stroke**

Goal: Increase overall cardiovascular health in the US population and reduce CHD and stroke deaths.

Obesity

- (Leading health indicator) Reduce the proportion of adults who are obese (to 30.6% from 34%).
- (Leading health indicator) Reduce the proportion of children and adolescents (age categories 2–5 years, 6–11 years, 12–19 years) who are considered obese (to 14.6% from almost 17%).

Diabetes

- Improve glycemic control among the population with diagnosed diabetes.
- Improve lipid control among people with diagnosed diabetes.
- Increase the proportion of the population with diagnosed diabetes whose blood pressure is under control.
- Increase the proportion of people with diabetes who receive formal diabetes education.
- Increase prevention behaviors in people with pre-diabetes at high risk of diabetes.

Objectives for Food Safety

- Reduce the number of outbreak-associated infections due to Shiga toxin-producing *E. coli* O157, or *Campylobacter*, *Listeria*, or *Salmonella* species associated with food commodity groups (beef, dairy, fruits and nuts, leafy vegetables, and poultry).

Key Food Safety Practices

- Increase the proportion of consumers who follow key food safety practices (clean: wash hands and surfaces often; separate: do not cross-contaminate; cook: cook to proper temperatures; chill: refrigerate promptly).
- (Developmental) Improve food safety practices associated with food-borne illness in food service and retail establishments.

- Each year approximately one in six Americans (48 million people) become ill. Of those who are sick, 128,000 are hospitalized and 3000 die of food-borne diseases. Reducing the number of people affected by food-borne illness by 10% would prevent illness in approximately 5 million Americans each year.

Nutrition Objectives for the United States

As can be seen already, a considerable gap exists between public health recommendations and consumer practices. The overarching goal for nutrition in the second decade of the millennium is that food intake patterns change in the direction of the targeted goals recommended in *Healthy People 2020*, the *Dietary Guidelines for Americans 2015–2020*, and the *MyPlate* food guidance system.

FOOD AND NUTRITION RECOMMENDATIONS

Food and nutrition guidelines are introduced in this chapter, with the intent of motivating the reader to achieve three principal goals. The first goal is to encourage individual interest in the health-promoting power of good nutrition and to promote self-evaluation and comparison of one's own food habits and choices with respect to the dietary recommendations presented here. The second goal is to understand the many systemic factors that have contributed to the current nutrition-related health issues. These problems are so pervasive that many health authorities believe a multisectoral approach, beyond traditional education about healthy food choices, is required. A final goal is to define the kinds and amounts of food that are generally acknowledged as essential for obtaining the necessary energy and nutrients required for health. The following reports provide the foundation for national nutrition recommendations that have been translated into law, policy, programs, and many consumer messages.

- Dietary Reference Intakes: The Essential Guide to Nutrient Requirements* (National Research Council, 2006) and *Dietary Reference Intakes for Calcium and Vitamin D* (National Research Council, 2010)
- Dietary Guidelines for Americans 2015–2020*, eighth edition (USDHHS & USDA, 2015)
- MyPlate food guidance system (USDA, Center for Nutrition Policy and Promotion, 2010) (Figure 11-3)

Dietary Reference Intakes

The original dietary reference intakes (DRIs) were developed by the Institute of Medicine (IOM) of the National Academies of Sciences, Engineering, and Medicine in 1997 to reflect the latest understanding about nutrient requirements based on optimizing health in individuals and groups. They are quantitative estimates of nutrient intakes, which can be used to plan and assess the diets of healthy people in the United States, to prevent disease and deficiencies. The recommended dietary allowances (RDAs) form the basis for the DRIs. The adequate intakes are to be used whenever there is not enough evidence to include a nutrient in the RDAs. See Box 11-3: Dietary Reference Intake Components and Definitions for details on these components and suggested uses.

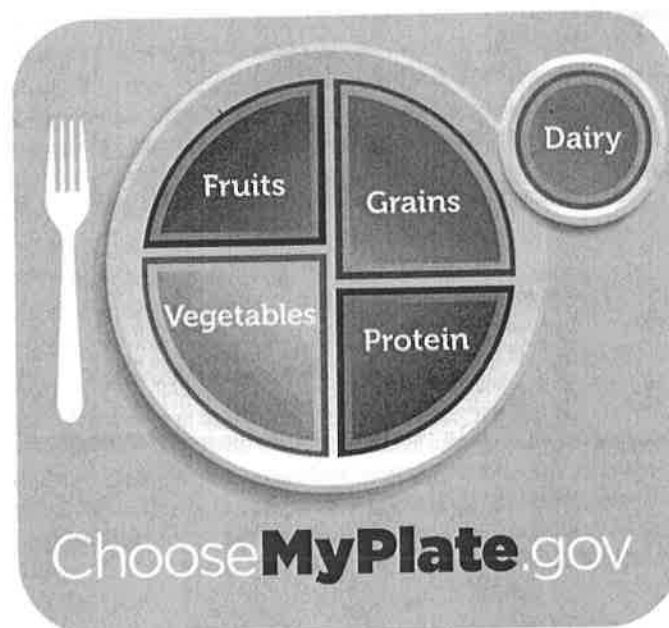


FIGURE 11-3 Learn about healthy eating at <http://www.choosemyplate.gov>. (From US Department of Agriculture, Center for Nutrition Policy and Promotion. [n.d.]. *Choose MyPlate*. <http://www.choosemyplate.gov>.)

It is important to note that in contrast to the routine 5-year review of the *Dietary Guidelines for Americans*, the DRIs are updated only when deemed necessary. In 2008 the US and Canadian governments decided there were enough new studies as well as concern about vitamin D, in particular, to warrant the development of new DRIs for vitamin D and calcium. The latest updates were published in late 2010. The revision of the vitamin D and calcium DRIs since 1997 demonstrates that DRIs continue to be researched and revised as more information and evidence-based studies become available.

There are some controversies over DRIs because there may be limited data relating to genetic diversity in the population or specific groups such as children, pregnant women, and elderly people. However, they are a good starting point based on best available evidence and probability of harm or benefit.

As the DRIs are intended to be applied to healthy people, it is possible that a provider might override the DRI for a specific nutrient on the basis of clinical judgment and recommend more or less for a particular recipient. It is also helpful to remember that whereas DRIs may be used for individuals, ideally, they are guidelines for population groups and apply over time. So, if an individual does not meet the recommendation for a specific nutrient, such as vitamin C, on a certain day, that is not a cause for alarm. It is the trend that matters with respect to food sources as opposed to supplements.

After this discussion of DRIs, the twentieth-century anthropologist Margaret Mead's statement that "People eat food, not nutrition" seems particularly apt. Nutrition recommendations stated in terms of micrograms or milligrams of nutrients are of

BOX 11-3 Dietary Reference Intake Components and Definitions**Estimated Average Requirement**

Estimated average requirement (EAR) is the (median) intake that meets the estimated nutrient needs of half of the individuals in a particular life stage and gender group. It is used as a basis for developing the RDA and is especially useful for evaluating adequacy of nutrient intake of a group (or groups) and for planning how much the group(s) should consume.

Recommended Dietary Allowance

RDA is the average dietary intake level that is sufficient to meet the nutrient requirement of nearly all (97–98%) healthy individuals in a particular life stage and gender group. It is computed with use of the EAR. In the past, the RDA of most nutrients represented the levels needed to prevent deficiency diseases. Now an RDA also includes the goal of preventing chronic diseases (e.g., heart disease or osteoporosis, where applicable). As a variety of IOM DRI publications note, the RDA should not be used to assess or plan nutrient intake for groups but may be useful in some individual applications (Taylor, 2008).

Adequate Intake

An adequate intake (AI) is set to fill the gap (e.g., infants) when there is not enough scientific evidence to determine the RDA. The AI is based on estimates of observed or experimentally determined mean nutrient intake of a group (or groups) of healthy people and assumes that the amount consumed is adequate to promote health. The level is set to meet or exceed the needs of almost all people in a particular life stage and gender group. This is the most controversial component in the DRIs.

Tolerable Upper Intake Level

This is the highest average daily intake that can be safely eaten continuously and still be considered safe for almost all healthy individuals in a specified group. The UL is not intended to be a recommended level of intake. No established benefit exists for individuals to consume nutrients at levels above the RDA or AI. As intake increases above the UL, the potential risk of adverse health effects increases. For most nutrients the UL would include total intakes from any of the following (alone or in combination): food, fortified food, and nutrient supplements. It is important to note that ULs are set only when there is a strong pool of scientific data. In cases where the evidence is limited or inconclusive, a UL will not be established. In that case, eating levels close to the RDA or AI (as applicable) is not advised.

Acceptable Macronutrient Distribution Range

This is the range of intake for a particular energy source (e.g., carbohydrate, fat, and protein) that is associated with reduced risk of chronic disease while providing intakes of essential nutrients for a healthy person within an identified life stage and gender group. An intake outside the acceptable macronutrient distribution range (AMDR) carries the potential of increased risk of chronic diseases and/or insufficient intakes of essential nutrients. For example, the AMDR for carbohydrates for a 19-year-old woman (in the life stage and gender group of female, 19–30 yrs old) is 45% to 65% of calories.

Estimated Energy Requirement

This is the average dietary energy intake predicted to maintain energy balance in a healthy adult of a specific life stage and gender group calculated with a reference weight, height, and level of physical activity that is consistent with good health.

From the American Dietetic Association Evidence Analysis Library and based on Greer, N., Mosser, G., Logan, G., & Wagstrom Halaas, G. (2000). A practical approach to evidence grading. *The Joint Commission Journal on Quality Improvement*, 26, 700–712; Taylor, C. L. (2008). *Framework for DRI development: Components “known” and components “to be explored.”* Background paper. Washington, DC: Institute of Medicine, National Academies of Science, Engineering and Medicine. <http://www.nationalacademies.org/hmd/Activities/Nutrition/SummaryDRIs/~media/Files/Activity%20Files/Nutrition/DRIs/New%20Material/11Bckgrd%20PaperFramework%20for%20DRI%20Devel>; US Department of Agriculture. (2010). Appendix 16: Glossary of terms. In *Dietary guidelines for Americans* (7th ed.). Washington, DC: US Government Printing Office. <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/PolicyDoc.pdf>.

no use unless people are advised as to what types and quantities of foods should be consumed to meet the recommendations. The intent of *Dietary Guidelines for Americans 2015–2020* has been to translate science-based nutrition recommendations into optimal eating guidelines that can be adopted by the public to maximize healthy habits and minimize chronic disease.

The DRIs also form the foundation for US nutrition policy, in the design and implementation of nutrition-related programs, including federal nutrition programs for families, children, and elderly people. These guidelines also provide nutrition education initiatives for the general public of adults and children aged 2 years or older.

Dietary Guidelines for Americans 2015–2020

Key recommendations from the 2015–2020 Dietary Guidelines Advisory Committee (DGAC) include recommendations to:

- Follow a healthy eating pattern across the life span. All food and beverage choices matter. Choose a healthy eating pattern at an appropriate calorie level to help achieve and maintain a healthy body weight, support nutrient adequacy, and reduce the risk of chronic disease.

- Focus on variety, nutrient density, and amount. To meet nutrient needs within calorie limits, choose a variety of nutrient-dense foods across and within all food groups in recommended amounts.
- Limit calories from added sugars and saturated fats and reduce sodium intake. Consume an eating pattern low in added sugars, saturated fats, and sodium. Cut back on foods and beverages higher in these components to amounts that fit within healthy eating patterns.
- Shift to healthier food and beverage choices. Choose nutrient-dense foods and beverages across and within all food groups in place of less healthy choices. Consider cultural and personal preferences to make these shifts easier to accomplish and maintain.
- Support healthy eating patterns for all. Everyone has a role in helping to create and support healthy eating patterns in multiple settings nationwide, from home to school to work to communities.

Other topics addressed in detail include guidance for specific population groups: children and adolescents, women of childbearing age, pregnant and breastfeeding women, and older adults, as well as adults at high risk of chronic disease. A discussion of

how to build healthy eating patterns embraces USDA eating patterns with lacto-ovo vegetarian, vegan, and Dietary Approaches to Stop Hypertension (DASH) variations provided at various calorie levels. (For details, see <http://health.gov/dietaryguidelines/>.) For nursing professionals interested in helping themselves or others balance calories, Chapter 2 is particularly helpful. Just like *Healthy People 2020*, the report includes an emphasis on consumer aspects of food safety.

Representing the best and most current scientific evidence and advice from nutrition experts, these guidelines are intended to reduce the nation's major diet-related health problems such as CHD, certain cancers, diabetes, high blood pressure, obesity, osteoporosis, and stroke (USDA, Food and Nutrition Service [FNS], 2011c).

Nursing professionals play a key role in promoting the *Dietary Guidelines of Americans* as one component of healthful lifestyles. For more information about the articles and reports used to inform the development of the *Dietary Guidelines for Americans*, see the *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans 2015–2020*, and the related USDA's Nutrition Evidence Library website (<http://www.nel.gov/>) (USDA, 2015).

The latest MyPlate food icon revision has retained the on-line tracker tools (now called SuperTracker for adults and BlastOff for kids) as well as Spanish language versions of educational materials.

The USDA unveiled MyPlate in June 2011 in keeping with the 2010 White House Child Obesity Task Force's call for action to provide the US public with easy to understand and useful advice. MyPlate visually reminds consumers what a healthy "plate" looks like using a familiar place setting (see Figure 11-3). It is not meant to stand alone as a teaching tool. Consumers and health professionals are directed to the website (<http://www.choosemyplate.gov>) for details. The new food guidance system puts four of the food groups on the plate (grains, vegetables, fruits, and protein group [which replaced the meat and bean group]) with dairy (including milk and dairy substitutes) on the side.

Although the USDA's MyPlate food guidance system reflects general eating patterns of Americans, it has enough flexibility for different cultural traditions and eating patterns, including vegetarian (see Box 11-4: Diversity Awareness).

Recognizing that in recent years almost 15 million adults and children have found it difficult to obtain enough food to meet their needs, the MyPlate website includes an emphasis on resources for eating on a budget and how to access nutrition assistance programs. The USDA also has resources available in Spanish. The website continues to be updated, so it is worth checking periodically.

DIETARY SUPPLEMENTS AND HERBAL MEDICINES

In recent decades the popularity of supplemental vitamins, minerals, proteins, fiber, and herbs has earned a high profile in the health field. It was the explosion of the use of single-component dietary supplements in the 1980s that helped to spur

the change from the old RDAs to the DRIs. New evidence indicated that perhaps ranges of nutrients could be used that were higher than the old "one size fits all" RDAs. At the same time, there appeared to be a point at which a nutrient could pose more of a risk than an advantage. As a result, tolerable upper limit (UL) guidelines were developed for specific life stages, ages, and gender (Taylor, 2008).

According to the National Institutes of Health (NIH), Office of Dietary Supplements (2012), most US adults take one or more dietary supplements either daily or occasionally. Almost 18% take other products, such as fish oil, echinacea, flaxseed oil, and ginseng (National Center for Complementary and Alternative Medicine, 2010). The 1994 Dietary Supplement Health and Education Act expanded the definition of dietary supplement to include any product intended for ingestion as a supplement to the diet. Today's dietary supplements include vitamins, minerals, herbals and botanicals, amino acids, enzymes, probiotics, and fish oils, as well as powders, energy drinks, and energy bars. People use supplements as if they were drugs. Additionally, they are marketed in the same manner as over-the-counter medications. To distinguish a dietary supplement from an over-the-counter drug, the words *dietary supplement* must appear on the product label. The labels may carry certain types of structure-function claims about certain common conditions associated with aging, pregnancy, menopause, and adolescence that do not relate to disease. These include health maintenance claims ("maintains a healthy circulatory system"), other nondisease claims ("for muscle enhancement" or "helps you relax"), and claims for common, minor symptoms associated with life stages ("for common symptoms of premenstrual syndrome" or "for hot flashes"). Such claims must be followed by the words "This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease." (Food and Drug Administration [FDA], 2008).

Because the FDA is the federal agency that oversees both dietary supplements and drugs, it might be easy to assume the federal regulations for supplements and drugs are similar. This is not the case. Dietary supplements are not regulated by the FDA in the sense that they do not require premarket review or approval by the FDA. Although a supplement manufacturer is responsible for providing evidence that its products are safe and its label claims are truthful and not misleading, it does not have to provide that evidence to the FDA before marketing the product.

Once a dietary supplement is on the market, the FDA monitors information on the product label and package insert to make sure that information about the supplement's content is accurate and that any claims made for the product are truthful and not misleading. If the FDA finds a product to be unsafe or otherwise unfit for human consumption, it may take enforcement action to remove the product from the marketplace or it may work with the manufacturer to voluntarily recall the product. Some supplements have had to be recalled because of proven or potential harmful effects. The reasons for these recalls include microbiological, pesticide, and heavy metal contamination; absence of a dietary ingredient claimed to be in the product; and the presence of more or less than the amount of the dietary ingredient claimed on the label.

 BOX 11-4 DIVERSITY AWARENESS
Food and Culture

The reasons why people eat the ways they do are numerous. Although it is true that without food people cannot survive, food is much more than a tool of survival. Food is also a source of pleasure ("Let's eat out tonight"), a source of comfort ("Right now, I could use some of my mother's chicken soup"), a symbol of hospitality ("Please come to my house for brunch on Sunday"), and an indicator of social status (consider an expensive T-bone steak versus a hamburger). Food also has ritual significance. Drinking champagne to celebrate an important event, the bride and groom saving the top layer of their wedding cake, and people of the Jewish faith sharing challah (braided bread) at their Sabbath (Friday evening) meal are examples.

To a large extent the environment determines what people typically eat. For example, wheat that is plentiful in the heartland of the United States is the principal grain in North America, whereas rice enjoys a similar status in Asian countries. Typical wheat-based staples in the United States and Canada include a slice of wheat bread, a bowl of wheat cereal, wheat crackers, pastries made from wheat flour, and pasta made from wheat. Rice-based foods form the backbone of the Chinese diet.

Every culture has its particular food ways, or activities related to food. Food ways include the activities that surround procuring, distributing, storing, consuming, and disposing of food, all of which define what is fit to eat, or what is edible. Factors that affect everyone's food choices and factors that affect food selections of new arrivals to a community should be examined. It is important to remember, however, that just because a person is from a specific culture does not mean the person follows his or her cultural food patterns. These general guidelines are helpful as a starting point, but do not assume—ask questions to clarify specific eating habits with individuals and families.

Among traditional Chinese people, health and disease are believed to relate to the balance between the forces of yin and yang in the body. Diseases that are caused by yang forces may be treated with yin forces to restore balance. Yin foods include low-calorie-density, low-protein foods, such as fresh fruits and vegetables. Yang foods are high in calories, cooked in oil, and irritating to the mouth, or are red, orange, or yellow. Examples include most meats, chili peppers, tomatoes, garlic, ginger, and alcoholic beverages. The hot-cold theory in Puerto Rico follows the same basic principles as do yin and yang, but the food groupings differ somewhat.

Religious beliefs affect the food choices of millions of people worldwide. Many religions, including Buddhism, Hinduism, Islam, Judaism, and Seventh

Day Adventism, specify the foods that may be eaten and how they should be prepared. The following is a very basic summary of the principal dietary practices of these five major world religions (adapted from Barer-Stein, 1979, and Kittler & Sucher, 2000).

Many Buddhists practice vegetarianism. Foods of plant origin are viewed as the most appropriate for consumption, except pungent foods (garlic, leeks, scallions, chives, and onions), which are believed to generate lust when eaten cooked and to cause rage when eaten raw. For most Buddhists, however, dietary rules such as these are observed on a voluntary basis. What characterizes all Buddhists is the belief that all forms of life share a common link and are thus sacred. Therefore rather than the specific type of food eaten, more important is the attitude of the person receiving the food and the person's sincere gratitude for the lives of the plants and animals contained in the meal that have served to sustain and further enhance the life of the individual.

Many Hindus practice vegetarianism, but those who originate from the cold northern areas of India usually eat meat (except for beef, which is considered sacred and prohibited).

Many Muslims follow Islamic food laws, which include foods that are halal (permitted), haram (prohibited), and questionable (*mashbooh*). Foods believed to be unclean, or haram, are animals that are improperly slaughtered or already-dead animals such as carrion, swine/pork and its by-products (bacon, lard, shortening), carnivorous animals with fangs (dogs, cats, and lions), birds of prey, and land animals without ears (frogs and snakes). Alcohol and intoxicants are also prohibited. Halal-certified products are used.

Conservative Jews follow Judaic food laws, which prohibit the consumption of swine/pork, carrion, carrion eaters (scavengers), shellfish, animals with a cloven (split) hoof and that do not chew their cud (horses), and animals not slaughtered by the appropriate ritual method or kosher (fit). According to Jewish kosher dietary laws, meat (beef, lamb, veal, and poultry), fish, and meat products (eggs) cannot be served at the same meal or be cooked or eaten in the same vessels as dairy products. Kosher-certified products are used.

The dietary practices of Seventh Day Adventists focus on health, so many Seventh Day Adventists practice vegetarianism as the foundation of their dietary standard. They also abstain from alcohol, and many do not drink caffeine-containing beverages.

From Barer-Stein, T. (1979). Multiculturalism and nutrition counseling. *Journal of the Canadian Dietetic Association*, 40(2), 112–116; Kittler, P. G., & Sucher, K. P. (2000). *Cultural foods: Traditions and trends*. Belmont, CA: Wadsworth.

The federal government can take legal action against companies and websites that sell dietary supplements when the companies make false or deceptive statements about their products, if they promote them as treatments or cures for diseases, or if their products are unsafe. In a position paper, the Academy of Nutrition and Dietetics (formerly the American Dietetic Association) states that some people may benefit from supplements but that a diet rich in nutrients should be their major source (Marra & Bovar, 2009). It went further to say that practitioners need to keep up to date on the safety and efficacy of these supplements. Although laws exist to help protect the consumer, the reality is that it is a "buyer beware" environment because of historically low funding and resources for the FDA, along with political pressure and lack of scientific study on the overwhelming majority of supplements available in the United States (Nestle, 2002).

Although the desirable way for the general public to obtain recommended levels of nutrients is by eating a variety of foods,

if people take dietary supplements, they should avoid taking them in excess of the UL of the DRI for those nutrients for their age and gender group to preclude possible adverse effects. An example of this is a recent study of the effects of dietary as well as calcium supplementation in fracture prevention in which it was concluded that there was no such association (Bolland et al., 2015). For other types of supplements, such as herbals or botanicals, caution is also advised. Natural is not always better. For example, the National Center for Complementary and Alternative Medicine cautions against the use of products such as comfrey or kava, which can be toxic to the liver.

Vitamin and Mineral Toxicity

Toxic levels of certain micronutrients can cause a host of health problems. For example, it is important to advise individuals not to overuse the fat-soluble vitamins (vitamins A, D, E, and K). Of particular concern is vitamin A, an excess of which may be

BOX 11-5 QUALITY AND SAFETY SCENARIO

Supplements/Vitamin A

Adele is a 32-year-old married black American woman with no children and a history of one miscarriage. She and her husband have been trying to conceive for the past 4 years and have recently started talking about going to a fertility clinic. Always one to try the "natural way" first, she read that vitamin A is important for normal fetal development and decides to take a multivitamin supplement with 25,000 IU of preformed vitamin A. Adele knows that she can get vitamin A from food, but she also makes an effort to read nutrition labels and choose fortified foods that have 20% or more vitamin A content. She comes into the physician's office for a regular routine visit. It is common knowledge that she and her husband are trying to have a baby.

Reflective Questions

- Why is it important to discuss the use and type of supplements (and potentially fortified food use) during preconception/pregnancy?
- What is the vitamin A DRI recommendation for a woman of her age?
- How can learning about simple changes in her eating habits/supplement use affect her risk of a spontaneous abortion or a birth defect in the event of pregnancy?
- What would your next step be in this situation?

Note: One retinol activity equivalent = 1 mcg of all-*trans*-retinol = 3.33 IU from retinol = 2 mcg of supplemental all-*trans*- β -carotene = 12 mcg of dietary all-*trans*- β -carotene = 24 mcg of other dietary provitamin A carotenoids. DRI, Dietary reference intake.

teratogenic during pregnancy or may increase the risk of lung cancer for current or former smokers (American Dietetic Association, 2009). On the other hand, water-soluble vitamins such as vitamin C and the B-complex vitamins may pose less danger because the body is able to excrete them through the urine.

Nutrient imbalances and toxicities are rarely likely to occur when nutrients are derived from foods in a normal diet. Most nutrient toxicities occur through supplementation, and in some cases with a combination of supplementation and fortification of foods. The estimated toxic doses for daily oral consumption of vitamins and minerals by adults are as low as five times the recommended intake for selenium, and as high as 25 to 50 times or more the recommended intakes for folic acid and vitamins C and E. The toxicities of high doses of nutrients such as vitamin A, vitamin B6, vitamin D, niacin, iron, and selenium are well established. Iron supplements intended for other household members are the most common cause of pediatric poisoning deaths in the United States (National Library of Medicine, 2011).

Large doses of vitamin A may be teratogenic. Because of this risk, supplementation with preformed vitamin A should be avoided during the first trimester of pregnancy unless there is evidence of deficiency (see Box 11-5: Quality and Safety Scenario). Excess preformed vitamin A supplements (more than 10,000 international units [IU]) during the first trimester of pregnancy has been linked to birth defects of the eyes, lungs, skull, and heart (Office of Dietary Supplements, 2012). Such a risk in early pregnancy raises the need for caution about general vitamin and mineral supplement use by women of childbearing age.

Besides problems with direct toxicity of some individual nutrients, there may be problems related to nutrient imbalances or adverse interactions with prescribed medication. Often, high

doses of a single nutrient may reflect interactions that result in a relative deficiency of another nutrient (American Dietetic Association, 2009). Some examples follow:

- High doses of vitamin E can interfere with vitamin K action and enhance the effect of warfarin as one of the anticoagulant drugs. Examples such as this are one of the reasons that health care providers may ask about supplement use before surgery and recommend discontinuation of use of certain supplements for 1 week before and 1 week after surgery. Large amounts of calcium inhibit absorption of iron and possibly other trace elements.
- Folic acid can mask hematological signs of vitamin B12 deficiency, which, if untreated, can result in irreversible neurological damage. Folic acid can also interact adversely with anticonvulsant medications.
- Zinc supplementation can reduce copper levels, impair immune responses, and decrease levels of high-density lipoprotein (HDL) cholesterol ("good" cholesterol).

Nursing professionals can help people who suspect an adverse supplement effect by reporting the event to the FDA, or by encouraging the individual to file a report. This should be done as soon as possible when there is a suspected problem. Information on how to do this is available at <http://www.fda.gov/food/dietarysupplements/reportadverseevent/>. Another avenue is to alert the product's manufacturer or distributor to any serious side effects through the address or phone number listed on the supplement's label. By law, dietary supplement firms are required to forward reports they receive about serious adverse effects to the FDA within 15 days.

Circumstances When Nutrient Supplementation Is Indicated

Nutrient supplements or fortified foods, or sometimes a combination of both, are sometimes necessary for specific populations to obtain desirable amounts of particular nutrients (National Research Council, 2010; USDHHS & USDA, 2015). Some examples follow:

- Folic acid (400 mcg) from fortified enriched grains or supplements in addition to folate-rich foods for women who could become pregnant to help prevent neural tube defects.
- Iron supplements during pregnancy when indicated in laboratory tests.
- Calcium and vitamin D supplements in older postmenopausal women to reduce their risk of osteoporosis (levels should not exceed the UL of 2000 mg for calcium or 100 mcg for vitamin D through either supplements or a combination of foods and supplements).
- Vitamin D for those who do not meet the recommended DRI intake (without exceeding the DRI UL of 4000 IU or 100 mcg by a combination of food, supplement, and fortified food).
- Vitamin B12 through food fortified with the crystalline form or B12 supplements for individuals older than 50 years (who may often have a reduced ability to absorb naturally occurring vitamin B12). In addition, vegans should ensure they have adequate intake of vitamin B12 through fortified foods or supplements.

People can get their nutritional requirements from foods and, when necessary, from supplements. However, the amounts needed

are generalized to population studies (e.g., amounts for all women during pregnancy). These requirements do not account for individual genetic variations. In the future, it may be possible for specific nutrients to be prescribed to individuals on the basis of genomic maps. This new and exciting study of nutrigenomics explores the effects of nutrients on gene expression. However, when it comes to nutrients in foods and their effects on gene expression, the science is not ready to create diets specific to an individual's genome makeup. As this is an issue of ethics medicine as well as nutrition, it is a field that will move with caution (Pavlidis et al., 2015).

FOOD SAFETY

Americans spend more than \$1 trillion on food each year, with nearly 50% of food consumption occurring outside the home (Johnson, 2011). The combined efforts of the food industry and the regulatory agencies are often credited with making the US food supply among the safest in the world. Nonetheless, the CDC reports that each year an estimated one in six Americans—a total of 48 million people—become sick from food-borne illnesses caused by contamination by any of a number of microbial pathogens. Of these, an estimated 128,000 people require hospitalization and 3000 people die (CDC, 2011a). Food-borne illnesses are estimated to cost the United States \$77.7 billion annually, not including costs to the food industry or public health agencies.

Attention to food-borne illnesses is becoming increasingly important with the globalization of the world's food supply. New disease-causing organisms have emerged, and food imports from countries without the same safety standards as the United States are on the rise. Furthermore, more consumers are demanding fresh produce and more seafood to be available throughout the year as well as accessibility to less-processed foods, such as raw milk and fresh juices that are not cooked or pasteurized to kill bacteria. Consumers may also ignore warnings about unsafe food habits because of preferences for foods such as raw oysters, rare hamburgers, fresh juices, unpasteurized cheese, and runny egg yolks, which all carry higher risks of contamination.

To protect the public from numerous sources of food contamination (physical, chemical, biological), private industry and numerous federal, state, and local agencies share responsibilities for regulating the safety of the US food supply. On the food industry side, one example of initiatives is food processors that are working on programs to better trace products through the supply chain and monitor temperatures in trucks from remote locations. In late 2010, Congress passed sweeping food safety legislation called the Food Safety Modernization Act (FSMA), which gives the FDA new powers to police food safety and focus its efforts on preventing food contamination. Subject to adequate funding, the FSMA allows the FDA to increase its inspection of imported food, set safety standards for fresh produce, force companies to recall tainted products, and require companies to keep better production records.

When the safeguards built into this system fail, however, consumers themselves must serve as the final and sometimes most important guardian against unsafe food. Therefore it is

essential to be informed and educated about the potential dangers of food-borne illness and ways to avoid contaminated food products.

Causes of Food-Borne Illness

A food-borne illness is classified according to the source of its contamination (the unintended presence of harmful substances or microorganisms). Food contaminants may be categorized as biological, chemical, or physical. Biological contaminants include bacteria, viruses, parasites, and fungi (yeasts and molds). Chemical contamination refers to the presence of pesticides, kitchen-cleaning supplies, and toxic chemicals in food that have been leached from worn metal cookware and equipment. Physical contamination includes dirt, glass chips, crockery, wood, splinters, stones, hair, jewelry, and metal shavings from dull can openers. Another unintended physical contaminant may be an unintended allergen added to a food product that typically does not include that ingredient (such as peanuts) during food processing in the same location.

Examples of Common Food-Borne Pathogens

The safety of the US food supply is so important that there are specific objectives tied to the monitoring of common pathogens in *Healthy People 2020*. These include outbreak-associated infections attributable to Shiga toxin-producing *Escherichia coli* O157, or *Campylobacter*, *Listeria*, or *Salmonella* species associated with food commodity groups (e.g., beef, dairy, fruits and nuts, leafy vegetables, and poultry). Two common types are discussed next.

Salmonellosis

The most frequently reported cause of food-borne illness is from *Salmonella* bacteria. Each year in the United States, approximately 40,000 cases of salmonellosis are reported, with 400 deaths from acute salmonellosis (CDC, 2010). The actual number of infections may be closer to 1.4 million because milder cases are often not diagnosed or reported. Although the *Salmonella* family includes more than 2300 serotypes of the bacterium, the most common in the United States are *Salmonella enteritidis* and *Salmonella typhimurium*.

The typical way humans are exposed to salmonellosis is by consuming foods contaminated with animal feces. Foods of animal origin such as beef, poultry, milk, and eggs are often the source of infection. However, *all* foods, including seafood from polluted water and vegetables, may become contaminated. Contamination may also occur from unsanitary handling of foods and utensils by infected food handlers and contact with the feces of some pets, especially those with diarrhea. Symptoms of salmonellosis (CDC, 2004) include abdominal cramping, mild to severe diarrhea, nausea, vomiting, and fever within 8 to 72 hours after infection. Symptoms may resolve within 4 to 7 days without treatment; however, infections can become life threatening for people with weakened immune systems such as infants with an immature immune system, young children, pregnant women, older adults, and people with autoimmune disorders or those being treated for cancer. Antibiotics are usually not necessary unless the infection spreads from the intestines. To prevent salmonellosis, avoid uncooked egg dishes, undercooked meat,

shellfish, and unpasteurized milk and juice. Adherence to sanitary regulations, as well as proper food handling, is necessary to control salmonellosis outbreaks.

***Escherichia coli* O157:H7 Infection**

Theodor Escherichia, a German pediatrician, first discovered the *E. coli* bacterium in the human colon in 1885. A particularly virulent strain of *E. coli*, known as *E. coli* O157:H7, was first identified in 1982 as a food-borne pathogen during an investigation of an outbreak of severe bloody diarrhea attributable to ingestion of contaminated hamburgers. As a leading cause of food-borne illness, *E. coli* O157:H7 can produce a powerful toxin causing severe illness and damage to the intestinal lining (CDC, 2011a). The illness is characterized by severe abdominal cramping, watery to bloody diarrhea, dehydration, nausea, and vomiting with or without low-grade fever. Hemorrhagic colitis is usually self-limited and lasts for an average of 8 days. Most *E. coli* O157:H7 infections (CDC, 2004) are food-borne and associated with undercooked or raw ground beef, unpasteurized fruit juices and milk, alfalfa sprouts, lettuce, spinach, and fruits. Moreover, outbreaks can be caused by secondary person-to-person contamination in homes, day care centers, nursing homes, and hospitals. Another mode of transmission of *E. coli* O157:H7 is by hand-to-mouth contact with animals or contaminated surfaces at petting zoos and agricultural fairs. Although all people are included in *E. coli* O157:H7 target populations, children and older adults are more susceptible. In cases confirmed in children, infection may develop into hemolytic uremic syndrome, leading to permanent loss of kidney function.

Food Safety Practices

The few examples already cited demonstrate how serious food-borne illness can be. Individuals in their own homes can reduce contaminants and keep food safe to eat by following safe food handling practices. Four basic food safety principles work together to reduce the risk of food-borne illness—clean, separate, cook, and chill. These four principles are the cornerstones of Fight BAC!, a national food safety education campaign (<http://www.fightbac.org>). *Healthy People 2020* included a key food safety objective designed to increase the proportion of consumers following them. As you can see from the following results of the 2006 national Food Safety Survey, there is significant room for improvement (see *Healthy People 2020*, FS-5.1–FS-5.4 for details).

- Clean: Wash hands, utensils, and cutting boards before and after contact with raw meat, poultry, seafood, and eggs (33% of the surveyed population did not do this) (USDA Center for Nutrition Policy and Promotion 2012).
- Wash all parts of the hands thoroughly with running warm water with soap and friction for approximately 20 to 30 seconds. Teach children to sing the *Happy Birthday* song twice. If no water is available, use alcohol-based (≥60%) hand sanitizers.
- Clean all surfaces with warm, soapy water often (including all appliances, knobs, and handles) and clean up spills immediately. A solution of one tablespoon of unscented, liquid chlorine bleach per gallon of water can be used to sanitize surfaces.

- At least once a week, discard refrigerated foods that should no longer be eaten. Cooked leftovers should be discarded after 4 days; raw poultry and ground meats should be discarded after 1 to 2 days.
- Separate: Do not cross-contaminate. Keep raw meat and poultry separated from foods that will not be cooked while shopping, preparing, or storing foods (11% of the surveyed population did not do this).
 - Rinse fresh fruits and vegetables thoroughly with running water before eating, cutting, or cooking them (unless they are prepackaged). Scrub firm surfaces (e.g., cantaloupes and cucumbers) with a produce brush. Commercial cleaners are unnecessary.
- Cook: Cook food to the proper temperatures and use a food thermometer. The appearance or smell of food does not always indicate its safety.
 - Seafood, meat, poultry, and egg dishes should be cooked to the recommended safe minimum internal temperature to destroy harmful microbes. Eggs should be cooked thoroughly, and children should not “lick” the bowls of cake mixes using fresh eggs.
 - When food is being cooked in a microwave oven, foods should be stirred, rotated, and/or flipped periodically to help them cook evenly.
- Chill: Refrigerate food promptly within 2 hours, or in 1 hour for environments that are 90°F or hotter. This includes groceries, food being prepared, and leftovers and takeout foods. Keep the refrigerator at 40°F or less and the freezer at 0°F or less and monitor temperatures with a thermometer.
 - Keep hot food hot (140°F or higher) and cold foods cold (32–40°F). Between these temperatures is the danger zone in which harmful bacteria can grow rapidly, even exponentially.
 - Thaw food properly to avoid any bad bacteria: in the refrigerator; in cold water, such as in a leak-proof bag, changing the water for cold water every 30 minutes; or in the microwave oven, never on the countertop.

These guidelines also apply to carryout meals, restaurant leftovers, and home-packed meals to go. If in doubt, discard it.

Making a food safe after it has been handled improperly may not always be possible. For example, certain bacteria found in food that has been left at room temperature too long may produce a heat-resistant toxin that cannot be destroyed by cooking. Therefore the principal point is to be careful in preparing food, including cooking foods to the right temperatures, keeping track of the time food is exposed to certain temperatures, and being vigilant when eating out. If there is any doubt about the safety of the food, it is better not to eat it.

Without exception, everyone should exercise their best judgment and care when eating out, when handling their own food, or when handling the food of others. Prevention through education is the key to promoting healthy lives that are unscathed by the potentially severe and life-threatening effects of food-borne illness. On a more positive note, normal healthy adults with healthy immune systems are able to withstand the ill effects of most contaminants from the environment and from food.

FOOD, NUTRITION, AND POVERTY

As already noted in the discussion of *Healthy People 2020*, a current focus is on attempting to reduce health disparities and health inequities, as well as a focus on future preventive measures. This can be done by healthy food choices being made available wherever people live, work, learn, and play.

Healthy People 2020 goal: Promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights.

- Eliminate very low food security among children (from 1.3% of households with children in 2008 to 0.2% in 2020).
- Reduce household food insecurity (from 14.6% in 2008 to 6% in 2020) and in doing so reduce hunger.

Poverty and Income Distribution

For most people in the United States, income has risen over time, providing more options for personal consumption expenditures, including those on food. However, growth in income has not increased equally for all households. Moreover, in recent economic times, people who normally have never needed help have flooded food banks and other federal and community resources (USA Today Supplement, 2010).

According to the US Census Bureau, in 2010 alone, 15.1% of the US population (or 46.2 million people) lived below the poverty level set by the government to determine eligibility for various types of government programs. This was the largest number in 52 years, since the beginning of poverty surveys. Of those people, approximately one-third (35.5%) were children, followed by those with disabilities (28%) and older Americans (25%). Regionally, poverty is concentrated in the South, followed by the West, Midwest, and Northeast. It also appears higher in cities than in rural areas (Nord et al., 2010; US Census Bureau, 2011).

In 2010, the groups with particularly high poverty rates included Hispanics and black Americans, with statistically equivalent poverty rates of 20.6% and 24.3% respectively. Food assistance programs, as discussed next, are one mechanism to provide a limited safety net to keep people from falling further into poverty (Nord et al., 2010).

Food Assistance for Low-Income Individuals

Most Americans are food secure, having enough money and resources to obtain adequate food for active, healthy lives. However, for the minority who are living at or below the national poverty line, obtaining a nutritious diet without assistance can be a challenge. Low-income families spend a significantly higher percentage of their annual income on food than other families, often with less access to healthier options such as fresh fruits and vegetables (FRAC, 2016). A variety of federal, state, and local governments and private charitable organizations work to reduce hunger in the United States. The primary responsibility at the federal level falls to the USDA, which administers 15 nutrition assistance programs through the FNS using a combination of federal funding and farm commodities. Programs target the diverse needs of different subgroups of low-income people by providing supplemental assistance through a variety of forms and settings. In 2011, federally funded outlays for nutrition

assistance programs resulted in amounts as detailed in the following list (USDA, FNS, 2011a):

- Supplemental Nutrition Assistance Program (SNAP)—formerly known as Food Stamps: \$71 billion (Rosenbaum, 2012)
- Child Nutrition Program (includes the National School Breakfast Program [NSBP], the National School Lunch Program [NSLP], the Special Milk Program, the Child and Adult Care Food Program, and the Summer Food Service Program): almost \$19.4 billion
- Special Supplemental Nutrition Program for Women, Infants, and Children (WIC): more than \$7 billion
- Commodity supplemental food programs (Food Distribution Program on Native American Reservations, Nutrition Services Incentive Program, the Emergency Food Assistance Program, and farmers' market programs): almost \$153 million

One in six people in the United States receive federally funded food assistance at some point every year. The SNAP, NSLP, NSBP, WIC, and Older American Act programs are the main programs that provide food and nutrition assistance. With tightening of federal and state budgets, these programs are continually targeted for significant funding cuts. Table 11-2 provides information on the various programs, along with their website addresses. Income eligibility requirements are based on household income and will change annually. Instructions for applying to the programs may be found directly on the respective websites.

Supplemental Nutrition Assistance Program

SNAP supplements the food-buying power of eligible low-income households and is the foundation of the nation's nutrition safety net. Benefits are provided through an electronic benefit transfer (EBT) card that participants use to purchase food at authorized stores. It is designed to help low-income families and individuals purchase nutritionally adequate foods. Households can use their EBT card to purchase any food or food product for home consumption, as well as seeds and plants for use in home gardens. Restaurants can be authorized to accept EBT cards from qualified homeless, older, or disabled people in exchange for low-cost meals. Items that recipients cannot buy with EBT cards include alcoholic beverages, tobacco, hot ready-to-eat foods, lunch-counter items, and foods to be eaten in the store, vitamins, medicines, and pet foods.

Although there is no requirement that the EBT card be used to purchase nutrient-dense food, the goal of the SNAP nutrition education program is to increase the likelihood that recipients will make healthy food choices within their limited food budget. SNAP uses multiple strategies to facilitate healthy food choices and active lifestyles. These include providing nutrition education programs; encouraging more farmers' markets, small urban markets, and bodegas to participate in the program; and offering a demonstration project to examine the impact of incentives on participant purchases of fruits and vegetables.

The program is administered nationally by the FNS and locally by state and welfare agencies in all 50 states, the District of Columbia, Guam, and the US Virgin Islands. Eligibility is based on financial factors such as income and expenses available to the household, as well as 5 years of legal immigrant status, if applicable. SNAP requires most able-bodied adults aged between

TABLE 11-2 Select Federal Nutrition Assistance Programs

Program	Mission	To Find Out More
Child and Adult Care Food Program (CACFP)	Provide aid to child and adult care institutions and family or group day care homes for the provision of nutritious foods that contribute to the wellness, healthy growth, and development of young children, and to the health and wellness of older adults and chronically impaired disabled individuals	http://www.fns.usda.gov/cacfp/child-and-adult-care-food-program
Child Nutrition Program	Provide healthy food to children from low-income families through a variety of programs, including the National School Lunch Program, the National School Breakfast Program, the Child and Adult Care Food Program, the Summer Food Service Program, the Fresh Fruit and Vegetable Program, and the Special Milk Program	http://www.fns.usda.gov/school-meals/child-nutrition-programs
Supplemental Nutrition Assistance Program (SNAP)	Offer nutrition assistance to low-income individuals and families and provide economic benefits to communities	http://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program-snap
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	Provide federal grants to states for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and nonbreastfeeding postpartum women, and to infants and children up to age 5 years who are found to be at nutritional risk	http://www.fns.usda.gov/wic/women-infants-and-children-wic
Food distribution programs	To strengthen the nation's nutrition safety net by providing food and nutrition assistance to schoolchildren and families; and support American agriculture by distributing high-quality, 100% American-grown USDA foods. The programs include the following: the Commodity Supplemental Food Program, the Food Distribution Program on Indian Reservations, The Emergency Food Assistance Program, the Nutrition Services Incentive Program, the DoD Fresh Fruit & Vegetable Program, and the Child Nutrition USDA Foods Program	http://www.fns.usda.gov/fdd/food-distribution-programs

DoD, Department of Defense; USDA, US Department of Agriculture.

Modified from US Department of Agriculture, Food and Nutrition Service. (2016). *Programs and services*. Washington, DC. <http://www.fns.usda.gov/programs-and-services>.

16 and 60 years (with few exceptions) to register for work, to take part in employment/training programs referred by the SNAP office, and to accept or continue in suitable employment. Households may own certain limited resources. In addition to income, the EBT allotment is also based on family size. In contrast to public perception, less than 10% of households received cash welfare in 2009, and the latest statistics from 2010 showed 40% of households had at least one wage earner. In addition, according to FNS data, most households advance from SNAP in less than 1 year (Rosenbaum, 2012). In 2011, 92% of SNAP funding went directly to 40.3 million people: 48% children, 44% adults, and 8% adult aged 60 years or older. The average monthly benefit per person was approximately \$134 and almost \$290 per household (USDA, FNS, 2011b).

With passage of the 2012 Farm Bill, approximately \$4.5 billion will be cut from SNAP, with an estimated loss of 500,000 possible recipients and almost \$90 less in benefits per household.

Child Nutrition Program

Collectively called the "Child Nutrition Program," these programs provide cash reimbursement and commodity support for meals served to children in schools, child care facilities, and summer settings. They include the NSLP, the NSBP, the Child and Adult Care Food Program, the Summer Food Service Program, and the Special Milk Program. The general purpose of these programs is to help ensure the health and well-being of all the nation's children. The two biggest and most well-known programs are described next.

National school lunch program. The federally funded NSLP is administered by the FNS. On the state level, the NSLP is usually administered by the US Department of Education, which contracts with local public, nonprofit private, and residential child care centers and schools to provide balanced, low-cost or free lunches. The NSLP reaches approximately 31.6 million children each school day (FRAC, 2016), including the following:

- Children from families with incomes at or below 130% of the federal poverty level guidelines are eligible for free school meals.
- Children from families with incomes above 130% to 185% of the poverty level are eligible for reduced-price school meals.
- Children from families with incomes more than 185% of the poverty level are eligible for full-price school meals.

Schools that choose to take part in the lunch program must implement wellness policies that promote healthy eating, address obesity, and encourage physical activity. Schools are provided with cash subsidies and approved agricultural commodities from the USDA as a supplement. Up to January 2012, free, reduced-price, or full-price lunches had to meet the following federal minimum pattern requirements:

- Must provide one-third of the recommended nutrient intake of 1989 RDAs
- To the extent possible, be consistent with the *Dietary Guidelines for Americans* recommendations for reducing sugar, salt, and fat intake

Under the Healthy Hunger-Free Kids Act of 2010, the USDA gained authority to set policy and nutrition criteria for all child

nutrition standards, including the NSLP. New meal standards were published in 2012 based on the 2009 IOM recommendations to move subsidized meals into line with the *Dietary Guidelines for Americans* and the DRIs (Stallings et al., 2010; USDA, FNS, 2011b). The new rules stipulate a doubling of previous amounts of fruits and vegetables served in schools, set limits on the levels of trans fats and salt, increase the amount of whole grains served, make 1% and fat-free milk the norm, and establish suitable ranges for daily calorie intake. They also require free drinkable water in food service areas and increase subsidies to schools following the new guidelines. Even with changes, the NSLP budget projections are less than the current budget by eliminating the meat/meat substitute requirement at breakfast, allowing a phase-in period for fruits and vegetables, honoring requests to take smaller portions, and discontinuing price supports for meals, including separately priced items.

National school breakfast program. The NSBP was designed to make it possible for all schoolchildren to receive a nutritious breakfast every day. Skipping breakfast can adversely affect children's performance potential. The NSBP provides assistance to states to initiate, maintain, or expand nonprofit breakfast programs in eligible schools and residential child care institutions. Any child attending a participating school may receive a free, reduced-price, or full-price breakfast based on the same income criteria used by the NSLP. In the 2010 to 2011 school year, 11.7 million children in almost 88,000 schools were fed every day (FRAC, 2016).

Special Supplemental Nutrition Program for Women, Infants, and Children

WIC supplies free nutritious supplemental food, nutrition counseling, breastfeeding support, and health and social service referrals to eligible low-income pregnant or postpartum women and to children younger than 5 years old who are at nutritional risk. Congress funds WIC every year for a specific amount as a federal grant program to be administered by FNS and 90 "state" agencies (including 50 states, 34 tribes, the District of Columbia, and 5 US territories). Services are offered in a wide variety of settings: county health departments, hospitals, mobile clinics, community centers, schools, public housing sites, Indian reservations, migrant health centers and camps, and Indian Health Service facilities.

Eligibility is based on the following factors. Income must be 185% or less of the US poverty income guidelines (approximately \$41,000 for a family of four in 2009), and participants must meet one of two major types of nutritional risk:

- Medically based risks, such as anemia, underweight, maternal age, history of pregnancy complications, or poor pregnancy outcome
- Diet-based risks, such as inadequate dietary pattern as determined by 24-hour recall, food frequency questionnaire, or diet history

Those who qualify usually receive monthly checks or vouchers to buy foods designed to augment their diet with specific nutrients. In addition, a growing number of state agencies issue an electronic benefit card (like a debit card), and some distribute WIC foods through warehouses or deliver WIC foods to recipients' homes.

The foods differ depending on an individual's specific food package designation but can include iron-fortified infant cereal, iron-fortified adult cereal, fruit or vegetable juice rich in vitamin C, eggs, milk, cheese, and peanut butter or dried beans. WIC recognizes and promotes breastfeeding as the optimal source of nutrition for infants. For women who do not breastfeed, WIC provides iron-fortified infant formula. Special infant formulas and medical foods may be provided when prescribed by a physician for a specified medical condition. In 2009 new foods were added and specific food packages were reformulated to improve variety, to increase flexibility for diverse cultures, and for alignment with the *Dietary Guidelines for Americans* and American Academy of Pediatrics infant feeding practice guidelines. These foods include soy-based beverages, tofu, fruits and vegetables, baby foods, whole-wheat bread, and other whole-grain options.

Each WIC participant receives vouchers with maximum monthly allowable amounts of particular components specially designed for the following categories: fully breastfeeding mother; pregnant or partially breastfeeding mother; postpartum, fully formula feeding mother; fully breastfed baby; partially breastfed baby; fully formula-fed baby; and children 1 to 5 years old (California WIC Association, 2009).

Of the 9.17 million people who received WIC benefits each month in 2011, approximately 4.86 million were children, 2.17 million were infants, and 2.14 million were women (USDA, FNS, 2011a). Financial constraints preclude WIC from serving all eligible people; therefore a system of priorities has been established for filling program openings. After a local WIC agency has reached its maximum caseload, vacancies are filled in the order of the following priority levels:

- Pregnant women, breastfeeding women, and infants determined to be at nutritional risk of serious medical problems
- Infants up to 6 months of age whose mothers participate in WIC or are eligible to participate and have serious medical problems
- Children up to age 5 years at nutritional risk of serious medical problems
- Pregnant or breastfeeding women and infants who are at nutritional risk of dietary problems
- Children up to age 5 years at nutritional risk of dietary problems
- Nonbreastfeeding postpartum women with any nutritional risk
- Individuals at nutritional risk only because they are homeless or migrants and current participants who would likely continue to have medical or dietary problems without WIC assistance

WIC funding may be inadequate in the future to fund the increased numbers of expected participants (National WIC Association, 2014). For state agencies that apply for a grant, the WIC Farmers' Market Nutrition Program (or WIC FMNP) gives additional coupons to people to use to purchase fresh fruits and vegetables at participating farmers' markets. The WIC FMNP has two goals: to provide fresh, nutritious, unprepared, locally grown fruits and vegetables from farmers' markets to WIC participants, and to expand consumers' awareness and use of farmers' markets.

The overall statistics on WIC demonstrate it is effective in improving the health of its participants. Medicaid costs for women who participate in the program during pregnancy and their infants are lower than those for women who do not participate. WIC participation is also linked to longer gestation periods, higher birth weights, and lower infant mortality rates (USDA, FNS, Office of Research and Analysis, 2012).

Food and Nutrition Programs for Older Adults

At the other end of the life cycle, a significant number of older people face special obstacles to obtaining an optimal diet. Of particular concern are adults older than 75 years who are frail, alone, or restricted to a limited budget. Life changes such as the loss of a spouse/significant other; sensory changes in taste or smell; physical inability to obtain food; and decreasing calorie needs can make acquisition of an adequate diet challenging.

A variety of nutrition assistance programs are available to this population. They include SNAP, the Senior Farmer's Market Nutrition Program, the Child and Adult Care Food Program, The Emergency Food Assistance Program, and the Commodity Supplemental Food Program. However, the programs that most people may be familiar with are some of those provided under the Older Americans Act, collectively called the Elderly Nutrition Services Program, which are managed by the Administration on Aging (AoA) through the USDHHS. They are designed to help older adults access nutritionally sound meals, obtain nutritional services and other health-promotion services (including nutrition screening and counseling), and reduce the social isolation that may occur in old age. Priority is given to older people with the greatest social and economic need: low income, minorities, those with limited English proficiency, rural location, and frail seniors at risk of institutionalization (USDHHS, AoA, 2009).

The older adults nutrition services program. This program includes the Congregate Nutrition Services Program (CNSP), the Home-Delivered Nutrition Services Program (i.e., "Meals on Wheels"); and the Nutrition Services Incentive Program (NSIP), which gives states, territories, and Indian tribal organizations (ITOs) the ability to purchase food or to cover the cost of commodities from the USDA for the CNSP and the Home-Delivered Nutrition Services Program. The AoA provides funds to states, territories, and ITOs, and it awards money to Area Agencies on Aging for coordination with area food sites such as senior centers, faith-based sites, community centers, adult day care centers, and schools. For NSIP, the share of the population who received meals under CNSP or Meals on Wheels in the preceding year determines money or commodity allocation.

By law, age is the only factor used in determining eligibility. People aged 60 years or older and their spouse or caretaker, regardless of age, are eligible for benefits. ITOs may select an age younger than 60 years for the definition of an older person for their tribes because of a shorter life expectancy and higher incidence of chronic illnesses. Additionally, disabled people who live in elder care housing facilities, people who accompany older participants to congregate feeding sites, and volunteers who assist in the meal service may also receive meals. For those in the Home-Delivered Nutrition Services Program, spouses of any

age and disabled persons may also participate as long as they live with the homebound elder.

Additionally, by law, there is no income requirement for meals. Each recipient may contribute as much as desired toward the cost of the meal, but meals are free to people who cannot make any contribution. As of 2011, federal money contributed only approximately 42% of the money for these programs; 15% came from state funding, with the balance coming from local, private, or participant contribution (Johnson, 2011). In recent years, many states have shifted allowable money from congregate feeding sites into Meals on Wheels or other nutrition/health-promotion programs to help keep older adults in their communities. Even so, long waiting lists for Meals on Wheels are not uncommon and volunteers to help deliver meals to stretch limited dollars are always needed. This situation is not likely to improve with continuing federal and state budget constraints.

In 2010, 92.5 million meals, or approximately 40% of total meals, were served in congregate settings to just less than 1.69 million meal participants. A 2009 report by the AoA showed 57% of those people were aged 75 years or older, 48% lived alone, 13% had annual incomes of \$10,000 or less, and 57% stated the meal provided half or more of their daily food intake. Participants also said they saw friends more often because of meals (87%). For every 10 meals, 6 were delivered to homebound elderly people, for a total of 149.2 million home-delivered meals to approximately 880,000 meal participants. Of those older people, 70% were aged 75 years or older, 56% lived alone, 25% had an annual income of \$10,000 or less, and 59% said the meals provided half or more of their daily food intake. Four in 10 people needed help with at least one activity of daily living, and 85% needed help with shopping, housework, and ambulating.

NUTRITION SCREENING

Nutrition screening is the process of discovering characteristics or risk factors that are known to be associated with dietary or nutrition problems. Its primary purpose is to identify individuals (such as older adults and the poor) who are potentially at high risk of complex and involved problems that relate to nutrition. To serve this purpose, screening criteria must be simple, relatively straightforward, and easy to administer. Screening is also helpful in establishing priorities for the most efficient use of valuable time and money.

The single largest demographic group at disproportionate risk of malnutrition is older Americans. Nutrition screening holds a tremendous preventive health potential for older adults. The nurse should assess the need for nutrition counseling or a referral to a registered dietitian for an older person who has food-related problems that are impacting eating pleasure and quality of life (American Dietetic Association, 2010a). The pendulum has shifted to reduce unnecessary therapeutic diets for those at risk of unintentional weight loss and undernutrition. There is also controversy about the benefit of weight loss for obese older Americans except if their laboratory test results indicate risk of metabolic syndrome. A dietitian or community nutrition program might be appropriate if any of the following are identified in the individual:

- Inappropriate or inadequate food intake
- Desire by obese elderly person to lose weight—tailoring to provide adequate calories, protein, and physical activity to preserve lean body mass
- Need for nutrient/disease-specific counseling with specific food preferences, cultural taboos, or environmental constraints
- Serum cholesterol levels of more than 240 mg/dL with desire to change eating pattern
- Inability to self-feed or to prepare and purchase food, or inability to carry out food-related activities of daily living

The health care professional should refer the individual to a physician when there has been an involuntary decrease in weight of more than 10 pounds during the previous 6 months. Additional anthropometric measurements suggesting malnutrition include the following:

- Triceps skin-fold thickness less than the 10th percentile
- Mid-arm muscle circumference less than the 10th percentile
- Serum albumin level less than 3.5 g/dL
- Evidence of osteoporosis or mineral deficiency (indicated by a history of bone pain or fractures, particularly in housebound older women)
- Evidence of vitamin deficiency (indicated by long-term inadequate fruit and vegetable intake; angular stomatitis, glossitis, or bleeding gums; or pressure sores in bedridden individuals)

NUTRITION RISK FACTORS

This section examines the role of nutrition in the cause and prevention of the leading nutrition-related chronic diseases—heart disease, stroke, some forms of cancer, osteoporosis, obesity, and type 2 diabetes—and in the early treatment of people in whom human immunodeficiency virus (HIV) infection was recently diagnosed.

Cardiovascular Diseases

Cardiovascular diseases (CVDs), principally CHD and stroke, are among the leading killers of both men and women among all racial and ethnic groups in the United States. Approximately one-fourth of the US population has some form of CVD, including hypertension, CHD, and stroke.

CVD prevention is so important that *Healthy People 2020* has specific objectives to improve cardiovascular health and quality of life through prevention, detection, and treatment of risk factors for heart attack and stroke. Specific objectives are listed in Box 11-2: *Healthy People 2020*.

Heart Disease

Diet Intervention

In an attempt to reduce the incidence of CVD, the American Heart Association (AHA) recommends that people older than 2 years adopt a well-balanced diet (Box 11-6: Research for Evidence-Based Practice), achieve and maintain a healthy body weight, and reach optimal levels for total cholesterol, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL)

BOX 11-6 RESEARCH FOR EVIDENCE-BASED PRACTICE

Dietary Risk Factors and Heart Disease^a

Developing guidelines and recommendations for preventing heart disease is a topic that is routinely reassessed. You may ask, “Why do the recommendations change over time?” As with all things scientific, technology is ever-growing and advancing. Such scientific progress brings new findings, for which guidelines are amended. The gold standard in medicine is to base all medical intervention protocols on evidence-based practice. Evidence-based practice is the use of current evidence from available research coupled with clinical expertise to establish high-quality patient care.

CVD is the leading cause of death in the United States, and suboptimal diet quality is the single largest risk factor contributing to death and disability. The American Heart Association notes that the primary contributors to poor dietary habits are insufficient consumption of fruits, vegetables, nuts/seeds, whole grains, and seafood and an excessively high intake of sodium (Mozaffarian et al., 2016). The American Heart Association’s evidence-based practice guidelines to prevent CVD encourage Americans to achieve at least four of the five following key components of a healthy diet:

- Fruits and vegetables: consume more than 4.5 cups per day
- Fish: consume more than two 3.5-oz servings per week (preferably oily fish)
- Fiber-rich whole grains (>1.1 g of fiber per 10 g of carbohydrates): consume three 1-oz-equivalent servings per day
- Sodium: limit to less than 1500 mg per day
- Sugar-sweetened beverages: limit to less than 450 kcal (36 oz) total per week

Considering that only 1.5% of adults and less than 1% of children in the United States currently meet these healthy diet criteria, there is a lot of room for improvement.

^aWith contribution from Staci Nix.

From Mozaffarian, D, Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., et al. (2016). Heart disease and stroke statistics—2016 update: A report from the American Heart Association. *Circulation*, 133, e38–e360.

cholesterol, blood pressure, and blood glucose (Lichtenstein et al., 2006). (The AHA did not set guidelines for children younger than 2 years.)

However, eating two or more servings of fish (approximately 8 ounces) every week, preferably oily varieties rich in eicosapentaenoic acid or docosahexaenoic acid, omega-3 fatty acids, such as canned light tuna, salmon, pollock, and catfish seems safe.

Smaller fish may have less mercury contaminants than larger ones.

- Limit intake of saturated fat to 10% of energy by choosing lean meats and vegetable alternatives, and fat-free (skim) or low-fat (1% fat) dairy products.
- When eating food prepared outside of the home, follow these diet and lifestyle recommendations:
 - Reduce salt intake by comparing the sodium content of similar products (e.g., different brands of tomato sauce) and choosing products with less salt or sodium; choosing versions of processed foods, including cereals and baked goods, that are reduced in salt or sodium; and limiting consumption of condiments (e.g., soy sauce, ketchup).
 - Neither antioxidant vitamin supplements nor other supplements such as selenium are recommended.

Many children, adolescents, and adults who already have unhealthy levels of lipids in their blood should receive nutrition counseling (Grundy et al., 2004). In children aged 2 to 20 years, an acceptable level of total cholesterol is less than 170 mg/dL.

Individuals with LDL cholesterol levels that are higher than 100 mg/dL should be advised to reduce their dietary intake of saturated fat and cholesterol to levels below those recommended for the general population (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001). The upper limit for these individuals is less than 7% of the total energy for saturated fat and less than 200 mg of cholesterol per day. The *Dietary Guidelines for Americans 2015–2020* does not set specific quantitative limits for dietary cholesterol consumption per day. However, the healthy eating patterns that are recommended are naturally low in cholesterol, with approximately 100 to 300 mg of dietary cholesterol per day. Individuals at risk of heart disease may be advised to further limit their cholesterol intake, particularly if their LDL cholesterol levels are high. After the dietary intervention has been outlined to the individual, follow-up sessions are scheduled to monitor lipid levels and dietary adherence.

The National Cholesterol Education Program (NCEP) develops new guidelines periodically, as warranted by research advances. The most recent set of guidelines, the *Third Report of the NCEP Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults*, also known as the Adult Treatment Panel III (ATP III) (Table 11-3), was updated in 2004. The changes in

options for more intensive cholesterol level reduction treatment for high-risk and moderate-risk individuals were based on the review of five clinical trials of cholesterol-lowering statin treatment. The update did not change the ATP III recommendations for people at moderate or lower risk. The ATP guidelines recommend that healthy adults have a lipoprotein analysis once every 5 years. A lipoprotein profile measures levels of LDL cholesterol, total cholesterol, HDL cholesterol, and triglycerides (fat in the blood). The level at which HDL becomes a major risk factor for heart disease is less than 40 mg/dL for men and less than 50 mg/dL for women.

In addition to a low HDL level, there are other major risk factors for CHD:

- Clinical forms of atherosclerotic disease (peripheral arterial disease, abdominal aortic aneurysm, and symptomatic carotid artery disease)
- Age (≥ 45 years for men and ≥ 55 years for women)
- Cigarette smoking
- Hypertension (blood pressure $\geq 140/90$ mmHg or taking antihypertensive medication)
- Family history of premature heart disease (heart disease in a first-degree relative at age less than 55 years for men or at age less than 65 years for women)
- Type 1 diabetes
- Obesity
- Metabolic syndrome

HDL cholesterol level greater than 60 mg/dL is considered a negative risk factor.

TABLE 11-3 Cholesterol and Lipoprotein Profile Classification

Cholesterol Reading	Classification
Total Cholesterol (mg/dL)	
<180	Optimal
<200	Near optimal
200–239	Borderline high
≥ 240	High
Low-Density Lipoprotein Cholesterol (mg/dL)	
<100	Optimal
100–129	Near optimal
130–159	Borderline high
160–189	High
≥ 190	Very high
High-Density Lipoprotein Cholesterol (mg/dL)	
≥ 60	Optimal
40–59	Borderline/normal
<40	A major risk factor for heart disease
Triglycerides (mg/dL)	
<150	Optimal
150–199	Borderline high
200–499	High
≥ 500	Very high

Modified from Nix, S. (2017). *Williams' basic nutrition and diet therapy* (15th ed.). St. Louis: Elsevier.

Therapeutic Lifestyle Changes Treatment Plan

The therapeutic lifestyle changes (TLC) treatment plan of nutrition, physical activity, and weight control is recommended for treatment of people who present with type 2 diabetes, elevated levels of LDL, or **metabolic syndrome**.

Metabolic syndrome describes the presence of a cluster of risk factors that often occur together, which dramatically increases the risk of coronary events. The syndrome is diagnosed when an individual has three or more of the following factors:

- Excessive abdominal fat, as indicated by too large a waist measurement (>35 inches or 88 cm in women and >40 inches or 102 cm in men)
- Elevated blood pressure (higher than 130 mmHg systolic or 85 mmHg diastolic)
- Low HDL level (<40 mg/dL)
- Elevated **triglyceride** level (>150 mg/dL), which is significantly linked to the degree of heart disease risk. (The guidelines recommend even borderline high triglyceride levels be treated with therapy that includes weight control and physical activity.)

The dietary component of the TLC treatment plan includes the following daily intake:

- Less than 7% of calories from saturated fat
- Less than 200 mg of dietary cholesterol
- Up to 35% of calories from total fat, provided most of the fat is unsaturated fat, which does not raise cholesterol levels. (A higher fat intake may be needed by some individuals with high triglyceride levels or a low HDL level, or both, to prevent their triglyceride levels or HDL status from increasing.)

- Intake of certain foods to boost the diet's LDL-lowering power: 2 g/day of plant stanols and sterols found in cholesterol-lowering margarines and salad dressings, and 10 to 25 g/day of foods high in soluble fiber, such as cereal grains, beans, peas, legumes, and many fruits and vegetables

A primary treatment goal of the TLC treatment plan is reduction of an elevated LDL level to:

- Less than 100 mg/dL with a therapeutic option of less than 70 mg/dL in the presence of CHD or other forms of atherosclerotic disease
- Less than 130 mg/dL with a therapeutic option of less than 100 mg/dL in the presence of two or more risk factors for CHD
- Less than 160 mg/dL in the presence of fewer than two risk factors for CHD

The final goal of the TLC treatment plan includes weight control (to enhance LDL level lowering and raise HDL level) and physical activity that lasts at least 30 minutes, expending at least 200 calories per day on most days (to decrease HDL and, for some, LDL levels).

Removing Barriers to Treatment Goals

To improve an individual's adherence to ATP III goals, treatment barriers can be eliminated by the development of protocols to encourage long-term individual adherence and follow-up, such as establishing clinic policy and developing computerized databases for those seeking care, establishing management algorithms, reinforcing and rewarding adherence, and enhancing third-party reimbursement. The nurse uses behavioral theories to identify a person's level of readiness to change and focus on counseling strategies to match that level of readiness (Snetselaar, 2004).

Hypertension

Blood pressure, the force of blood against the walls of arteries, is recorded as the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats). The measurement is written with one number above (or before) the other, with the systolic blood pressure (SBP) listed first and the diastolic blood pressure (DBP) listed second. For example, a blood pressure measurement of 120/80 mmHg is expressed verbally as "120 over 80." Normal blood pressure is less than 120 mmHg systolic and less than 80 mmHg diastolic. *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (National High Blood Pressure Education Program, 2003) added a pre-hypertension classification defined as an SBP range of 120 to 139 mmHg or a DBP range of 80 to 89 mmHg to highlight increased risk of progression to frank hypertension and CVD (National High Blood Pressure Education Program, 2003). A more recent review by the panel members appointed to the Eighth Joint National Committee (JNC 8) did not readdress the definitions of hypertension and pre-hypertension, but reexamined and redefined thresholds for drug treatment (James et al., 2014). JNC 8 also found strong evidence to address treating hypertensive 60-year-old or older individuals to a goal blood pressure of 150/90 mmHg and younger hypertensive individuals aged 30 to 59 years to a DBP of less than 90 mmHg (James et al., 2014). On the basis of

this evidence, *Healthy People 2020* contains objectives related to pre-hypertension (see Box 11-2: *Healthy People 2020*).

Epidemiology

In 2008 hypertension contributed to the deaths of approximately 348,000 Americans out of 2.4 million people. Approximately 44% were men and 56% were women (Roger et al., 2012). If a definition of hypertension as blood pressure higher than 140/90 mmHg is used, as many as 76.5 million adult Americans, or nearly one-third of all adults in the United States, have high blood pressure. NHANES data from 2005 to 2008 show that one in three people with hypertension are unaware of their condition, and over 50% of those surveyed do not have controlled high blood pressure (Egan et al., 2011). Untreated hypertension can damage arteries and increase the risk of stroke and congestive heart failure. High blood pressure is also responsible for many cases of kidney failure requiring dialysis and increases the risk of kidney failure in people with diabetes.

Non-Hispanic black and non-Hispanic white Americans are more likely to have high blood pressure than are Hispanic Americans although the rates for all ethnicities are significant. More women than men (3 in 4) have high blood pressure at age 75 years or older. It appears to affect more people with lower educational and income levels, although this may be related to other factors.

Diet Intervention

The modifiable nutrition-related risk factors for stroke include high blood pressure, obesity, habitual high alcohol intake, and high intake of sodium (Appel et al., 2006; CDC, 2011c; Lloyd-Jones et al., 2010). However there appears to be no need to restrict salt intake to less than the suggested 2000 mg currently in the guidelines for everyone with mild hypertension. There appears to be a class of hypertensive individuals who are salt sensitive who benefit from sodium restriction (Sanada et al., 2011). No certain method exists for identifying susceptible people or ascertaining how many of them become hypertensive as a result of excessive salt intake; therefore the conservative preventive health approach recommends a daily salt intake limited to 6 g or less for adults. Sodium chloride is approximately 40% sodium by weight; therefore a diet with 6 g of salt contains approximately 2300 mg of sodium. This amount is regarded as mild sodium restriction. Ideally, the recommendations are to reduce sodium intake to approximately 1500 mg, but this is very difficult with the current prevalence of sodium in packaged and restaurant foods. More than 45 national health organizations and 20 restaurant and food packaging companies have so far joined in the National Salt Reduction Initiative, started by New York City mayor Michael Bloomberg in 2008; the initiative aims to reduce the sodium level in food by 25% over 5 years. The following are the three major sources of sodium in the US diet, in order of predominance:

- Salt added by food processing companies as an ingredient in almost all processed foods (including many foods that do not taste salty, such as baked goods); most processed foods have a high sodium content (80%)
- Salt added by consumers to food during cooking or at the table (5–6% each)

- Salt from all animal products, which are a natural source of sodium

The following recommended food tips are designed to reduce salt and sodium intake:

- Sodium occurs naturally in many foods and is also added to most processed foods; therefore add salt only sparingly in home cooking and at the table.
- Consume fewer foods that have high sodium levels, such as many cheeses; processed meats; most frozen dinners and entrees; packaged mixes; most canned soups and vegetables; salad dressings; and condiments such as soy sauce, pickles, olives, catsup, and mustard.
- Rinse canned vegetables before warming them.
- Eat salty, highly processed salty, salt-preserved, and salt-pickled foods infrequently.
- Check labels for the amount of sodium in foods and choose products lower in sodium (free, <5 mg per serving; low, <140 mg per serving; reduced or less, 25% less than standard-reference food; healthy, <480 mg per serving).

Dietary Approaches to Stop Hypertension Eating Plan

Clinical studies show that following the DASH eating plan helps to lower blood pressure. The National Heart, Lung, and Blood Institute, with additional support by the NIH, funded the DASH research, with the final results appearing in 1997. The DASH eating plan makes consuming less salt and sodium easier because the plan includes abundant fruits and vegetables, which are lower in sodium but higher in potassium than other foods. Potassium and sodium play important roles as electrolytes in intracellular and extracellular fluid balance. People at high risk of hypertension may have a high sodium intake that may upset the sodium-to-potassium ratio, and eating more vegetables and fruits may account for the success of the DASH diet. The plan also includes more fat-free or low-fat milk and milk products, whole grains, fish, poultry, beans, seeds, and nuts, but contains less sweets, added sugars and sugar-containing beverages, fats, and red meats than the average typical American diet.

The plan is rich in magnesium, potassium, calcium, protein, and fiber. At approximately 2100 calories a day, the nutrients include 4700 mg of potassium, 500 mg of magnesium, and 1250 mg of calcium. These totals are approximately two to three times the amounts most Americans receive.

On the basis of the findings of DASH clinical studies, a combination of the eating plan and reduced sodium intake can reduce elevated blood pressure or prevent it when blood pressure is normal. The plan may even eliminate the need for medication or, in the case of severe high blood pressure, allow a reduction in medication. Other steps to control or prevent hypertension should continue to be encouraged, including exercise weight loss when necessary, not smoking, and limiting alcohol consumption. DASH may also improve health in other ways. The potassium in fruits and vegetables helps reduce hypertension (AHA, 2016) and may reduce the risk of some cancers; the calcium in dairy products may reduce fat mass and thus hypertension (Zemel, 2001). The diet may help lower the risk of osteoporosis, and a diet low in saturated fat and cholesterol can reduce CVD risk. The complete DASH eating plan entitled *Your Guide to Lowering*

Your Blood Pressure With DASH (USDHHS, NIH, National Heart, Lung, and Blood Institute, 2006) can be obtained from <http://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-index>.

Cancer

Epidemiology

The National Cancer Institute estimates that almost one in two (41%) women and men will receive a diagnosis of some type of cancer in their lifetime. Cancer remains the second leading cause of death in the United States (American Cancer Society, 2017; Miniño, 2011).

The most common cancers in men and women are lung, colorectal, prostate and breast; these cancers apprise approximately 46% of cancer deaths. Over 25% of cancer deaths are due to lung cancer. For men in 2017, 42% of new cases will occur at prostate, lung, and colorectal sites; in women the most common sites are breast, lung, and colorectal. Breast cancer alone accounts for 30% of newly diagnosed cases (American Cancer Society, 2017).

Approximately one-third of cancer deaths among men and women are related to diet and sedentary lifestyle factors. The introduction of a healthy diet (Figure 11-4) and exercise practices at any time from childhood to old age can promote health and likely reduce cancer risk.

Diet Intervention for Risk Reduction

Many dietary factors can affect cancer risk: types of foods, food preparation methods, portion sizes, food variety, and overall calorie balance. An overall dietary pattern that balances calorie intake and physical activity for weight management along with inclusion of a high proportion of plant foods (fruits, vegetables, whole grains, and beans) and limited amounts of processed or red meats and whole-fat dairy products may reduce the risk of cancer. The phytochemicals in fruits and vegetables, in particular, appear to have a protective effect by themselves, but dietary supplements, in particular supplements that exceed DRIs, do not provide the same benefits.



FIGURE 11-4 Teenagers who help to prepare safe, nutritious meals become engaged in the healthy eating process. (From Mahan, L. K., & Raymond, J. L. [2017]. *Krause's food & the nutrition care process* [14th ed.]. St Louis: Elsevier.)

Based on its review of the scientific evidence, the American Cancer Society (ACS) updated its nutrition and physical activity guidelines in 2011 (Kushi et al., 2012). The ACS recommendations are very consistent with the messages of the *Dietary Guidelines for Americans 2015–2020*, the MyPlate guidelines, and the dietary recommendations of other national agencies for general health promotion and prevention of other diet-related chronic conditions. Although no diet can guarantee full protection against any disease, the ACS believes that the following recommendations offer the best nutrition information currently available to help Americans:

- For national, state, and local community action:
 - Apply policy and environmental changes that increase access to affordable, healthy foods in all places where adults and children live, work, go to school, or play and decrease access and marketing of foods and drinks of low nutritional value, particularly to youth.
- For individuals:
 - Choose most of the foods you eat from plant sources. Choose fewer and smaller portions of high-fat or calorie-dense foods and beverages. Eat at least 2.5 cups of a variety of fruits and vegetables every day. Choose whole-grain breads, cereals, pastas, brown rice, and beans. Limit consumption of processed meat (bacon, sausage, luncheon meats) and red meats such as beef, pork, or lamb. For those who do eat meat, choose leaner cuts and small portions, not more than one-quarter of the plate (similar to the MyPlate recommendation). Many scientific studies show that eating fruits and vegetables (especially green and dark yellow or orange vegetables, foods in the cabbage family, soy products, and legumes) may protect against cancers at many sites, particularly for cancers of the gastrointestinal and respiratory tracts. Consumption of at least five servings of fruits and vegetables among both smokers and nonsmokers seems to reduce the risk of lung cancer. Grains as well as fruits, vegetables, and dairy products are also an important source of many vitamins and minerals, such as folate, calcium, and selenium, which have been associated with a lower risk of colon cancer in some studies. Beans (legumes) are especially rich in nutrients that may protect against cancer. Consumption of meat, particularly red and processed meats, has been associated with an increased risk of cancer at several sites, most notably the colon, stomach, and prostate.
 - Since 1991 the 5 A Day for Better Health Program (now Fruits and Veggies—More Matters) has raised public awareness about the importance of fruits and vegetables in disease prevention. The program is jointly sponsored by the CDC and the Produce for Better Health Foundation (a nonprofit consumer education foundation representing the fruit and vegetable industry). Through its unique national public-private partnership, Fruits and Veggies—More Matters seeks to increase consumption of fruits and vegetables to five or more servings each day. The program focuses on mothers as the gatekeepers for families for the most part and provides information, recipes, and materials for both consumers and partner organizations. It gives

Americans a simple, positive message: eat more fruits and vegetables, start small, and aim for variety.

- Be physically active: achieve and maintain a healthy weight. Being overweight or obese, by itself or in combination with excess belly fat, increases the risk of cancers at several sites, such as the colon and rectum, prostate, endometrium, breast (among postmenopausal women), and kidney. Both increasing physical activity and balancing food intake to maximize nutrient density within calorie needs are essential. Keeping a healthy BMI without being underweight is ideal. If overweight, avoidance of more weight gain or even losing as little as 5% to 10% of weight can be beneficial.
- For those who drink alcohol, limit consumption. No more than one drink per day for women or two drinks per day for men should be the limit. Alcoholic beverages, along with cigarette smoking and the use of tobacco products, contribute to cancers of the oral cavity, esophagus, and larynx. Studies have also shown an association between alcohol consumption and an increased risk of breast cancer (American Cancer Society, 2009). The mechanism of this effect is not known, but the association may be related to the carcinogenic effects of alcohol or its metabolites, to changes in levels of hormones such as estrogens, or other processes. Regardless of the mechanism, studies show that the risk of breast cancer increases with an intake beginning at only a few drinks per week. Reducing alcohol consumption is a good way for women who drink regularly to reduce their risk of breast cancer.

Nurses may find it is helpful to refer to the sections in the nutrition and physical activity guidelines (Kushi et al., 2012) that refer to other aspects of food intake relating to prevention of cancer. They include more specific suggestions for particular cancers, evidence specific to nutrient supplementation, and answers to other frequently asked questions. It is available free for download (subject to copyright if used) at <http://onlinelibrary.wiley.com/doi/10.3322/caac.20140/full>.

Osteoporosis Epidemiology

Osteoporosis, a bone disease characterized by low bone mass leading to fragile bones and an increased risk of hip, spine, and wrist fractures, is a major public health risk for an estimated 44 million individuals in the United States, or 55% of people aged 50 years or older (National Osteoporosis Foundation, 2011). Osteoporosis has already been diagnosed in 10 million people, and 34 million more people have low bone mineral density or osteopenia, placing them at increased risk of osteoporosis. Of the 10 million Americans estimated to have osteoporosis, 80% are women and 20% are men. Of those with hip fractures, 24% die within a year, men twice as often as women and black American women more often than Caucasian women. Direct financial expenditures for management of osteoporotic fracture alone were estimated at \$19 billion in 2005 and will likely rise to approximately \$25.3 billion by 2025. These figures underestimate significantly the true costs of osteoporosis because they fail to include the costs of treatment for individuals without a

history of fractures or the indirect costs of lost wages or productivity of either the individual or the caregiver.

The National Osteoporosis Foundation recognizes the following risk factors for osteoporosis:

- Older age: as age increases, risk increases
- Female gender
- Personal history of osteoporosis or fracture as an adult
- Family history of osteoporosis or broken bones
- Low levels of sex hormones: in women, early estrogen deficiency (younger than 45 years) or low estrogen levels during menopause, missing periods (amenorrhea); in men, low levels of testosterone and estrogen
- Diet: low in calcium or vitamin D intake; high intake of protein, sodium, and caffeine
- Sedentary lifestyle
- Use of oral corticosteroid therapy for 3 months or more
- Smoking (active or passive)
- High alcohol intake (three or more drinks per day)
- Specific medications (steroids, some anticonvulsants, and other medications)
- Some diseases and conditions (anorexia nervosa, rheumatoid arthritis, gastrointestinal diseases, including celiac disease, sickle cell anemia, and lupus).

Although the prevalence of osteoporosis and the incidence of fracture differ by sex and race/ethnicity, there is a significant risk for all groups even with differences in bone mass density. The latest available facts (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2012a, 2012b) indicate that an estimated 20% of non-Hispanic Caucasian/Asian women, 10% of Hispanic women, and 5% of non-Hispanic black women 50 years or older currently have osteoporosis. Low bone density is even higher in the same groups: 52%, 49%, and 35% respectively. Currently, risk is rising most rapidly in Hispanic women although the reasons are unknown. Among men 50 years or older, an estimated 7% of non-Hispanic Caucasian/Asian men, 4% of non-Hispanic black men, and 3% of Hispanic men have osteoporosis. Low bone density is higher in the same groups: 35%, 19%, and 23% respectively (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2012a, 2012b). As there is limited information on other ethnic/racial groups, the data are not included.

Pathophysiology

Osteoporosis develops slowly, resulting in loss of bone mass and fractures, especially in the wrist, hip, and spinal areas. It is defined as a skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture. Bone strength reflects the integration of two main features: bone density and bone quality. Bone mineral density is expressed as grams of mineral per area or volume and, in any given individual, is determined by peak bone mass and amount of bone loss. Bone quality refers to architecture, turnover, damage accumulation (microfractures), and mineralization. Osteoporotic bone fractures more easily than healthy bone; as such, osteoporosis is a significant risk factor for fracture.

Factors involved in building and maintaining skeletal health throughout life. The bone mass attained early in life, 85% to

90% of which is reached by age 18 years for girls and age 20 years for boys, is perhaps the most important determinant of lifelong skeletal health. Individuals with the highest peak bone mass after adolescence have the greatest protective advantage when there is a decline in bone density with increasing age, illness, and diminished sex steroid production.

Genetic factors exert a strong and perhaps predominant influence on peak bone mass, but physiological, environmental, and modifiable lifestyle factors can also play a significant role. Among these factors are adequate nutrition and body weight, the sex hormones of puberty, and physical activity (particularly weight-bearing activity). Therefore maximizing bone mineral density early in life presents a vital opportunity to reduce the effect of bone loss related to aging. Childhood is a critical time for development of lifestyle habits conducive to maintaining good bone health throughout life. Additionally, cigarette smoking, which may start in adolescence, may have a deleterious effect on bone mass.

Prevention

Once thought to be a natural part of aging among women, osteoporosis is no longer considered age or sex dependent and is largely preventable, thanks to the recent progress in the understanding of its causes, diagnosis, and treatment. Optimization of bone health is a process that must occur throughout the life span in both men and women so as to prevent osteoporosis. Calcium and vitamin D are the nutrients most important for attaining peak bone mass and for preventing and treating osteoporosis. Although it is difficult to obtain an adequate amount of calcium from food sources, the alternative use of supplements is in question as there is no apparent evidence that they prevent fractures as well as dietary sources (Bolland et al., 2015).

A healthy diet, adequate in calories and appropriate nutrients, is essential for normal growth and development of all tissues, including bone. Table 11-4 suggests dietary calcium (and vitamin D) intake recommendations for various stages of life. Factors contributing to low calcium intake include restriction of consumption of dairy products because of food preferences or lactose intolerance, a generally low level of fruit and vegetable consumption, and a high intake of low-calcium beverages such as soft drinks. Lactose and vitamin D enhance calcium absorption, as does an acidic environment, seen in superior absorption in calcium-enriched orange juice. Calcium is well absorbed from dairy foods, which are also the only source of lactose that enhances absorption.

Vitamin D is a fat-soluble vitamin encompassing two molecules—vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol). Vitamin D3 is the form of vitamin D that best supports bone health. It is synthesized in the body when the skin is exposed to the ultraviolet rays of the sun. This process is complicated by various concerns about sunscreens, clothing, and weather changes. Vitamin D from foods, as well as that from sun exposure, then undergoes a complicated metabolic pathway through the liver and the kidneys, emerging as the hormone 1,25-dehydroxyvitamin D₃, the active form. Vitamin D is commonly added to milk, and other food sources of vitamin D include fatty fish (salmon and mackerel); fortified margarine; eggs; and

TABLE 11-4 Dietary Reference Intakes for Calcium and Vitamin D

Life Stage Group	CALCIUM			VITAMIN D		
	EAR (mg/day)	RDA (mg/day)	UL (mg/day)	EAR (IU/day)	RDA (IU/day)	UL (IU/day)
Infants from birth to 6 mo	—	—	1000	—	—	1000
Infants from 6 to 12 mo	—	—	1500	—	—	1500
1–3 yr	500	700	2500	400	600	2500
4–8 yr	800	1000	2500	400	600	3000
9–13 yr	1100	1300	3000	400	600	4000
14–18 yr	1100	1300	3000	400	600	4000
19–30 yr	800	1000	2500	400	600	4000
31–50 yr	800	1000	2500	400	600	4000
51–70 yr men	800	1000	2000	400	600	4000
51–70 yr women	1000	1200	2000	400	600	4000
>70 yr	1000	1200	2000	400	800	4000
14–18 yr, pregnant or lactating	1100	1300	3000	400	600	4000
19–50 yr, pregnant or lactating	800	1000	2500	400	600	4000

EAR, Estimated average requirement; RDA, recommended dietary allowance; UL, tolerable upper intake level.

From Food and Nutrition Board, Institute of Medicine. (2011). *Dietary reference intakes for calcium and vitamin D*. Washington, DC: National Academies Press.

some fortified, ready-to-eat cereals. Some studies are questioning whether or not most infants and young children in the United States are getting adequate calcium and vitamin D intakes. Black and colleagues (2014) concluded that the overall dietary intake of children consuming a usual diet makes it impossible to meet the vitamin D recommendations of the Institute of Medicine, Food and Nutrition Board (2011). During adolescence, when consumption of dairy products decreases, vitamin D intake is likely to be inadequate, which may affect calcium absorption adversely. Other nutrients have been evaluated relative to bone health. High dietary protein, caffeine, phosphorus, and sodium intake may adversely affect calcium balance; however, their effects appear to be offset in individuals with adequate calcium intakes.

Food should be selected to provide adequate calcium intake. Women of all ages should make sure they get adequate calcium intake by consuming more calcium-rich foods, including calcium-fortified foods such as orange juice, milk, and other dairy products as they deliver the most calcium of any food group. Low-fat (1%) and fat-free milk, low-fat yogurt, and low-fat cheeses are the dairy products of choice. Other good sources of calcium include sardines, canned salmon (if the bones are eaten), and some dark green leafy vegetables, especially collard greens. Orange juice and milk fortified with calcium are also good sources, as are soy, almond and rice milks, and other fortified food products. Supplementation with calcium tablets may be appropriate for high-risk individuals with inadequate calcium intake. However, it is particularly important for older women to be vigilant about their intakes of calcium from dietary sources, supplements, and medications such as antacids because of the

risk of exceeding the UL of any age/gender group (National Research Council, 2010). Men may also be wise to limit calcium supplementation and not exceed normal dietary levels because of an association with increased risk of prostate cancer (Kushi et al., 2012).

For those who do choose calcium supplements, calcium carbonate (40% elemental calcium), calcium citrate (24%), calcium lactate (14%), and calcium gluconate (9%) are preferred. (Dolomite and bone meal are not recommended because they may be contaminated with lead.) Calcium supplement absorption is most efficient for individuals with adequate gastric acid production at doses no greater than 500 mg at a time when taken with meals.

Anyone younger than 25 years who ingests less than the recommended DRI for calcium should be urged to develop strategies for increasing it. Children, particularly girls between the ages of 9 and 18 years, are at the highest risk of deficiency (National Research Council, 2010). By modeling appropriate behaviors, health care professionals can help prevent or delay the onset of osteoporosis in themselves, their families, and the people in their care.

Obesity

Overweight (defined in the Body Mass Index Formulas section) can seriously affect health and longevity and is associated with the leading nutrition-related causes of death in the United States: type 2 DM, CVD, and some cancers. Obesity (defined in the Body Mass Index for Adults section) is also associated with gout and gallbladder disease and may contribute to the development of osteoarthritis in the weight-bearing joints.

Epidemiology

Overweight and obesity are found worldwide, and the prevalence of these conditions in the United States ranks high in comparison with that of other developed nations. As already mentioned, 36.5% of American adults aged 20 years or older are obese. In children, 8.9% of those aged 2 to 5 years were classified as obese and 17.5% of those aged 6 to 11 years were classified as obese, and 20.5% of adolescents aged 12 to 19 years were classified as obese (CDC, 2016a,b). Lifestyle, genetics, hormonal factors, and social-ecological factors are among the many factors contributing to the problem.

Obesity is more common in women than in men. Among men there is a modest ethnic variation in the prevalence of being overweight, the greatest difference occurring between black men (67%) and Hispanic American men (74.6%). Among women the ethnic variation is substantial. Almost 57.6% of white women are overweight, Hispanic American and Puerto Rican women have a greater prevalence of being overweight (73%) than their white counterparts, and more than 79.6% of black women are overweight (National Center for Health Statistics, 2011). Potential contributing factors often associated with the greater propensity for adult black women becoming obese include lower levels of physical activity, higher calorie intake, and lower levels of education and socioeconomic status, as well as broader acceptance of a larger body size within the black American community (Hawkins, 2007; Sanchez-Johnson et al., 2004).

Body Mass Index for Adults

Based on an adult's height and weight, body mass index (BMI) is a helpful indicator of underweight, normal weight, overweight, and obesity (USDHHS, 2010b). One can calculate a person's BMI by dividing the person's weight in kilograms by their height in meters squared (<http://www.cdc.gov/healthyweight/assessing/bmi>).

Body mass index formulas. BMI may be used as an indicator of body fat, but it cannot be interpreted as a specific percentage of body fat. Age and sex influence the relationship between fat and BMI. For example, women are more likely to have a higher percentage of body fat than men have for the same BMI. As weight is part of the BMI calculation, it must be noted that scale weights may be inaccurate if used universally. For example, a well-trained athlete with a higher proportion of muscle to fat will weigh more because muscle weighs more than fat. By the same token, bone weight differs in people with smaller frames compared with those with larger frames and higher bone density. Additionally, older people have more body fat than do younger adults (Gallagher et al., 2000). BMI is used to screen and monitor a population to detect the risk of health or nutritional disorders. In an individual, other data must be used to determine whether a high BMI is associated with increased risk of disease and death for that person; use of BMI alone is not diagnostic. Waist circumference is a better indicator of the risk of metabolic syndrome. As mentioned previously, the latter identifies several risk factors associated with morbidity such as elevated level of triglycerides, low HDL level, high LDL level, elevated blood glucose level, and elevated blood pressure. For more details, see USDHHS (2010b).

BMI ranges are based on the effect body weight has on disease and death. A BMI from 19 to 25 kg/m² is a healthy target range for adults. BMIs higher than 25 kg/m² are associated with increased risks of developing CVD, gallbladder disease, high blood pressure, and non-insulin-dependent DM (type 2 diabetes).

BMIs for adults are expressed by one number, regardless of age or sex, using the following guidelines established by the World Health Organization (2006):

- Underweight: BMI less than 18.5 kg/m²
- Healthy weight: BMI of 18.5 to 24.9 kg/m²
- Overweight: BMI of 25 to 29.9 kg/m²
- Class 1 obese: BMI of 30 to 34.9 kg/m²
- Class 2 obese: BMI of 35 to 39.9 kg/m²
- Class 3 obese (morbid obesity): BMI of 40 kg/m² or higher

Body Mass Index Growth Charts for Children

Pediatric health care providers have used growth charts since 1977, with the newest ones released in 2000 by the CDC to more accurately reflect the nation's cultural and racial diversity. To track growth and development in children and adolescents through age 20 years, pediatricians, nurses, and nutritionists use charts widely to assist in signaling potential developmental and weight problems earlier in childhood/adolescence. They consist of a series of percentile curves that illustrate the distribution in growth of children across the United States.

The BMI is an early warning signal that is helpful as early as age 2 years to help identify children who have the potential to become overweight. Early identification of obesity risk gives parents the opportunity to modify their family eating and activity patterns before their children develop a weight problem.

The CDC's charts are based on data gathered through the NHNES, the only survey that collects data from actual physical examinations on a cross-section of Americans from all over the country. This survey shows that since the 1980s the number of overweight children and adolescents has doubled. The growth charts indicate that, in general, children are heavier today than in 1977, but height has remained virtually unchanged. The charts are available on the CDC website at <http://www.cdc.gov/growthcharts>.

Diet Intervention in Weight Reduction

With the advances in nutritional genomics it may be possible to individualize dietary recommendations on the basis of a person's genotype, thus having a greater impact on risk reduction in diet-related diseases such as obesity (Box 11-7: Genomics). A balanced diet to support weight reduction should include appropriate serving sizes to meet individual nutrient needs. Additionally, exercise is particularly important from the outset, because with exercise there is less need to restrict food intake. Exercise also favors long-term maintenance of body weight (as described in Chapter 12).

Nurses make referrals to supervised or unsupervised programs as appropriate. People expect this type of advice on maintaining their health. Therefore nurses can play an important role, although not supervising individuals' weight loss efforts directly. For more information on obesity among adults, see the *Solving the Problem*

BOX 11-7 GENOMICS

Nutritional Genomics^a

The relatively new field of nutritional genomics is a multidisciplinary field of research that investigates the effects a person's diet has on that person's genes (i.e., nutrigenomics) and how our genetic variations dictate our response to certain nutrients (i.e., nutrigenetics). It has long been accepted that slight variations in our genetic makeup account for the individuality of our physical appearances. Think about how you guess at what your height potential will be. We generally look to our biological parents for answers regarding our physical appearance. Likewise, the study of nutritional genomics is attempting to predict how a specific genetic identity will influence a person's response to food and the nutrients within it.

There are many examples of how such individual genetic variants alter disease treatment in health care. For example, two people with hypertension may need different medications to treat the same condition because of their biological response to certain medications. It stands to reason then that the same two people may also benefit from different dietary interventions. Obesity is one of the primary health concerns in the United States and is a significant risk factor for all other major chronic diseases. Nutritional genomics makes possible the use of personalized diet prescription based on an individual's specific genetic profile. Researchers believe that the potential for personalized dietary intervention could drastically change the prevalence of chronic disease, particularly that of obesity (Huang et al., 2015). If such diet therapies are more effective in managing or preventing disease, this will allow health care to focus more on health promotion instead of disease management. Such a shift in health care represents a significantly more sustainable and cost-effective strategy to enhance the health of the nation.

For additional information regarding nutritional genomics, refer to the website of the Center of Excellence for Nutritional Genomics at the University of California, Davis: <http://nutrigenomics.ucdavis.edu>.

^aWith contribution from Staci Nix.

From Huang, T., & Hu, F. B. (2015). Gene-environment interactions and obesity: Recent developments and future directions. *BMC Med Genomics*, 8(Suppl 1), S2.

of Childhood Obesity Within a Generation: The White House Task Force on Childhood Obesity Report to the President (White House Task Force Report on Childhood Obesity, 2010), *The Surgeon General's Vision for a Healthy and Fit Nation* (USDHHS, 2010b), and *Recommended Community Strategies and Measurements to Reduce Obesity in the United States* (Khan et al., 2009).

There are many positive effects of only relatively small amounts of weight loss (5% to 10% of body weight) for people who are obese, including the following:

- Decreased blood pressure (decreased risk of a heart attack and stroke)
- Reduced abnormally high levels of blood glucose associated with diabetes
- Reduced elevated levels of cholesterol and triglycerides associated with CVD
- Reduced sleep apnea (irregular breathing during sleep)
- Decreased risk of osteoarthritis in the weight-bearing joints
- Decreased depression
- Increased self-esteem

The acronym LEARN has been suggested as a mnemonic device for health professionals. LEARN refers to the steps nurses can take to help the person who needs to improve health-related

behavior (Brownell, 2000). LEARN is particularly useful as a guideline for communicating with the clinically obese individual who has indicated dissatisfaction with his or her current weight:

L—Listen with sympathy and understanding to the person's perception of the problem.

E—Explain personal perceptions of the problem.

A—Acknowledge and discuss differences and similarities.

R—Recommend treatment.

N—Negotiate an agreement.

In 1998 an NIH-sponsored technical support conference identified the following characteristics of voluntary weight loss and weight control in the United States (USDHHS, 2010b):

- Obesity is a chronic disease.
- Obesity has many causes.
- Cure is rare; palliation is realistic.
- Weight loss is slow.
- Recidivism is common.
- Weight regain may be slow, but it is often rapid.
- Management is often more frustrating than the underlying disease.

The conference noted significant adverse effects for obese dieters who regain lost weight:

- Repeated weight gain and loss may have adverse psychological and physical effects; for example, evidence suggests that mildly to moderately overweight women who are dieting may be at risk of binge eating.
- Although data on the health effects of repeated weight gain and loss (weight cycling) are also inconclusive, weight cycling appears to affect energy metabolism and may cause faster regaining of weight.
- Depression and decreased self-esteem occur.

These findings paint a bleak outlook that one should share with caution when advising individuals.

Fad diets do not provide the best way to lose weight and should be avoided. However, recognizing that people will do almost anything to lose weight when desperate, it is helpful to be able to discuss current fads intelligently and to guide individuals as needed. The new prevention-focused model of health care, mentioned earlier, includes many facets needed to avoid and treat obesity among adults and children in the United States. On an individual basis, for people who cannot or do not choose to maintain a BMI less than 30 kg/m² as a priority, the paradigm *Health at Any Size* (Spark, 2001) is described in Box 11-8.

FDA-approved weight loss medication can play a helpful role in assisting individuals to lose weight and keep it off. As of early 2012, currently orlistat (also available as Xenical by prescription or Alli over-the-counter) is the only approved general weight loss drug. It is important to help those using it to recognize the warning signs and see a health provider if they have negative symptoms. Other non-FDA-approved weight loss supplements that are available are generally not recommended because of safety concerns.

Diabetes

Prevalence and Incidence

Diabetes is becoming more prevalent, especially type 2 diabetes, which is associated with obesity. The numbers of existing cases

BOX 11-8 Health at Any Size**The Size Acceptance Nondiet Movement**

This paradigm (Spark, 2001) has replaced the question "How can fat people lose weight?" with the question "How can fat people be healthy?" The following tenets are the foundation of the movement:

- Good health is a state of physical, mental, and social well-being. People of all sizes and shapes can reduce their risk of poor health by adopting a healthy lifestyle, which includes eating a variety of healthy foods, being physically active because it is fun and feels good, and appreciating the body as it is.
- Human beings come in a variety of sizes and shapes; size diversity is a positive characteristic of the human race. Respect the bodies of others, although they might be quite different.
- There is no ideal body size, shape, BMI, or body composition that every individual should strive to achieve.
- Self-esteem and body image are strongly linked. Helping people feel good about their bodies and about who they are can help motivate them to maintain healthy behaviors.
- People are responsible for care of their own bodies.
- Appearance stereotyping is wrong. Their weight notwithstanding, all people deserve to be treated equally in the job market and on the job, to be treated equally in the media, and to receive competent and respectful treatment by health care professionals.

How to Become a Size-Sensitive Health Professional

- On the intake form, include a question asking whether the person is satisfied with his or her body size. If the answer is "yes," then try to avoid the issue in the future.

- When the person asks not to be weighed, the request is acknowledged without complaint and automatically taken into account on follow-up office visits. (There are a few cases in which weighing is necessary, such as when certain medications, chemotherapy, or anesthetics are administered.)
- A size-sensitive health care professional does not necessarily avoid mentioning weight but should avoid making an issue of weight, avoid lectures and humiliation, and respect the individual's wishes with regard to weight discussions.
- When weight contributes to a problem, the professional mentions this situation but also considers other diagnoses and recommends tests to determine the actual diagnosis when appropriate. If weight loss is a recommended treatment for a problem, the compassionate professional may mention this, but at minimum, and recommend and prescribe other treatments. Accept the individual's wish not to use weight loss as a treatment.
- Some health care professionals believe that overweight and obesity are not necessarily unhealthy. However, other professionals who believe that fat is unhealthy may acknowledge that weight loss is usually ineffective or that individuals have the right to direct their own treatment.
- Ideally, the waiting area, examining suite, and consultation room are equipped with armless chairs, large blood pressure cuffs, large examination gowns, and other equipment suitable for large people. If this is not the case, then the office staff acknowledges the importance of these items when told.

From Spark, A. (2001). Health at any size: The size acceptance nondiet movement. *Journal of the American Medical Women's Association*, 56(2), 69–72.

(prevalence) and new cases (incidence) were increasing between 1990 and 2008, but there has been a possible decrease in diabetes incidence since 2008 (Herman & Rothberg, 2015). The CDC's diabetes maps appear to be mirroring the trends seen in state obesity maps. An estimated 25.8 million Americans (8.3% of the US population) had the disease in 2010 (CDC, 2011b). Among those, older adults and minorities were disproportionately affected. Almost 27% (or 10.9 million) of adults 65 years or older have diagnosed diabetes. After adjustment for population age differences, 2007 to 2009 national survey data of adults (aged 20 years or older) showed the risk of diagnosed diabetes. When compared with non-Hispanic white adults, the risk was 18% higher among Asian Americans, 66% higher among Hispanics, and 77% higher among non-Hispanic black Americans. It was about the same for Cubans, Central Americans, and South Americans, 87% higher for Mexican Americans, and 94% higher for Puerto Ricans. In the Native American population, just among those served by the Indian Health Service, the prevalence is almost twice the national average. Rates differ by region, ranging from 5.5% among Alaska Native adults to 33.5% among Native American adults in southern Arizona.

DM accounts for 90% to 95% of all diagnosed cases of diabetes. The risk factors include the following: having pre-diabetes (impaired glucose tolerance and/or impaired fasting glucose), being older than 45 years, being overweight or obese, not exercising regularly, having a family history of diabetes or a personal history of gestational diabetes, or giving birth to a baby of at

least 9 pounds. Other risk factors include high blood pressure, low HDL cholesterol level, high triglyceride level, and certain races or ethnic groups (Nesto, 2005).

Type 2 DM is the seventh leading cause of death among Americans and the leading cause of blindness, kidney failure, and lower extremity amputations; it also greatly increases the risk of a heart attack or stroke. In 2007, diabetes accounted for more than \$174 billion in direct and indirect medical costs and lost productivity (CDC, 2011b). Much of the burden of diabetes can be prevented or delayed by early detection, improved delivery of care, and better education on disease self-management (American Diabetes Association, 2012).

Type 2 Diabetes in Children

Although DM in children and adolescents was believed to be exclusively type 1, type 2 diabetes is now considered a sizeable and growing problem among Native Americans and an emerging public health problem among other North American ethnic groups. The epidemic of obesity among children and adolescents, the decrease in physical activity, the increase in calorie-dense foods, and the exposure to diabetes in utero are likely contributors to the increase in prevalence of type 2 DM in this population. Young children with type 1 DM or type 2 DM who are either overweight or obese should be observed for metabolic syndrome and CVD risk. The adolescent population is at higher risk because of lifestyle implications, smoking, poor diet adherence, etc., that may put them at risk of chronic disease earlier in life. Recent

studies suggest that renal and CVD disease risk is approximately twice that of youth with type 1 DM (Wong et al., 2015).

Although some children and adolescents are symptomatic, others do not enter the clinical arena until they have severe ketoacidosis and may have a transient insulin requirement. Diabetic complications (dyslipidemia and hypertension) have been observed among Pima Indians as early as the teenage years. No evidence-based guidelines for treatment of type 2 diabetes in children and adolescents are available, and oral agents have not been tested or approved for this age group. Generally, children and adolescents with type 2 DM have poor glycemic control. Population mobility, lack of symptoms, denial of illness, absence of family support, and inadequate health care insurance coverage have all been identified as major barriers to adherence to treatment and follow-up and to successful clinical management. Because of a longer duration of disease (from earlier onset), and because glucose control and adherence are challenging during the teenage years, the lifetime complications (microvascular and macrovascular diseases and decreased quality of life) in this population will probably be considerable (Fagot-Campagna et al., 2000).

Diet Intervention

Medical nutrition therapy (MNT) is the most critical and pivotal component of diabetes care. At the minimum, MNT involves the team efforts of a physician, a registered nurse, a registered dietitian, and, in some practice settings, a mental health professional. The purpose of MNT for people with type 2 DM is to delay or prevent the development of complications (blindness, CHD, nephropathy, and neuropathy). No single diabetic diet or American Diabetes Association diet exists. The recommended diet can be defined only as a nutrition prescription based on assessment, treatment goals, and outcomes. Nutrition advice for people with type 2 diabetes is essentially the same as that for the general population: follow the *Dietary Guidelines for Americans*. MNT for people with diabetes should be individualized, with consideration given to usual eating habits, culture, and other lifestyle factors. Nutrition recommendations are then developed and implemented to meet treatment goals and desired outcomes. Monitoring metabolic parameters, including blood glucose levels, glycosylated hemoglobin (HbA1C) levels, lipid values, blood pressure, body weight, renal function (when appropriate), and quality of life, is crucial to ensure successful outcomes. Monitoring HbA1C to less than 6.5% or 7% in most current guidelines is not always the only criterion to use. More importantly the treatment should be started early to prevent further destruction of the beta cells of the pancreas that produce insulin. Studies show that even in people with pre-diabetes or diabetes there is a loss of 50% to 80% of their beta cells (Aguilar & Zonszein, 2015). The American Diabetes Association further recommends ongoing nutrition self-management education for these individuals.

For people with hyperglycemia, hyperlipidemia, obesity, or suboptimal nutrition, start with this nonpharmacological management:

- Determine an appropriate, tailored meal plan based on energy needs for body weight goals (moderate weight loss, weight maintenance, weight gain). With that data, the determination

is made with regard to serving sizes and numbers with use of MyPlate. For children and adolescents, their growth needs must be accounted for as well.

- Encourage regular exercise.
- Evaluate the individual with use of the outcome measures listed in Table 11-5. People who have been counseled regarding diet and exercise but who have not responded satisfactorily after 4 to 6 weeks should be referred to a registered dietitian who is a diabetes educator. Those with acute complications, such as hypoglycemia, exercise-related problems, renal disease, autonomic neuropathy, hypertension, or CVD, must first see a physician.

A nutrition prescription, which is done after the physician has completed a physical and medical assessment, may be general, but it should reflect the individual's therapy goals. The following are some sample orders the nurse might write for the dietitian:

- Individualized diabetic meal plan to achieve clinical goals of diabetes MNT
- MNT to achieve blood glucose levels as near normal as possible
- Individualized meal plan to decrease diabetes control and blood lipid levels
- Diet for improved glycemic control and blood pressure measurements

The registered dietitian with a summary of the planned nutrition intervention may define the prescription further. For example, the dietitian might write:

- Weight-reduction meal plan based on general eating guidelines, 1200 to 1500 calories, three meals, and one snack
- 2300 mg sodium meal plan with weight maintenance
- Carbohydrate-counting meal plan, adjusting carbohydrate and meal timing to achieve target glucose goals

Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome Epidemiology

According to the CDC in 2011, 1.2 million adults and adolescents in the United States were infected with HIV, more than ever before (CDC, 2016c). In 2015, approximately 40,000 people were diagnosed with HIV; the number of new diagnoses decreased 19% from 2005 to 2014. This represents a true decline in cases (CDC, 2016c). Whereas HIV infection can be diagnosed earlier in many more people, still as many as one-third wait until it is too late for effective prevention or treatment and advance to AIDS within 12 months of diagnosis. AIDS has been diagnosed in just more than 1 million people, since the beginning of the epidemic (CDC, 2016c).

Diet Intervention

Attention to nutrition in early HIV intervention is essential for several reasons. People can now live for decades with HIV/AIDS as long as HIV/AIDS is diagnosed early and they are treated early. Even for those people who are HIV positive but in whom HIV infection is diagnosed late, it may still take up to 1 year before most will progress to AIDS. Nutritious diets can improve the sense of well-being, minimize disease symptoms and the side effects of medications, and reduce the risk of opportunistic

TABLE 11-5 Goals and Recommendations of Medical Nutrition Therapy for Individuals With Type 2 Diabetes

Index	Goal	Recommendation
HbA1c	For diagnosis must have: ≥6.5% with a method that is NGSP certified and standardized to DCCT assay	The HbA1c test is the preferred test to diagnose diabetes in nonpregnant adults; other tests listed below may also be used
FPG	≥126 mg/dL (7.0 mmol/L) Fasting is defined as no calorie intake for at least 8 h	The FPG test detects diabetes and pre-diabetes. It is most reliable when done in the morning
2-h plasma glucose	≥200 mg/dL (11.1 mmol/L) during OGTT	May also be used with a WHO-approved method and a glucose load of 75 g of anhydrous glucose dissolved in water
Random plasma glucose	≥200 mg/dL (11.1 mmol/L)	In people with classic hyperglycemia or hyperglycemic crisis
HbA1c	A reasonable HbA1c goal for many nonpregnant adults is <7%; individualize to ≤6.5% or up to 8% depending on factors such as the level of hypoglycemia, life expectancy, duration of disease, and level of CVD	Perform HbA1c test at least twice a year in individuals who are meeting treatment goals and who have stable glycemic control Lowering of HbA1c fraction is associated with reduction of microvascular complications of diabetes and possibly macrovascular disease
Weight change	For most overweight/obese people (BMI <35 kg/m ²) recommend modest weight loss (5–7% of body weight)	Modest weight loss has been shown to reduce insulin resistance
MNT	Individuals who have pre-diabetes or diabetes should receive individualized MNT as needed to achieve treatment goals, preferably provided by a registered dietitian familiar with components of diabetes MNT; meet body's daily nutritional needs and minimized risk of chronic disease	Structure the program to emphasize lifestyle changes, including education and regular physical activity Modify macronutrient composition to individual and medical condition while meeting DRIs for micronutrients; a variety of meal patterns work (Mediterranean, a lower-fat, lower-carbohydrate pattern, or vegetarian); saturated fat intake should be <7% of total calories; intake of trans fat should be minimized
Physical activity	If there are no medication limitations, physical activity distributed over at least 3 days per week with no more than 2 consecutive days without physical activity; encourage the person to perform resistance training at least twice per week	Physical activity level gradually increased and sustained at target goal To improve glycemic control, assist with weight maintenance, and reduce risk of CVD, at least 150 min of moderate-intensity aerobic physical activity per week (50–70% of maximum heart rate)

BMI, Body mass index; CVD, cardiovascular disease; DCCT, Diabetes Control and Complications Trial; DRI, dietary reference intake; FPG, fasting plasma glucose; HbA1c, glycated hemoglobin; MNT, medical nutrition therapy; NGSP, National Glycohemoglobin Standardization Program; OGTT, oral glucose tolerance test.

From American Diabetes Association. (2012). Standards of medical care in diabetes. *Diabetes Care*, 35(1), S11–S63.

infections. For people who are asymptomatic, following the *Dietary Guidelines for Americans* recommendations for meal planning and food safety is suggested. Implementation of good dietary habits early in the disease may have benefits for end-stage developments such as severe weight loss. The person who receives a diagnosis of being HIV positive usually becomes depressed. Depression can lead to loss of appetite; therefore attention to nutrition is critical as soon as a diagnosis is made.

An initial nutritional assessment suggesting the extent to which nutrition counseling is needed and providing valuable baseline information for evaluation of the progression of the disease is necessary (American Dietetic Association, 2010b). Involving the person's significant others in early discussions of optimal nutrition and food safety is important. A nutrient-dense, protein-rich, well-balanced diet in line with the *Dietary Guidelines for Americans 2015–2020* should be stressed but should also include a vitamin and mineral supplement. Evidence suggests that micronutrient deficiencies are common (zinc, iron, selenium, and vitamin B12) and that those affected individuals not taking vitamin supplementation have increased morbidity and mortality (American

Dietetic Association, 2010b). Fair evidence also shows that people with HIV infection and their caregivers do not understand how to best avoid food-borne illness. Giving them practical tips, as well as reasons to avoid certain foods, is helpful (Hoffman et al., 2005). Because of a compromised immune system, illness in people with HIV/AIDS will become worse when they are exposed to food-borne organisms.

The aims of nutrition therapy and counseling specifically for asymptomatic persons who have HIV/AIDS are individualized and based on the following criteria:

- Determine how the person appeared physically before becoming HIV positive. Was the person obese or heavily muscled? Was the person inactive or athletic? Was the person eating a balanced diet high in vitamins and minerals?
- Determine the calorie intakes necessary to achieve or maintain a healthy weight.
- Determine that the protein is of high quality to help maintain or gain healthy muscle mass.
- Determine what the person knows about nutrition and its effect on the disease as well as food and water safety.

- Determine the person's knowledge of the use of food to ease some of the gastrointestinal side effects of medications.
- Determine the person's understanding of the importance of maintaining eating and medication schedules to ensure maximal absorption of medication.

Assess current knowledge when the individual has diabetes or dyslipidemia, and refer the person as appropriate for teaching about how to manage these conditions within the context of HIV/AIDS.

Breastfeeding should be avoided to prevent vertical transmission of HIV from the mother to the child. This objective is fairly easy to implement in the United States, which has a long history of safe breast milk substitutes in the form of milk-based and soy-based infant formulas. In many developing countries, however, the risks attached to feeding an infant with something other than breast milk are greater than the 20% risk of vertical transmission of the virus that causes AIDS.

CASE STUDY

Obesity/Overweight: Estella

Estella is a 34-year-old Hispanic single mother of three children sharing a small apartment with her 68-year-old mother in inner-city Los Angeles. She is a full-time laborer in a local manufacturing facility and attends night classes to obtain her medical assistant's license. She is receiving some government assistance but is raising her children, aged 4, 7, and 10 years, on a meager income. Most days she arrives home too tired to prepare a well-balanced meal for her family and admits to eating a lot of fast food. Her mother, despite declining vision, works part-time on evenings at a local fast food restaurant to help with financial difficulties. Her mother is responsible for most of the preparation of meals. Their diet consists mainly of inexpensive carbohydrates: flour tortillas, breads, pasta, cheese, and potatoes. The family budget does not allow for much fresh fruit or vegetables or expensive meats; therefore bologna and hot dogs are frequently served.

Estella has recently been hired at a county hospital as a nursing assistant. A required preemployment physical examination revealed several health risks.

At 5 feet, 4 inches, she weighs 185 pounds. Her resting heart rate and blood pressure are also above normal levels. She has a family history of diabetes and heart disease: her father died of a heart attack at age 55 years, and her mother has diabetes that requires daily insulin injections. She was referred to her primary care physician, who recommended immediate lifestyle changes, including walking 30 minutes per day, 4 to 5 days per week, as well as dietary counseling.

Reflective Questions

- What is Estella's understanding of healthy eating?
- How can learning about simple changes in her eating habits affect Estella's weight and risk of type 2 diabetes?
- What local resources promote inexpensive programs to help Estella lose weight?

CARE PLAN

Obesity/Overweight: Estella

***NURSING DIAGNOSIS:** Alteration in current weight related to diet modification and weekly monitoring

Defining Characteristics

- Single mother works full-time and attends night school. Is raising three children and supporting her mother on a limited income. Income falls into poverty level for family of five.
- Is a divorced woman with limited support system and resources.
- Current weight is 185 pounds at 5 feet, 4 inches tall (84.1 kg, 162.6 cm). Her BMI is 31.8 kg/m², including her in the obesity category.
- Resting blood pressure is 164/87 mm Hg, and pulse rate is 88 beats/min.
- Father died at age 55 years of a massive heart attack.
- Mother is overweight and has type 1 diabetes and high blood pressure.
- Diet consists of processed foods and a high-fat diet with little fresh fruit or vegetables.
- Recent job change requires her to be on her feet, walking, lifting, and transporting care recipients.
- Inner-city neighborhood is unsafe to walk in alone or allow her children freedom to play outdoors.
- Single mother of three small boys; she realizes the need to improve her own health to be able to care for and enjoy her children.

Expected Outcomes

- Estella's overall health will improve through reduction of all of the following: weight, BMI, resting pulse rate, and blood pressure.

- Establish realistic goals with Estella to improve quality of meals on a limited income.
- Develop a realistic exercise plan that is inexpensive and not time-consuming.

Interventions

- Teach meal planning strategy to include *Dietary Guidelines for Americans* basic recommendations for a healthy diet and (as deemed appropriate) refer Estella to a certified diabetes educator or registered dietitian if resources permit.
 - Teach Estella easy menus to prepare that use more whole grains, fruits, and vegetables and less processed or fast food. (Resources might include the USDA's Center for Nutrition Policy and Promotion's *Recipes and Tips for Healthy, Thrifty Meals*; https://www.cnpp.usda.gov/sites/default/files/usda_food_plans_cost_of_food/FoodPlansRecipeBook.pdf)
 - Encourage a regular exercise program, beginning with a walking program of 30 minutes per day, four to five times per week. Gradually increase the pace and distance to intensify aerobic benefits.
- Investigate safe options, such as a neighborhood YMCA or park program, for family activities; refer to SNAP or WIC as appropriate; or offer other community resources such as Share Our Strength's Cooking Matters (<http://cookingmatters.org/>) courses for low-income adults and children.

SUMMARY

This chapter has introduced a wide range of subjects, including the *Healthy People 2020* and *Dietary Guidelines for Americans 2015–2020* nutrition objectives, the most current diet recommendations to reduce the risks of developing nutrition-related diseases, FDA regulations for food labeling, government nutrition assistance programs for poor and older Americans, and primary and secondary prevention strategies related to the most common nutrition-related chronic diseases. Many more primary prevention strategies are being discussed as an adjunct to secondary prevention in an effort to make all strategies more successful. Together these topics form the basis of what is known as preventive nutrition, a requisite for the promotion of the nation's public health. All the topics examined in this chapter can be studied further through use of the Internet. High-quality, up-to-date materials and continuing nutrition education literature for professionals are free and on-line.

 EVOLVE CHAPTER FEATURES

<http://evolve.elsevier.com/Edelman/>

- Study Questions

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•Exercise

Kevin K. Chui, Frank Tudini, and Sheng-Che Yen

OBJECTIVES

After completing this chapter, the reader will be able to:

- Explain the physical activity and fitness goals of *Healthy People 2020*, and the progress made toward these goals.
- Describe how physical activity positively influences physical and psychological health.
- Identify the benefits of physical activity throughout the aging process.
- Evaluate the prescriptions for and benefits of daily physical activity, aerobic exercise, and resistance training.
- Explain the interventions to promote exercise adherence and compliance.

KEY TERMS

Aerobic exercise	Exercise prescription	Physical activity
Anaerobic exercise	Fat mass	Physical fitness
Arthritis	Fibromyalgia syndrome	Relaxation response
Borg scale	Flexibility	Resistance training
Cardiorespiratory fitness	Low back pain	Rheumatoid arthritis
Cool-down period	Muscular fitness	Tai chi
Cross-training	Obesity	Warm-up period
Exercise	Osteoporosis	Yoga

? THINK ABOUT IT

Knowing Versus Doing

Having knowledge of the benefits of exercise does not correlate well with long-term exercise compliance. Confidence in the ability to exercise and a sense of the meaning and purpose (core desire) of exercise in life ensure better success.

- What motivates an individual to put the effort into developing and maintaining an active lifestyle?
- Why is being active and physically fit important?

Regular physical activity and exercise enhance both physical and psychological health. Generally, people who exercise regularly, or those who naturally include physical activity in their daily routine, feel better mentally and physically, improve their health profiles, and safeguard their functional independence as they go through the aging process. A holistic approach to physical activity involves exercise for cardiorespiratory health (endurance), exercise for musculoskeletal health (strength, flexibility, and bone density), and body awareness. Body awareness and mindfulness during exercise facilitate self-inquiry and self-acceptance, helping to relieve psychological stress and preventing physical injury (Box 12-1). Not only is an active lifestyle an important component

of primary prevention but regular physical activity is also an essential modality in the treatment of chronic disease, which establishes the potential for benefit in all aspects of the biopsychosocial and spiritual model of health.

DEFINING PHYSICAL ACTIVITY IN HEALTH

To fully understand the *Healthy People 2020* objectives regarding exercise, the following definitions will be used:

Physical activity: body movement that is produced by the contraction of skeletal muscles and that substantially increases energy expenditure; includes transportation and vocational and leisure-time activity. Leisure-time activity can be further categorized into sports, recreational activities, and exercise training (Figure 12-1).

Exercise (exercise training): planned, structured, and repetitive body movement performed to improve or maintain one or more components of physical fitness.

Aerobic exercise: activity that uses large muscle groups in a repetitive, rhythmical fashion over an extended period to increase the efficiency of the oxidative energy-producing system and increase cardiorespiratory endurance; uses stored adipose tissue as a major fuel source.

BOX 12-1 Health Impact of Physical Activity

- Improves quality of life
- Improves mood and promotes a sense of well-being
- Increases flexibility
- Builds muscle strength
- Increases endurance
- Increases the efficiency of the heart
- Increases bone density
- Helps with weight reduction
- Decreases risk of stroke
- Decreases risk of heart disease
- Decreases risk of diabetes



FIGURE 12-1 Some people choose more vigorous types of exercise.

Anaerobic exercise: high-intensity, short-duration activity that increases the efficiency of the phosphocreatine and glycolytic energy-producing systems and increases muscle strength, power, and speed of reactivity; uses phosphagens and glucose-glycogen as major fuel sources.

Physical fitness: a set of attributes (cardiorespiratory fitness, muscular fitness, and flexibility) that people have or achieve that relates to the ability to perform physical activity without undue fatigue or risk of injury.

Muscular fitness: the strength and endurance of muscles that allows participation in daily activities with low risk of musculoskeletal injury.

Flexibility: adequate muscle length and joint mobility to allow free and painless movement through a wide range of motion (ROM).

HEALTHY PEOPLE 2020 OBJECTIVES

Unfortunately, only 23% of the adult population performs enough regular, sustained exercise to gain any significant health benefit, and slightly more than 10% of the population exercises at an intensity necessary to promote cardiorespiratory fitness. According to the Physical Activity and Fitness section (focus area) of *Healthy People 2020*, overall 30.3% of adults 18 years or older in 2013 reported no leisure-time physical activity (National Health

Interview Survey, Centers for Disease Control and Prevention [CDC], National Center for Health Statistics) (US Department of Health and Human Services [USDHHS], 2010). Furthermore, the percentage of adults who report no leisure-time physical activity differs by race and ethnicity, sex, educational level, geographical location, disability status, age group, and the presence or absence of arthritis symptoms. The tendency to be sedentary, unfortunately, continues to increase with age and affects all the body's systems, such as the cutaneous, cardiovascular, respiratory, gastrointestinal, and urinary systems. As a result of a person being sedentary, the risk of premature morbidity, death, impairment, functional limitation, and disability increases. According to data from the 2013 Behavioral Risk Factor Surveillance System (BRFSS), the percentage of adults who engage in no leisure-time physical activity increases with age: 18.3% for 18 to 24 years, 22.5% for 25 to 34 years, 24.9% for 35 to 44 years, 27.3% for 45 to 54 years, 28.7% for 55 to 64 years, and 33.1% for 65 years or older (CDC, 2016a). The goal of the Physical Activity and Fitness focus area is to "improve health, fitness, and quality of life through daily physical activity" (USDHHS, 2010). In 2008 the USDHHS released the first-ever publication of national guidelines for physical activity, *2008 Physical Activity Guidelines for Americans* (USDHHS, 2008). These guidelines provide an evidence-based approach to assist Americans to improve their health status. They recommend that children and adolescents be active for at least 60 minutes daily and advise adults to perform at least 150 minutes of moderate-intensity activity per week or 75 minutes of vigorous activity per week. In 2012, only 20.6% of adults met the guidelines for both aerobic and muscle-strengthening activities (CDC, 2017). The importance of physical activity in the nation's health is reflected in the 15 physical activity and fitness objectives (USDHHS, 2010), a number of objectives which now emphasize traditional and nontraditional partnerships. These objectives take into account the demonstrated relationship between physical activity and an improvement in the biological markers associated with health, and they identify the reasons for the trend toward a more sedentary lifestyle. The National Physical Activity Plan has a vision that all Americans will be physically active in all aspects of their life, which includes work and play (National Physical Activity Plan, 2010). Box 12-2: *Healthy People 2020* provides a summary of the updated physical activity objectives set for 2020.

Physical Activity Objectives: Making Progress

The review of the physical activity data from *Healthy People 2020* (<http://www.healthypeople.gov>) provides evidence of the progress that has been made toward achieving the original objectives and the regress that has occurred (National Center for Health Statistics, 2016; USDHHS, 2010).

Improving trends (the percentage of):

- Adults aged 18 years or older who reported no leisure-time physical activity: 36.2% in 2008, 32.3% in 2009, 32.4% in 2010, 31.6% in 2011, 29.6% in 2012, 30.3% in 2013.
- Adults who engage in aerobic physical activity of at least moderate intensity for at least 150 min/wk, or vigorous intensity for at least 75 min/wk, or an equivalent combination: 43.5% in 2008, 47.2% in 2009, 47.1% in 2010, 48.8% in 2011, 50.0% in 2012, 49.9% in 2013.

BOX 12-2 HEALTHY PEOPLE 2020

Objectives for Physical Activity

- Reduce the proportion of adults who engage in no leisure-time physical activity.
 - Increase the proportion of adults who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity.
 - Increase the proportion of adolescents who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity.
 - Increase the proportion of the nation's public and private schools that require daily physical education for all students.
 - Increase the proportion of adolescents who participate in daily school physical education.
 - Increase regularly scheduled elementary school recess in the United States.
 - Increase the proportion of school districts that require or recommend elementary school recess for an appropriate period.
 - Increase the proportion of children and adolescents who do not exceed recommended limits for screen time.
 - Increase the number of states with licensing regulations for physical activity provided in child care.
 - Increase the proportion of the nation's public and private schools that provide access to their physical activity spaces and facilities for all persons outside normal school hours (i.e., before and after the school day, on weekends, and during summer and other vacations).
 - Increase the proportion of physician office visits that include counseling or education related to physical activity.
 - (Developmental) Increase the proportion of employed adults who have access to and participate in employer-based exercise facilities and exercise programs.
 - (Developmental) Increase the proportion of trips made by walking.
 - (Developmental) Increase the proportion of trips made by bicycling.
 - (Developmental) Increase legislative policies for the built environment that enhance access to and availability of physical activity opportunities.
- Adults who engage in aerobic physical activity of at least moderate intensity for more than 300 min/wk, or vigorous intensity for more than 150 min/wk, or an equivalent combination: 28.4% in 2008, 31.2% in 2009, 31.7% in 2010, 33.1% in 2011, 34.3% in 2012, 34.3% in 2013.
 - Adults who perform muscle-strengthening activities on 2 days or more per week: 21.9% in 2008, 22.6% in 2009, 24.2% in 2010, 24.2% in 2011, 23.9% in 2012, 24.1% in 2013.
 - Adults who meet the objectives for aerobic physical activity and for muscle-strengthening activity: 18.2% in 2008, 19.0% in 2009, 20.6% in 2010, 20.8% in 2011, 20.6% in 2012, 20.8% in 2013.
 - School districts that require regularly scheduled elementary school recess: 57.1% in 2006, 58.9% in 2012.
 - School districts that require or recommend elementary school recess for an appropriate period: 61.5% in 2006, 63.3% in 2012.
 - Children aged 2 to 5 years who view television, view videos, or play video games for no more than 2 hours a day: 75.6% in 2005 to 2008, 76.2% in 2009 to 2012.

- Physician visits made by all children and adults that include counseling about exercise: 7.9% in 2007, 8.7% in 2008, 9.6% in 2009, 9.2% in 2010.

Worsening or no change in the trend (the percentage of):

- Adolescents who meet current federal physical activity guidelines for aerobic physical activity: 28.7% in 2011, 27.1% in 2013.
- Adolescents who participate in daily school physical education: 33.3% in 2009, 31.5% in 2011, 29.4% in 2013.
- Adolescents in grades 9 through 12 who view television, view videos, or play video games for no more than 2 hours a day: 67.2% in 2009, 67.6% in 2011, 67.5% in 2013.
- Adolescents in grades 9 through 12 who use a computer or play computer games outside school (for nonschool work) for no more than 2 hours a day: 75.1% in 2009, 68.9% in 2011, 58.7% in 2013.
- Children aged 2 to 5 years who use a computer or play computer games outside school (for nonschool work) for no more than 2 hours a day: 97.4% in 2005 to 2008, 97.5% in 2009 to 2012.
- Office visits made by individuals with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia that include counseling or education related to exercise: 13.0% in 2007, 14.1% in 2008, 15.1% in 2009, 12.3% in 2010.

According to the 2014 *State Indicator Report on Physical Activity* (CDC, 2014), the US national weighted percentage of adults who reported no leisure-time activity is 25.4% (unchanged since the 2010 report), with a low of 16.5% in Colorado and a high of 36.0% in Mississippi. Furthermore, for adults nationally, 51.6% met the 150-minute aerobic activity per week guideline, 31.8% met the 300-minute aerobic activity per week guideline, 29.3% met the muscle-strengthening guideline, 20.6% met both the 150-minute aerobic activity guideline and the muscle-strengthening guideline, and 3.4% usually biked or walked to work. Nationally for youths, from the Youth Risk Behavior Surveillance System (YRBSS) data, 15.2% reported that they did not participate in at least 60 minutes of physical activity on at least 1 day (an improvement from 17.1% reported in 2010), with a low of 10.7% in Montana and Nebraska and a high of 27.7% in the District of Columbia. Furthermore, for youths nationally, 27.1% met aerobic activity guidelines and 29.4% had daily physical education (a decline from 30.3% reported in 2010). However, despite gains (indicating that the message regarding the benefits of physical activity is reaching some segments of the population), the improvements fall short, and the new goals set for *Healthy People 2020* reflect the work that remains.

The prevalence of obese children, adolescents, and adults has increased in the United States and is considered an epidemic. Children and adolescents (aged 2–19 years) are categorized as being obese if their body mass index (BMI), expressed as weight in kilograms divided by height in meters squared, is equal to or greater than the 85th percentile in age- and gender-specific BMI growth charts. According to results from the NHANES for 2011 to 2014, which is conducted by CDC's National Center for Health Statistics, 17.0% of children and adolescents are obese. By age group, 8.9%, 17.5%, and 20.5% of children and adolescents aged 2 to 5 years, 6 to 11 years, and 12 to 19 years respectively were

obese, with the same pattern found in both sexes (Ogden et al., 2015). Between 1999 to 2000 and 2013 to 2014, there was a significant increase in obesity in children and adolescents; however, there was no significant increase between 2003 to 2004 and 2013 to 2014: 13.9% in 1999 to 2000, 15.4% in 2001 to 2002, 17.1% in 2003 to 2004, 15.4% in 2005 to 2006, 16.8% in 2007 to 2008, 16.9% in 2009 to 2010, 16.9% in 2011 to 2012, and 17.2% in 2013 to 2014 (Ogden et al., 2015).

Adults, those aged 20 years or older, are considered overweight if their BMI is 25.0 to 29.9 kg/m², obese if their BMI is 30.0 kg/m² or higher, and extremely obese if their BMI is 40 kg/m² or higher. According to data from the NHANES for 2011 to 2014, 36.3% of adults aged 20 years or older were obese (Ogden et al., 2015). The overall prevalence of obesity among women (38.3%) was higher than among men (34.3%). The pattern of obesity for both sexes was similar by age group and was highest (40.2%) among middle-aged adults (40–59 years) and lowest (32.3%) among younger adults (20–39 years), with older adults (60 years or older) falling in the middle (37.0%). Between 1999 to 2000 and 2013 to 2014, there was a significant increase in obesity in adults: 30.5% in 1999 to 2000, 30.5% in 2001 to 2002, 32.2% in 2003 to 2004, 34.3% in 2005 to 2006, 33.7% in 2007 to 2008, 35.7% in 2009 to 2010, 34.9% in 2011 to 2012, and 37.7% in 2013 to 2014 (Ogden et al., 2015).

The age-adjusted prevalence of overweight and extreme obesity has also been reported for adults by the NHANES (Fryar et al., 2014). The prevalence of overweight adults was 34.0% in 1999 to 2000, 35.1% in 2001 to 2002, 34.1% in 2003 to 2004, 32.6% in 2005 to 2006, 34.3% in 2007 to 2008, 33.0% in 2009 to 2010, and 33.6% in 2011 to 2012. The prevalence of extreme obesity was 4.7% in 1999 to 2000, 5.1% in 2001 to 2002, 4.8% in 2003 to 2004, 5.9% in 2005 to 2006, 5.7% in 2007 to 2008, 6.3% in 2009 to 2010, and 6.4% in 2011 to 2012.

The number of adults who combine good dietary practice with regular physical activity in an attempt to attain an appropriate body weight has decreased. This decidedly negative trend may be related to the decline in physical activity in and outside schools. According to the YRBSS data from the CDC (2014), 29.4% of adolescents participated in daily school physical education in 2014 (down from 33.3% in 2009), and the target for *Healthy People 2020* is 36.6% (USDHHS, 2010). Additional changes from the YRBSS include a significant increase in the percentage of 9th to 12th graders who report playing video or computer games or used a computer for 3 hours or more per day (31.1% in 2011 compared with 41.3% in 2013) and a decrease in the percentage who played on at least one sports team (58.4% in 2011 compared with 54.0% in 2013).

In a seminal study that tracked physical activity over time using data from the Trois-Rivières Growth and Development Study, there was a significant but weak correlation between adult and childhood physical activity (Trudeau et al., 2004). Researchers from the same institution (Larouche et al., 2012) recently examined the effects of receiving different amounts of physical education during primary school (5 hours of weekly physical education vs. 40 minutes of weekly physical education) on the amount of physical activity during four life transitions (i.e., adolescence, postsecondary studies, entry into the labor market,

and parenthood). They found a progressive nonlinear decline in the physical activity of both groups and differences between sexes during life transitions. The researchers suggest initiatives should be undertaken to maintain or increase physical activity during these transition periods. In a similar type of study based on data from the National Longitudinal Study of Adolescent Health, increased physical activity during adolescence decreased the likelihood of young adults being overweight (Menschik et al., 2008). Using data from the Canadian Physical Activity Longitudinal Study, Brien and colleagues (2007) reported that previous cardiorespiratory fitness ($\dot{V}O_{2max}$) and previous BMI measurements are significant predictors of future weight gain and obesity in adults. Finally, a meta-analysis explored the different mechanisms through which physical activity during adolescence benefits adult health, such as reducing morbidity (Hallal et al., 2006).

If a standard is to be set for the importance of physical activity throughout the life span, it needs to start with children, who have the potential to develop lifelong healthy habits.

As the health care system moves toward a preventive model, primary care providers must facilitate a wellness attitude in their care recipients, which involves not only encouraging individuals to be physically active but also leading by example. Recommending regular exercise and espousing the benefits from personal experience can have a significant influence on individual involvement. Health care practitioners are in a position to inquire about and provide counseling for the exercise habits of their care recipients. For example, for each of the preferred physical therapist practice patterns (musculoskeletal, neuromuscular, cardiovascular/pulmonary, and integumentary), the first corresponding pattern is primary prevention/risk reduction. Although some progress has been made in providing preventive care to reduce risk, data indicate a shortfall in reaching the goal set for 2020 (USDHHS, 2010). Although there has been some improvement in some areas, overall the proportion of the population reporting physical activity has remained essentially unchanged, and progress is limited. Obviously, the progress that has been made toward the physical activity objectives for the year 2020 does not reflect a significant shift in the attitude of the general population or the health care profession. There are still populations at greater risk of obesity based on race/ethnicity (National Institute of Diabetes and Digestive and Kidney Diseases, 2012; Whitson et al., 2011); school type, public versus private (Li & Hooker, 2010); and socioeconomic status (Balistreri & Hook, 2011; Scharoun-Lee et al., 2009) (Box 12-3).

Aging

The biological changes attributed to aging closely resemble the effects of physical inactivity. The list for both aging and inactivity includes an increase in body fat and a decrease in all the following: aerobic capacity, muscle mass (sarcopenia), metabolic rate, strength and flexibility, bone mass, sexual function, mental performance, immune function, and sleep quality.

Among older adults, exercise can improve health, prevent disability and hospitalizations, improve blood lipid profiles, and reduce body fat. According to the 2010 US census, the population aged 65 years or older has grown to 40.3 million people, an increase of 15% since 2000 (US Census Bureau, 2011). In 2012

BOX 12-3 Populations With Low Rates of Physical Activity

- Women are generally less active than men at all ages.
- People with lower incomes and less education are typically not as physically active as those with higher incomes and education.
- Black Americans and Hispanics are generally less physically active than whites.
- Adults in northeastern and southern states tend to be less active than adults in north central and western states.
- People with disabilities are less physically active than people without disabilities.
- By age 75 years, one in three men and one in two women engage in no regular physical activity.

there were an estimated 43.1 million older adults aged 65 years or older, and that number is expected to almost double to 83.7 million by 2050 (Ortman et al., 2014). Projected numbers and proportions of the US population of older adults have been reported: 43.1 million or 13.7% in 2012, 56.0 million or 16.8% in 2020, 72.8 million or 20.3% in 2030, 79.7 million or 21.0% in 2040, 83.7 million or 20.9% in 2050 (Ortman et al., 2014).

Exercise is especially important for older women, who constitute the majority of the older population, because it has the potential to improve bone health (Bielemann et al., 2013; Hamilton et al., 2010; Julián-Almárcegui et al., 2015) and reduce fracture risk as part of a multidimensional approach (Kemmler et al., 2013; Perry & Downey, 2012). The percentage of female older adults aged 65 years or older has been reported and projected as 56.4% in 2012, 55.1% in 2030, and 55.1% in 2050 (Ortman et al., 2014). The percentage drastically increases for reports and projections for older adults aged 85 or older: 66.6% in 2012, 62.4% in 2030, and 61.9% in 2050 (Ortman et al., 2014).

By exercising, older people can improve levels of cardiovascular, cardiopulmonary, and metabolic functions, including muscle performance and aerobic capacity. Several researchers have reported significant increases or improvements in strength (Candow et al., 2011), physical performance such as gait speed (Chou et al., 2012), flexibility (Marquard et al., 2012), self-efficacy (Park et al., 2011), quality of life (McGrath et al., 2010), balance (Rose & Hernandez, 2010), continence (Shamliyan et al., 2008), bone density (Alghadir et al., 2015), safety (fewer falls and fall-related injuries) (Caban-Martinez et al., 2015), and the ability to live independently (Cowan et al., 2009). Additional resources are available that discuss exercise prescription considerations and guidelines for the older adult (American College of Sports Medicine [ACSM], 2013; Chodzko-Zajko et al., 2009; Elsayy & Higgins, 2010; Liu et al., 2011a; McDermott & Mernitz, 2006; O'Donovan et al., 2010).

Older adults, in particular, need to be concerned about their nutritional status because the potential for malnutrition, a common problem for older adults, is associated with a decline in muscle strength and thus poorer outcomes, such as decreased function and performance (Bauer et al., 2008; Henwood et al., 2012; Jones et al., 2009; Mithal et al., 2013; Morgan, 2012; Tarnopolsky, 2008; Walrand et al., 2011).

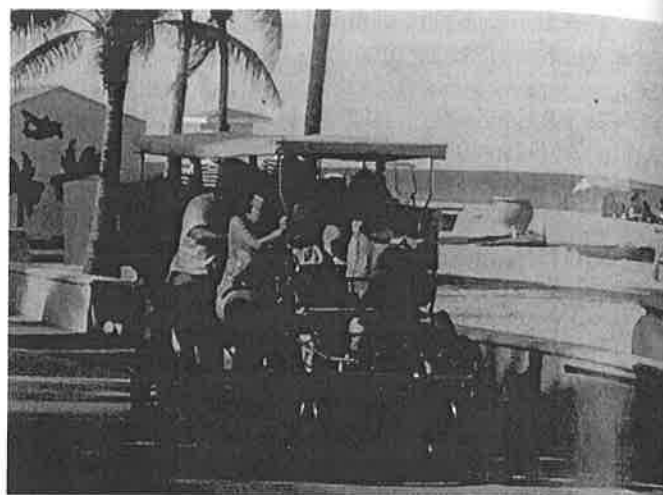


FIGURE 12-2 Older adults can maintain functional independence while biking.

The health of the musculoskeletal system depends on movement and activity. Bone is a dynamic tissue, constantly changing and adapting to the stresses to which it is subjected. Bone strength depends on stresses applied by muscular and weight-bearing activity (mechanical stress during active movement). Exercise may increase or maintain bone mineral density (BMD), but recent meta-analytic data suggest that the effects of exercises on BMD may depend on the mode of exercise, body part, combination of exercises (mixed loading), and other (e.g., pharmacological, tai chi) concurrent treatments (Almstedt et al., 2011; Alperson & Berger, 2011; Guadalupe-Grau et al., 2009; Howe et al., 2011; Martyn-St James & Carroll, 2009). To stay healthy, joints must do what they are designed to do—move and bear weight. The health of the cartilage covering the joint surfaces is vital for maintaining proper joint function. The only way the cartilage can receive nourishment is through the manufacture and distribution of synovial fluid, which delivers nutrients, removes waste products, and lubricates joint surfaces. Movement is vital for the creation of this environment of blood and lymph in and out of joint structures and the adjacent soft tissues. Without the stress of weight-bearing activity, normal bone and cartilage metabolism and repair become dysfunctional, resulting in injury and disease.

Effects of Exercise on the Aging Process

Everyone needs physical activity to be healthy. Human physiology has evolved in preparation for physical exertion. Until recently, survival through the vigor of daily living depended on a moderate degree of physical fitness. However, with mechanization and the style of living in today's society, daily life has become too sedentary. A lifestyle of inactivity places the population at risk of death and morbidity, and the literature supports exercise as an essential element of health.

Regular physical activity can help maintain functional independence and improve the quality of life throughout the aging process (Figure 12-2). Physical and psychological benefits of increased physical activity have been documented widely in healthy and in chronically ill older adults (Arne et al., 2009;

CDC, 2015; Dogra, 2011; Lin et al., 2010; Liu-Ambrose et al., 2010). Unfortunately, according to data from the BRFSS, less than 33.1% of older adults engage in physical activity (CDC, 2016a). According to the CDC (2015), older adults require at least 2.5 hours of moderate-intensity aerobic activity weekly, as well as muscle strengthening on 2 days or more per week. Considerable research has tested interventions to increase activity by younger adults and by populations of all ages. Interventions' research with older adults is being reported more frequently. The most common interventions are self-monitoring, general health education, goal setting, supervised center-based exercise, problem-solving, feedback reinforcement, and relapse prevention education. A few studies have examined multicomponent cognitive-behavioral group intervention (Zijlstra et al., 2009). Lifestyle activity in an older adult recommends the accumulation of minutes of physical activity spread over the entire day. Some evidence suggests the potential beneficial effects of lifestyle activity and the probability that some aging adults may be more receptive to lifestyle activity changes that include episodic exercise (Zijlstra et al., 2009).

CARDIAC RISK FACTORS

The literature strongly demonstrates that the risk of coronary heart disease (CHD) decreases as physical activity increases and that a plausible relationship between the decreased risk and a number of potential physiological and metabolic mechanisms exists (Ahmed et al., 2012; Ghadieh & Saab, 2015; Li et al., 2015; Pattyn et al., 2013):

- Increasing levels of high-density lipoprotein (HDL) cholesterol
- Decreasing levels of low-density lipoprotein (LDL) cholesterol
- Decreasing total cholesterol levels
- Decreasing serum triglyceride (TRG) levels
- Decreasing high blood pressure
- Improving glucose tolerance and insulin sensitivity
- Decreasing obesity; altering the distribution of body fat
- Reducing the sensitivity of the myocardium to the effects of catecholamines, thereby decreasing the risk of ventricular arrhythmias
- Enhancing fibrinolysis and altering platelet function

High-Density Lipoprotein and Serum Triglyceride Levels

Exercise has a major influence on lipoprotein metabolism, primarily affecting plasma levels of HDL and TRG. There is a strong negative correlation between CHD and plasma HDL levels. Increases in HDL level lower the total cholesterol to HDL ratio, thereby reducing CHD risk. Exercise, a common part of treatment of hypertriglyceridemia, may have a lowering effect on TRG levels (Cho et al., 2014; Lee & Heo, 2014; Vrablík & Češka, 2015). A meta-analysis of randomized controlled trials examined the effects of progressive resistance training on adults and found significant reductions in total cholesterol levels, the ratio of total cholesterol to HDL, and the levels of non-HDL, LDL, and TRG (Kelley & Kelley, 2009). A similar systemic review examined

exercise in obese children and found that aerobic exercise improved LDL and TRG concentrations and that combined exercise (aerobic fitness, strength, and flexibility training) improved the HDL concentration (Escalante et al., 2012). In another study of obese children, exercise significantly lowered total cholesterol, TRG, LDL, very low density lipoprotein, and insulin levels and significantly increased HDL levels when compared with no exercise (Zorba et al., 2011). A recent meta-analysis of randomized controlled trials compared the effects of diet, exercise, and both diet and exercise on total cholesterol, HDL, LDL, and TRG and found that exercise alone and when combined with diet results in positive changes in lipid and lipoprotein levels in adults (Kelley et al., 2012).

The effect of exercise on lipid metabolism may be related more to the volume (duration and frequency) than to the intensity of the exercise. In a systematic review, Tambalis and colleagues (2009) reviewed the literature for responses in the levels of blood lipids to a variety of modes and volumes of exercise. Moderate-intensity aerobic exercise training (less than 60% $\dot{V}O_{2max}$ or six metabolic equivalents) appears to have the greatest effect on HDL levels. However, stronger evidence suggested that high-intensity aerobic training promotes significant increases in HDL levels. This was observed among a wide range of 90 to 200 minutes per week. Resistance training supported a marked reduction in LDL levels, followed by a significant reduction in total cholesterol levels. The review found combining resistance and aerobic exercise can lead to remarkable reductions in LDL levels, significant increases in HDL levels, and significant decreases in total cholesterol levels (Tambalis et al., 2009).

Hypertension

According to the CDC, the age-adjusted percentage of the US population with hypertension increased from 25.5% in 1988 to 1994 to 30.0% in 2011 to 2012. The ACSM (2009a) and the American Heart Association (Braith & Stewart, 2006) recommend resistance training in the prevention and treatment of hypertension (Box 12-4). Furthermore, the ACSM (Pescatello et al., 2004) summarizes evidence, of differing degrees, that supports the use of physical activity, dynamic aerobic training, dynamic exercise, and resistance training to decrease blood pressure in adults. The summary of the evidence supports regular endurance exercise to decrease blood pressure in older adults. There was no evidence to support a different blood pressure response to exercise between sexes and different ethnicities. A recent systematic review examined the effects of various forms of exercise training on resting blood pressure in healthy adults (Cornelissen & Smart, 2013). Only randomized controlled trials were included in the meta-analysis, and the results indicate that endurance, dynamic resistance, and isometric resistance training lower both systolic blood pressure and diastolic blood pressure. A similar meta-analysis reported the blood pressure-lowering effects of dynamic resistance training and isometric handgrip training (Cornelissen et al., 2011).

The ACSM recommends endurance training should include aerobic activities with use of large muscle groups on most days of the week for 30 minutes or more (ACSM, 2009a). Low- to moderate-intensity aerobic exercise also appears to be effective in

BOX 12-4 Resistive Training Exercises**Chest Press (Figures 1 and 2)**

- Lie on a bench with feet flat on the bench, or lie on the floor with knees bent and feet flat, whichever is more comfortable.
- Hold weights near shoulders with elbows out and palms facing away from the body.
- Exhale while extending arms straight up, following an "A" pattern with the weights touching at the peak.
- Slowly lower the weights back to original position while inhaling.
- Repeat 8 to 12 times.

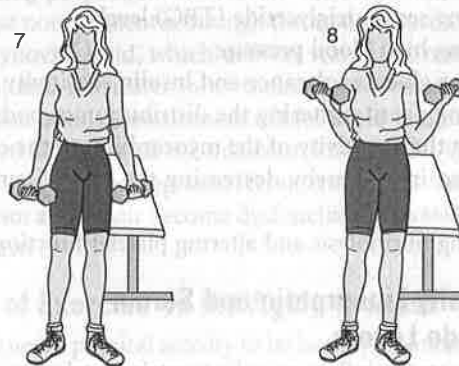
Chest Fly (Figures 3 and 4)

- Lie on a bench with feet flat on the bench, or lie on the floor with knees bent and feet flat, whichever is more comfortable.
- With palms facing each other, extend arms above chest, keeping elbows slightly bent at all times.
- Inhale and lower arms perpendicularly away from the body until arms are out of peripheral vision.

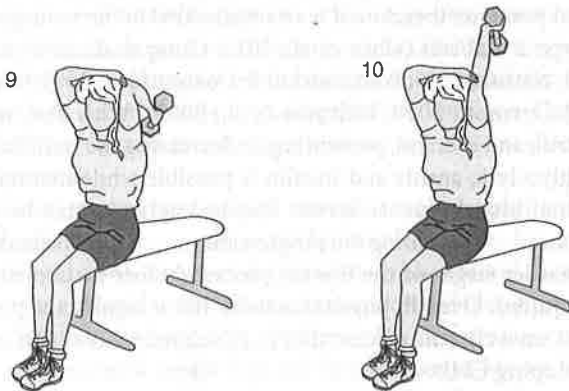
- Exhale while returning to starting position by visualizing arms hugging a barrel that is lying on the chest.
- Repeat 8 to 12 times.

Bent Over Row (Figures 5 and 6)

- Bend at waist while supporting the body with one hand (on table, bench, etc.) and holding a weight with the other hand in an overhand grip.
- Keep knees bent while the weight is hanging perpendicular to the torso.
- Slowly pull the weight up to the chest as if starting a lawn mower, exhaling and keeping the elbow away from the body.
- Slowly lower weight back to starting position while inhaling.
- Repeat 8 to 12 times on each side.

Dumbbell Curl (Figures 7 and 8)

- Stand or sit with weights held at sides in an underhand grip, keeping elbows close to the body and upper arms stationary.
- Curl weights to the chin or upper chest while exhaling.
- Inhale while slowly lowering weights.
- Keep back straight throughout the duration of motion.
- Repeat 8 to 12 times.

BOX 12-4 Resistive Training Exercises—cont'd**Triceps Extension (Figures 9 and 10)**

- While seated or standing in the neutral back position, lift the hand holding the weight straight above the head and in alignment with the ear.
- Keeping the upper arm tight, slowly bend the elbow to lower the weight between the shoulder blades.
- Use the free hand to support the elbow and to prevent movement in the upper arm.
- Raise the weight back to its original position by straightening the arm and exhaling.
- Repeat 8 to 12 times on each side.

lowering blood pressure (Cornelissen et al., 2009; Hua et al., 2009; Roussel et al., 2009). The mechanisms underlying the exercise-training effect on lowering blood pressure are not completely clear but may involve attenuation of sympathetic nervous system activity. This attenuation results in the dilation of peripheral blood vessels, which decreases systemic vascular resistance. Decreasing sympathetic nervous system activity may have a beneficial effect on the insulin resistance that is often observed in hypertensive people. The literature has also uncovered significant effects of both interval and continuous training of between 45 and 60 minutes on systolic and diastolic blood pressure (Lamina, 2010). Fagard (2011) reviewed the current literature and found inconclusive evidence for exercise intensity and its effect on blood pressure. This study observed two exercise groups, low-intensity exercise (33% of heart rate reserve) and high-intensity exercise (66% of heart rate reserve), performed three times a week for a 1 hour each time. The results revealed that systolic blood pressure decreases with both intensities but diastolic blood pressure decreases significantly after higher-intensity exercise (Fagard, 2011).

Hyperinsulinemia and Glucose Intolerance

Hyperinsulinemia and glucose intolerance account for the various types of diabetes. Diabetes mellitus encompasses a group of metabolic disorders that have in common an increase in blood glucose levels and associated metabolic dysfunction. Type 1 involves elevated blood glucose levels that are a result of a deficiency of circulating insulin caused by destruction of the pancreatic β cells, and type 2 diabetes involves elevated blood glucose levels from insulin resistance (decreased insulin sensitivity)—largely in skeletal muscles—or impaired insulin secretion (Nathan, 2015). Approximately 90% to 95% of those with diabetes have type 2 diabetes. According to the CDC, the age-adjusted percentage of the US population with diabetes increased from 8.8% in 1988 to 1994 to 11.9% in 2011 to 2012. In addition, adiposity and poor fitness are linked with insulin resistance (Larson-Meyer et al., 2010). Complications of diabetes include heart disease and stroke, peripheral arterial disease, retinopathy, nephropathy, peripheral neuropathy, and lower-extremity amputation (Deshpande et al., 2008).

Exercise, in addition to diet, is a first-line intervention for diabetes (Gulve, 2008). In a recent meta-analysis of randomized controlled trials, both diet and lifestyle interventions including exercise and physical activity decreased 2-hour plasma glucose and fasting plasma glucose levels in individuals with impaired glucose tolerance (Gong et al., 2015). In a similar meta-analysis of randomized controlled trials, researchers examined the effects of lifestyle interventions including exercise and physical activity on risk factors in individuals with type 2 diabetes and found a significant reduction in the level of hemoglobin A1c (HbA_{1c}), among other risk factors (Chen et al., 2015). A randomized control trial by Belli and colleagues (2011) examined the effects of 12-week overground walking training in individuals with type 2 diabetes. The exercise group performed walking at the ventilatory threshold velocity. When compared with the control group, the exercise group had significant reductions in HbA_{1c} levels (glycemic control) and body composition (body mass and BMI) and a significant increase in exercise capacity (peak oxygen uptake and exercise duration). Marcus and colleagues (2008) compared the effects of aerobic exercise with a combination of aerobic and high-force eccentric resistance exercise over the course of 16 weeks in individuals with type 2 diabetes. Both groups had a significant decrease in HbA_{1c} levels, decrease in amount of intramuscular fat, and increase in 6-minute walk distance, with no between-group differences. The aerobic and high-force eccentric resistance exercise group also had a significant gain in lean tissue and greater decrease in BMI when compared with the aerobic exercise group (Box 12-5: Diversity Awareness).

In addition, several meta-analyses examined the effects of different modes of exercise on glycemic control. Strasser and colleagues (2010) examined the effect of resistance training with abnormal glucose metabolism and found significant improvements in glycemic control, with a mean HbA_{1c} level reduction of 0.48%. Irvine and Taylor (2009) found the following results in individuals with type 2 diabetes: progressive resistance exercise resulted in a significant reduction in HbA_{1c} level of 0.3% when compared with no exercise; there was no difference in HbA_{1c} levels between resistance and aerobic exercise groups; and progressive resistance exercise resulted in significant increases in strength



BOX 12-5 DIVERSITY AWARENESS

Walk Away From Ethnic Glucose Intolerance

The Pima Indians of the Gila River Indian Community in Arizona have the highest documented incidence rates of type 2 diabetes in the world. On the island of Mauritius in the southwest Indian Ocean, all four ethnic groups (Hindu and Muslim Asian Indians, African Creoles, and Chinese) have unusually high rates of type 2 diabetes. In the United States, type 2 diabetes is 30% more prevalent in blacks than in whites. The presence of type 2 diabetes in each of these ethnic groups provides strong support for the existence of one or more modifiable risk factors in the cause of the disease.

Excessive weight gain is a strong independent predictor of type 2 diabetes. The development of type 2 diabetes (characterized by insulin resistance, hyperinsulinemia, and glucose intolerance) is related to weight gain in adults, particularly to fat accumulation around the waist, abdomen, and upper body (android or apple shape). This type of fat distribution is also associated with a higher risk of developing CHD. Adipose tissue is a major site for insulin insensitivity, and most obese individuals have increased insulin resistance or some degree of glucose intolerance, or both.

Physical activity has an important role in the prevention and treatment of type 2 diabetes. By helping to maintain a proper lean-to-fat body mass, either by losing weight or by preventing weight gain, physical activity may indirectly protect against the development of type 2 diabetes. The modulating effect of physical activity on fat stores helps to increase insulin sensitivity and glucose tolerance. Additionally, physical activity may directly affect glucose metabolism. The shorter-term effect of exercise can lower plasma glucose levels by enhancing the effect of insulin; long-term exercise improves insulin action and increases glucose tolerance.

Epidemiological studies of ethnic groups indicate that physical inactivity is also a risk factor for type 2 diabetes. In the United States, blacks and Native Americans have a disproportionate number of poor, unemployed, and disadvantaged individuals who lack access to the health care system. The least active individuals within these populations should be given the most attention because they have the most to gain. The methods and programs that are used to relay information to the public on the importance of physical activity need to be varied, depending on the socioeconomic and cultural factors specific to ethnic populations. Promotion of physical activity by schools, communities, and government and health agencies, with these factors in mind, will significantly help achieve the goal of improving lifestyles and decreasing the incidence of type 2 diabetes.

when compared with aerobic exercise and no exercise. Chudyk and Patrella (2011) reported that aerobic exercise alone or combined with resistance training significantly reduced HbA_{1c} levels, systolic blood pressure, and triglyceride levels in individuals with type 2 diabetes. Furthermore, waist circumference was significantly reduced only when aerobic exercise and resistance training were combined.

During physical activity, contracting skeletal muscles work with insulin to enhance glucose uptake into the cells (Stanford & Goodyear, 2014; Turcotte & Fisher, 2008). Insulin resistance impedes glucose mobilization into cells, increasing plasma glucose levels and setting the potential for development of type 2 diabetes. Although insulin resistance in skeletal muscles may be the primary defect, the development of disease appears to be related to elevated insulin levels, a result of the body's response to the need to mobilize glucose into the cells. Additionally, this syndrome also often involves elevated TRG levels and hypertension, which

contribute to the potential for disease. Exercise increases insulin sensitivity, improves the inherent effect of endogenous insulin, decreases obesity, and plays a role in lowering TRG levels and blood pressure; therefore it is recommended in the management of type 2 diabetes (Chen et al., 2015; Gong et al., 2015; Gulve, 2008; Nathan, 2015; Polikandrioti & Dokoutsidou, 2009; Waryasz & McDermott, 2010; Weltman et al., 2009). With diet, weight control, and exercise, preventing or decreasing the need for oral antiglycolytic agents and insulin is possible while maintaining normal blood glucose levels. Physical activity may be most beneficial in preventing the progression of type 2 diabetes during the earlier stages of the disease process, before insulin therapy is required. Overall, physical activity has a significant positive effect on a chronic disease that is associated with a high risk of developing CHD.

OBESITY

Overweight and obesity are conditions of excess body fat (adipose tissue). Adults are considered overweight if their BMI is 25.0 to 29.9 kg/m² and obese if their BMI is 30.0 kg/m² or higher. Furthermore, the ACSM (Wallace & Ray, 2009) considers those with a BMI of 40 kg/m² or higher as being extremely obese.

Obesity may also be defined as body weight that is equal to or greater than 120% to 125% of the ideal body weight. Fat mass (body fat percentage) is also important in determining the ideal body weight. The recommended body fat levels are approximately 15% to 16% for men and 23% to 24% for women (ACSM, 2009b). The average American man and woman tend to exceed the recommended body fat level. An increase in fat mass and the development of obesity occur when energy intake exceeds total daily energy expenditure for a prolonged period. Decreased physical activity may be both a cause and a consequence of weight gain over a lifetime.

The prevalence of obesity, as well as overweight and extreme obesity, is typically reported on the basis of BMI values, as is the case with the National Health and Nutrition Examination Survey (NHANES). Unfortunately, the prevalence of obesity in the United States remains high and has been increasing. According to the NHANES data for 2009 to 2012 (CDC, 2016b), from 2009 to 2012 35.3% of the US population was obese (up from 33.9% in 2005 to 2008). A nutrition and weight status objective (NWS-9) for *Healthy People 2020* is to reduce the proportion of adults who are obese to 30.5% in 2020. In the United States, no state has met the nation's *Healthy People 2010* goal to lower obesity prevalence to 15%. In fact, no state has an obesity prevalence less than 20%. The number of states with an obesity prevalence between 30% and less than 35% actually increased from none in 2000 to 19 in 2014, including Alabama, Delaware, Georgia, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, and Wisconsin (CDC, 2014). Furthermore, three states have a prevalence of obesity greater than 35%: Arkansas, Mississippi, and West Virginia.

According to the most recent NHANES data, the prevalence of obesity in women exceeds that of men in the non-Hispanic black, Hispanic, and Mexican American ethnic groups.

Furthermore, the prevalence of obesity differs by racial/ethnic group for female adults only. That is, adult females of Mexican American (49.2%), Hispanic (44.4%), and non-Hispanic black (56.6%) racial/ethnic backgrounds have a greater prevalence of obesity than do those of non-Hispanic white (32.8%) background. In contrast, the prevalence of obesity is comparable for males of Mexican American (44.0%), Hispanic (40.1%), non-Hispanic black (37.1%), and non-Hispanic white (32.4%) racial/ethnic backgrounds.

Several studies have related increased fat mass and reduced physical activity to the risk of cardiovascular disease and overall mortality (Larson-Meyer et al., 2010). Both obesity and decreased activity are related to insulin resistance, elevated blood pressure, and elevated total and LDL cholesterol concentrations, all of which reduce with weight loss and fitness (Larson-Meyer, 2010). Nevertheless, obesity should be considered an independent target for intervention in health promotion. Being overweight and being obese are major contributors to many preventable causes of death. On average, higher body weights are associated with higher death rates (USDHHS, Prevention and Wellness, 2015).

Maintaining fitness and health is closely related to controlling weight. The literature supports the positive influence that physical activity has on body weight and obesity. A meta-analysis concluded that exercise resulted in weight loss in people who were overweight or obese (Shaw et al., 2006). In fact, in comparison with no treatment, the meta-analytic data show that exercise alone produced favorable changes in body weight, BMI, diastolic blood pressure, and serum triglyceride, serum HDL, and fasting serum glucose levels. A more recent meta-analysis examined the effect of exercise on body composition in menopausal women (Yeh et al., 2011). The results showed a significant decrease in weight, BMI, and body fat in menopausal women who exercised. A recent study examined the ability of obese adolescents with diabetes to retain the benefits of a 12-week exercise intervention (Gow et al., 2016). Significant gains in aerobic fitness ($\dot{V}O_2$ peak) and time to anaerobic threshold were achieved after the intervention and were maintained for an additional 6 months.

Physical activity:

- Promotes a negative energy balance (burns calories)
- Increases metabolic rate for an extended period after the activity
- Increases metabolic efficiency for burning calories by increasing lean body mass
- Helps counteract the decrease in metabolic rate associated with low-calorie diets by preserving lean body mass
- Is a good alternative to eating when eating is a response to stress rather than to hunger

Unfortunately, most overweight people ignore exercise as a means of weight loss, or they exercise at rates below federal health guidelines (CDC, 2010).

Management of obesity involves a comprehensive program of nutrition management, behavior modification, and physical activity or exercise. The key to normalizing body fatness is long-term adherence and permanent lifestyle changes, not dieting or short-term exercise trials.

Increasingly sophisticated obesity treatments that demonstrate the best outcomes emphasize five components: behavioral

techniques, cognitive strategies, social support, nutrition, and exercise. The effectiveness of physical activity is related to the frequency and duration of each activity session and the longevity of the activity program. Recommended ACSM guidelines for exercise include the following (Wallace & Ray, 2009):

- A program of low-impact aerobic exercise, increase in daily activities, and resistance training
- A frequency of 5 to 7 times a week
- A length of 40 to 60 minutes a day or 20 to 30 minutes twice daily

As long as calorie expenditure is similar, moderate lifestyle activity may be as effective as structured exercise. Moderate intensity appears to be most effective for total and fat calorie consumption during the activity.

Women tend to have a 5% to 10% lower resting metabolic rate than men and a higher percentage of body fat than men of similar weight. Consequently, women have a lower percentage of lean body mass and may not be as metabolically active as are men during exercise. Women may expend up to 40% fewer calories than do men during the same exercise protocol at the same relative intensity (Tremblay et al., 1985).

Fat in men is stored primarily in the upper body or upper abdominal region. Fat in women is primarily stored in the lower half of the abdomen, the hips, and the thighs. Adipose tissue metabolism tends to be different in various regions. The fat-metabolism response to exercise appears to be less in the femoral-gluteal region than in the upper body-abdominal region. Femoral-gluteal adipose tissue serves as an important source of energy during lactation. Women may not lose fat as easily as do men in response to exercise, because genetic differences are related to where and how fat is stored and metabolized. Consequently, women who need to lose weight may need to be more diligent about increasing the duration of their exercise training sessions and making resistance training a priority to facilitate maximal energy expenditure.

Several studies have examined parental awareness of weight status in children. A survey by the American Academy of Child and Adolescent Psychiatry (2004) of parents, 23% of whom had overweight children, reported that only 10.5% of parents with overweight children perceived their children's weight accurately compared with 59.4% of other parents. In a study by He and Evans (2007), 29.9% of the children examined were overweight or obese. However, on the basis of the parent's perception of their children's weight, only 18.3% were overweight or obese. Factors such as the child's sex, the child's ethnicity, and mother's weight contributed to the parent's inability to recognize weight status. In a study by Huang and colleagues (2007), 61% of parents correctly identified their child's weight status, and these parents were also able to correctly identify the weight status of unrelated children in 58% of reviewed photographs. The results indicate that the parent's ability to correctly identify their child's weight status depends on their child's age and weight status. Moore and colleagues (2012) examined factors that influenced parental concern about their child's weight. Their results indicate that parents were significantly more likely to be concerned about their child's weight if the child was female, they believed the

child to be overweight or obese, or the child was overweight or obese on the basis of the BMI.

OSTEOPOROSIS

Osteoporosis, or porous bone, is the most common bone disease and a major health threat. It is characterized by low bone mass and structural weakness of bone tissue, leading to bone fragility and increased risk of fractures (National Institutes of Health, Osteoporosis and Related Bone Diseases National Resource Center, 2011; Smith et al., 2009). In the United States an estimated 10 million people have osteoporosis and 44 million have low bone density and an increased risk of developing osteoporosis (National Osteoporosis Foundation, 2016). Furthermore, half of adults aged 50 years and older are at risk for breaking a bone, and one in two females and one in four males will fracture a bone due to osteoporosis. Unfortunately, the incidence of osteoporosis in women is greater than heart attack, stroke, and cancer combined (National Osteoporosis Foundation, 2016).

Some loss of bone occurs naturally after age 30 years. Twenty to thirty percent of bone mass development is regulated by environmental factors, such as nutrition and physical activity. In addition to the importance of optimizing physiological intake of calcium and vitamin D (Kalyani et al., 2010), and maintaining normal menstrual cycles for maximization of peak bone mass, physical activity plays a significant role in developing bone mass during childhood and adolescence and in maintaining skeletal mass into adulthood and old age (Bielemann et al., 2013). Two recent meta-analyses provide evidence to support the importance of the combined effects of nutrition and physical activity on bone health (Behringer et al., 2014; Julián-Almárcegui et al., 2015). Physical activities, those that involve weight-bearing in particular, increase BMD (Behringer et al., 2014; Borer, 2005) and provide support for a stronger skeletal foundation throughout aging. Additionally, systematic reviews examining the effects of different exercises in menopausal and postmenopausal women suggested that an active lifestyle and strength training may help to reduce fracture risk and preserve BMD, specifically spine and hip BMD, in osteopenic and osteoporotic women (Howe et al., 2011; Hurley & Armstrong, 2012; Martyn-St James & Carroll, 2009; Zehnacker & Bemis-Dougherty, 2007). A systematic review supports the benefits of resistance training to improve the domains of physical function and activities of daily living in those with osteoporosis or osteopenia (Wilhelm et al., 2012). Inadequate calcium intake during growth has implications for peak bone mass, which may occur as early as the late teenage years or as late as the mid-30s, and may have implications for bone health later in life (Theobald, 2005). Unfortunately, Caucasian females in North America aged 4 to 8 years, 9 to 18 years, 19 to 50 years, and older than 51 years take in 105%, 64%, 74%, and 55% of the recommended amount of calcium respectively (Borer, 2005). Although dietary sources are the preferred means of achieving adequate calcium intake, foods fortified with calcium are becoming more prevalent and are manufactured to provide approximately 300 mg of calcium in each serving (see Chapter 11).

Bone mass increases during childhood and adolescence and peaks during the third decade of life. When a person reaches

age approximately 30 years, age-related bone loss occurs throughout the skeletal system, in all races and in both sexes. However, there are significant differences in bone loss patterns between the sexes, with female sex being a risk factor for osteoporosis. Women have less bone mass than men at all ages, and by their mid-thirties can expect age-related bone loss of approximately 1% annually. The rate of bone loss accelerates rapidly during the first 5 years after menopause, with annual losses of 3% to 5% being common. By the fifth decade, or during their forties, women can anticipate a 10% loss of vertebral bone mass. Cumulative bone loss can approach 40% of peak bone mass over a woman's lifetime. Unfortunately, a loss of at least 30% of bone mass is required for detection on plain film radiographs (McKinis, 2014). Therefore it is important to detect women at risk early in the natural course of the disease and to target interventions toward lifestyle-oriented health promotion. Additional risk factors for osteoporosis include Caucasian/Asian race, family history, low body weight for height, premature menopause, lack of physical activity, long-term smoking, and excessive alcohol consumption (Mirza & Cannalis, 2015; Smith et al., 2009; Stagi et al., 2014). In addition, risk factors for osteoporotic fractures attributable to falls include sensory and coordination deficits, unsafe living situation, older age, musculoskeletal weakness, alterations in posture (e.g., increased spine kyphosis), diminished reflexes, medication use, and associated diseases (Hsu et al., 2014; Kessenich, 2007).

The ACSM recommends that osteoporotic people should engage in weight-bearing and impact exercises to promote strengthening and cardiovascular conditioning, as well as flexibility, coordination, and balance training to improve quality of life, maintain an active lifestyle, and decrease the risk of falls (Kohrt et al., 2004). Maintenance of bone mass may be related to the intensity of the physical activity and the degree to which the activity stresses the bone. Weight-bearing actions that stress the skeleton (walking, stair climbing, floor calisthenics, and aerobic dance) have a positive effect on bone density. Weight-bearing exercise, which increases mechanical stresses on the skeleton, is an important component of reducing osteoporosis risk. Such exercises should be performed for 20 to 30 minutes or more, at least three to five times per week (Smith et al., 2009). Recent intervention trials and meta-analyses suggest that low-impact to moderate-impact weight-bearing exercises combined with resistance and/or agility training facilitate the most effective gains in BMD, prevention of bone loss, and functional capacity in older men and women (Nikander et al., 2010). Aerobic exercise and resistance training have also been advocated for people with osteoporosis (Iwanto et al., 2010) and may give affected individuals more desire to participate in daily activities, promoting a more active lifestyle (Lirani-Galvao & Lazaretti-Castro, 2010). In younger women, the goal of exercise is to increase bone density; in older women who are already 30 to 40 years after menopause, a more realistic goal would be to decrease the risk of fractures through fall prevention. With respect to reducing fall risk in older postmenopausal women, Lirani-Galvao and Lazaretti-Castro (2010) found that tai chi may play a role in preventing osteoporotic fractures because of increases in muscle strength and improvements in balance and decreased risk of falling; however,

research has shown that tai chi does not support increases in BMD. Furthermore, it was found that the incidence of fragility fractures was noticeably lower in middle-aged to older men and women who participated in 3 to 4 days of moderate to vigorous physical activity per week (Nikander et al., 2010). A recent review also discusses the evidence to support the use of assistive devices such as spinal and foot orthoses for fall prevention (Hsu et al., 2014). See Box 12-6: Research for Evidence-Based Practice for a recent longitudinal study that supports the benefits of exercise to reduce the incidence of falls and fractures in older women with a history of falls (Kim et al., 2014).

ARTHRITIS

Arthritis upsets the balance of joint health. Although rheumatoid arthritis and osteoarthritis have different causes and attack different parts of the joint, impaired joint function is the result. Cartilage is destroyed, and irregularities occur in the bone ends. As proper joint alignment changes, normal ROM is decreased, normal muscle balance and activity are altered, and disfigurement and dysfunction occur; and ultimately normal movement patterns are altered. Although there is an ongoing progression in arthritis that cannot be reversed by exercise, physical activity nevertheless helps to restore health to synovium and cartilage, increase strength and flexibility, decrease joint vulnerability, and delay the onset of dysfunction. Most importantly, exercise has been shown to reduce pain and joint stiffness, reduce fatigue, and improve function and psychological well-being in individuals with arthritis (Cooney et al., 2010; Kelley et al., 2015; Kujala, 2009; Nelson et al., 2014). Further evidence is needed to determine if postponing exercise is appropriate during exacerbations of rheumatoid arthritis (Cooney et al., 2010); however, vigorous exercise is

typically contraindicated in individuals with acute joint inflammation (ACSM, 2009b).

Using exercise to counteract the effects of inactivity associated with arthritis is certainly a component to effective management (ACSM, 2009b). Although researchers have concluded that regular exercise cannot relieve or cure arthritis, exercise has the following quality-of-life benefits for people with arthritis (ACSM, 2009b; Cooney et al., 2010; Kujala, 2009; Nieman, 2000):

- Improvement in joint function and increase of ROM
- Increase in muscle strength and aerobic fitness that enhance daily activities of living
- Improvement in psychological state
- Decrease in loss of bone mass, and may promote increased BMD
- Decrease in the risk of chronic disease

Consequently, exercise programs based on individual needs and interests should emphasize exercises to increase joint ROM and flexibility (performed before aerobic or strength activities) and should also include muscle-strengthening (two to three times per week) and aerobic exercises (5–10 minutes with progression to a 30-minute session 3–5 days per week) and be functionally based (ACSM, 2009a).

The collective evidence strongly and consistently suggests that exercise is beneficial for individuals with osteoarthritis. The specific aspects of exercise prescription for individuals with osteoarthritis have been studied to differing extents. In terms of the different modes of exercise, various forms of exercise have been shown to be effective for osteoarthritis. A systematic review of studies of the effect of aquatic exercise on osteoarthritis concluded that aquatic exercise produces short-term beneficial effects on function and quality of life and, to a lesser extent, pain management (Bartels et al., 2007). A more recent systematic

BOX 12-6 RESEARCH FOR EVIDENCE-BASED PRACTICE

Falls and fractures in participants and excluded nonparticipants of a fall prevention exercise program for elderly women with a history of falls: 1-year follow-up study.

Objectives: To examine the effectiveness of strength and balance exercises to prevent falls in community-dwelling older adults with a history of falls.

Design: A 1-year follow-up study was conducted on 105 women older than 70 years who had experienced at least one fall in the previous year. Participants were randomly assigned to an exercise group or education group. A third group consisted of women excluded from participation. The exercise group performed strengthening and balance activities that increased in complexity in a sequential manner for 3 months. The education group received information on nutrition, cognitive function, and oral hygiene in the same period. Those excluded from the study were asked to continue their regular routines. Outcomes of interest, including falls, injuries, fractures, and function, were measured at three points in time: at the baseline, after intervention, and at 1-year follow-up. Falls, injuries, fractures, and function were measured at the baseline, after intervention, and at 1-year follow-up.

Setting: Community health promotion center.

Participants: Community-dwelling women older than 70 years with a history of falls.

Intervention: Participants were randomly assigned to one of two groups: exercise (conducted twice per week for 3 months to improve strength and balance) ($n = 52$) and education (conducted once per month for 3 months; $n = 53$). Both groups were also compared with a group of excluded participants ($n = 91$).

Measurements: The primary outcome measures included fall rates, fracture rates, and odds ratios (ORs) for falls and fractures. Additional outcome measures included measures of balance, walking speed, and lower extremity strength.

Results: There was a significant difference ($\chi^2 = 7.069$, $P = 0.029$) in fall incidences between groups: 19.6% in the exercise group, 40.4% in the education group, and 40.8% in the excluded group. There was also a significant difference (Fisher's exact test = 0.043) in fracture rate between groups: 10.0% in the exercise group, 9.5% in the education group, and 27.6% in the excluded group. When compared with the exercise group, those in the education group (OR 2.78) and the excluded group (OR 2.83) had significantly greater odds of falling, and those in the excluded group (OR 4.30) also had significantly greater odds of fractures. Additional significant differences between groups and over time included increases in one leg standing time, usual walking speed, knee extension strength, and dorsiflexion strength.

Conclusion: These findings support the use of strengthening and balance exercises to decrease the incidence of falls and fractures in those with a history of falls.

From Kim, H., Yoshida, H., & Suzuki, T. (2014). Falls and fractures in participants and excluded nonparticipants of a fall prevention exercise program for elderly women with a history of falls: 1-year follow-up study. *Geriatrics & Gerontology International*, 14(2), 285–292.

review examined the effects of aquatic exercise on symptoms and function associated with lower extremity osteoarthritis and reported significant effects for pain, self-reported function, physical functioning, stiffness, and quality of life (Waller et al., 2014). With respect to fall risk, the available evidence produces mixed results with use of aquatic exercise to reduce fall risk in individuals with hip and/or knee osteoarthritis, supporting the use of aquatic exercise in conjunction with fall risk education to effectively reduce fall risk, but not the use of aquatic exercise alone (Arnold & Faulkner, 2010; Hale et al., 2012). Lastly, an 18-week trial comparing aquatic exercise with land-based exercise found that although both modes of exercise improved function and pain management, the aquatic exercise group demonstrated a significantly greater reduction in pain level (Silva et al., 2008). Long-term effects have not been shown to date; thus, we suggest aquatic exercise either be incorporated into a broader exercise program or be modified and exercise increase regularly to promote adaptation to and avoid accommodation to the training stimulus.

With respect to non-aquatic-based exercise, an umbrella review found high-quality evidence supporting the beneficial effects of exercise on pain and function in individuals with osteoarthritis of the knee (Jamtvedt et al., 2008). Similarly, a systematic review of the effects of strength training alone, exercise therapy alone, and a combination of exercise and manual therapy in individuals with osteoarthritis of the knee concluded that these modes of treatment improved function and reduced pain to a small degree, with the addition of manual therapy to treatment producing a moderate effect on pain (Jansen et al., 2011). A systematic review incorporating adults and older adults with knee osteoarthritis supported progressive resistance exercise and aerobic exercise as having a modest beneficial effect on strength, pain, and function (Keysor & Brems, 2011). A recent systematic review of randomized controlled trials concluded that physical therapies including strength training, tai chi, and aerobic exercises improved balance outcomes and decreased fall risk in older individuals with knee osteoarthritis (Mat et al., 2015).

Available evidence may also support a small but positive benefit from education and self-management programs as complements to exercise to improve self-efficacy (May, 2010). Furthermore, additional evidence suggests that increased belief that physical activity can be beneficial to manage arthritis leads to higher levels of participation in physical activity (Ehrlich-Jones et al., 2011) and is significantly associated with decreased pain and fatigue, increased function, and a self-perceived positive effect (Bezalel et al., 2010; Hewlett et al., 2011; Pisters et al., 2010). Exercise intensity is another important consideration for exercise prescription in individuals with osteoarthritis (OA); however, unlike the mode of exercise, intensity has received little attention. There is limited research available that compares the outcomes in individuals with OA with the intensity of training; however, some evidence supports both high-intensity and low-intensity training as being of equal benefit in individuals with knee OA with respect to pain, strength, and function, without a difference in the rate of unfavorable effects. More research is needed to determine the optimal parameters for exercise in individuals with osteoarthritis, and an impairment-based, person-centered

approach with consideration of comorbidities and accessibility is required (Bennell & Hinman, 2011).

Rheumatoid arthritis (RA) and fibromyalgia syndrome are two related arthritic conditions that have begun to be studied more. Evidence suggests that aerobic exercise in individuals with fibromyalgia can increase function and relieve some symptoms (Busch et al., 2008). However, evidence pertaining to the effectiveness of strength training to produce similar effects in individuals with fibromyalgia is of low quality (Kujala, 2009). A recent systematic review concluded that aquatic therapy can improve self-reported function capacity (Fibromyalgia Impact Questionnaire) and performance-based function (6-minute walk test) and reduce stiffness in individuals with fibromyalgia (Lima et al., 2013). In addition to evidence supporting the use of a combination of aerobic and strength exercises to improve outcomes in those with rheumatoid arthritis (Cooney et al., 2010), the use of tai chi as a form of activity in individuals with RA has also been considered. A case series study of the use of tai chi in individuals with RA supported significant reduction in swelling of joints and increase in strength and endurance as measured by the "timed sit to stand test," and suggests practicing tai chi may help individuals with RA increase their level of physical activity (Uhlig et al., 2010). Importantly, although the evidence has not shown that tai chi reduces pain or relieves other symptoms of RA, it does not appear to exacerbate these symptoms (Han et al., 2004). A meta-analysis of the effects of cardiorespiratory aerobic exercise in individuals with rheumatoid arthritis demonstrated small but meaningful effects on quality of life, function, and pain (Baillet et al., 2010). In addition, a recent systematic review examined the correlates in four categories (sociodemographic, physical, psychological, and social variables) with levels of physical activity in individuals with rheumatoid arthritis (Larkin & Kennedy, 2014). Positive correlations with physical activity were found for motivation, self-efficacy, health perception, and previous physical activity levels, whereas negative correlations were found for fatigue, a coerced regulation style (i.e., the extent to which the person believes the physical activity goal was set not by himself or herself but by others), and certain physiological variables.

Again, further evidence is needed to determine if postponing exercise is appropriate during exacerbations of RA (Cooney et al., 2010). A review of the studies of the effects of aerobic exercise, strength training, and aquatic therapy on individuals with fibromyalgia syndrome concluded there is evidence supporting benefits of exercise in this population to improve function and well-being, and decrease pain and stiffness (Busch et al., 2007; Kujala, 2009; Lima et al., 2013). Aerobic activities such as stepping and walking and strengthening exercises such as lifting weights or use of resistance exercise machines can be used in addition to stretching for flexibility. Although exercise is part of the overall management of fibromyalgia syndrome, the review by Busch and colleagues (2007) examined the effects of exercise when used separately or combined with other strategies such as education programs, biofeedback, and medications. In that review, aerobic exercises were done for at least 20 minutes once a day (or twice for 10 minutes), 2 days a week. Strength training was done two to three times a week and with at least 8 to 12 repetitions per exercise. The exercise programs lasted between 2.5 and 24

weeks. In a study by Sañudo and colleagues (2010), aerobic exercise was compared with combined exercise (aerobic, muscle strength, and flexibility exercises) and control (nonexercising) groups. Both exercise groups demonstrated significant improvements on the Fibromyalgia Impact Questionnaire and the Beck Depression Inventory. When compared with the aerobic exercise and control groups, the combined exercise group had significantly better outcomes on the SF-36 physical function, body pain, vitality, and mental health subscales and for ROM (shoulder and hip) measurements and grip strength. In a more recent study, Sañudo and colleagues (2012) examined the effect of whole-body vibration exercise on balance in women with fibromyalgia. The control group received an exercise training program, and the experimental group received the same exercise training program plus whole-body vibration exercises. The results indicated that the group with whole-body vibration demonstrated significantly better balance, as measured by the mediolateral stability index, when compared with the control group.

LOW BACK PAIN

Low back pain is a common medical and social problem frequently associated with disability and absence from work. Low back pain is a multifactorial disorder that is unlikely to be caused by a single factor. Obesity is associated with an increased risk of low back pain, as well as an increased likelihood of seeking care for subacute and chronic low back pain (Shiri et al., 2010). The risk of low back pain increases as BMI increases: 2.9% when BMI is 20 to 25 kg/m², 5.2% when BMI is 26 to 30 kg/m², 7.7% when BMI is 31 to 35 kg/m², and 11.6% when BMI is 36 kg/m² or greater (Smuck et al., 2014). Contrary to commonly held opinion, there is a lack of evidence that a sedentary lifestyle is a risk factor for the onset of low back pain (Chen et al., 2009). However, higher levels of muscular and aerobic fitness are associated with a decreased risk of low back pain (Heneweer et al., 2012). A recent meta-analysis concluded that aerobic exercise can reduce pain and improve the physical and psychological functioning of individuals with chronic low back pain (Meng & Yeu, 2015). Roffey and colleagues (2010a) in a systematic review found strong evidence that there is no relationship between awkward occupational postures and low back pain. Specifically, it is unlikely that occupational bending and twisting (Wai et al., 2010a), occupational sitting (Roffey et al., 2010b), occupational standing or walking (Roffey et al., 2010c), occupational lifting (Wai et al., 2010b), occupational pushing or pulling (Roffey et al., 2010d), occupational carrying (Wai et al., 2010c), and occupational manual handling and individual assistance (Roffey et al., 2010e) are independent risk factors for low back pain.

Exercise can, however, have a positive influence on low back pain. There is some evidence to support overground walking more than treadmill walking in the management of low back pain (Hendrick et al., 2010). A more recent study found a positive synergistic effect of a rehabilitation program consisting of 14 exercises and treadmill exercises on the low back extensor strength in individuals with chronic low back pain (Cho et al., 2015). A systematic review concluded that exercise can effectively reduce pain and improve function in persons with chronic low back

pain; however, there was no clear advantage for any one form of exercise (van Middelkoop et al., 2010). Staal and colleagues (2004) concluded that graded activity was more effective than usual care in reducing the number of days of absence from work because of low back pain. Olaya-Contreras and colleagues (2015) examined the effects of advising a group of people with acute severe low back pain to “stay active in spite of the pain,” and they found no difference in pain intensity trajectory and a significantly higher level of physical activity when this group was compared with a group that was instructed to “adjust activity to the pain.” Given the acknowledged detriments of bed rest, staying active is good advice for individuals with low back pain. A recently updated Cochrane Review found that exercise therapy for acute low back pain may be effective in reducing pain and improving function in persons with chronic low back pain and reducing absenteeism in persons with subacute low back pain (Hayden et al., 2005). Another Cochrane Review found moderate evidence that exercise following treatment for low back pain may reduce recurrent episodes of low back pain (Choi et al., 2010).

The spinal column is composed of 24 vertebrae stacked vertically, forming natural curves that allow the bony column to function with the resiliency of a spring. The intervertebral disks help with mobility and shock absorption. The health of the bony vertebrae and the cartilaginous disks depends on movement. The cartilage receives its nutrients from cyclical compression and decompression as a function of weight-bearing and non-weight-bearing movement. Similarly, repeated weight-bearing and non-weight-bearing activity stimulates vertebral bone integrity.

Muscles are intimately involved in the support and function of the spinal column. Maintaining the proper curves (anterior and posterior convexities) of lordosis in the cervical and lumbar vertebrae and kyphosis in the thoracic vertebrae is vital for sustaining the spring and shock-absorption qualities of the spine. The lumbar curve is especially influenced by three sets of muscles that are attached to the pelvis and the lumbar vertebrae. By altering the tilt of the pelvis, these muscles can increase (iliopsoas muscle) or decrease (abdominal and hamstring muscles) the lumbar curve. In addition, the deep muscles of the back (paraspinal muscles) work in controlled synergistic and antagonistic fashions to control spinal planes of motion; they are also influential in supporting the spinal curves in posture. Weakness or shortening of any of these muscles can adversely impact posture and increase stress on the back. The result can be back pain from muscle strain, altered joint function (facet joints), and abnormal force on the intervertebral disks.

In a systematic review, Hayden and colleagues (2005) concluded that in persons with various levels of low back pain, exercise was beneficial in terms of reducing pain, improving function, and decreasing absenteeism. The American Pain Society and the American College of Physicians have also jointly stated that there is good evidence for the effectiveness of exercise in reducing chronic low back pain (Chou & Huffman, 2007). Specific types of exercise that have been shown to be effective in persons with low back pain include training of the deep and superficial paraspinal muscles as well as unweighted or suspended exercise. The only systematic review of the effects of unweighted movement

on persons with chronic low back pain concluded that there was consistent and strong evidence to support unweighted exercise to decrease pain and improve function (Slade & Keating, 2007). Exercise targeting specific lumbar paraspinal muscles has been shown to substantially reduce pain and restore function (Chang et al., 2015; Hwangbo et al., 2015; Koumantakis et al., 2005; Shaughnessy & Caulfield, 2004). Although walking appears to be effective in the management of chronic musculoskeletal pain, including low back pain (O'Connor et al., 2015), Rasmussen-Barr and colleagues (2009) found that graded exercises target both deep and superficial muscles that support and control the lumbar spine and pelvis and were more effective in the long term in reducing disability and the need for recurrent treatment and improving pain self-efficacy.

The goal of exercise programs for individuals with low back pain is to prevent debilitation as a result of inactivity and to increase endurance, strength, and flexibility, allowing a return to usual functional activities. Exercise recommendations and progression of activity are highly individualized on the basis of the origin, duration, and severity of pain. Strengthening exercises for trunk and extremity musculature have been demonstrated to benefit people with low back pain. Aerobic conditioning, such as walking, swimming, and stationary bicycling, is recommended to maintain endurance and prevent debilitation from inactivity (ACSM, 2013).

Advanced age, osteoporosis, arthritis, and low back pain are not reasons to exclude exercise from anyone's lifestyle. In fact, the opposite is true. These conditions are reasons to remain as physically active as possible to facilitate the ability to function throughout the aging process.

A referral to a physical therapist is warranted in most, if not all, cases of low back pain to allow there to be proper comprehensive management, which may include exercise as well as other safe and effective interventions.

IMMUNE FUNCTION

The relationship between exercise and immune function has a fairly long history of study, and the interest that grew out of the human immunodeficiency virus (HIV) epidemic continues to stimulate investigations in this area. Several studies demonstrate that people with impaired immune function can exercise safely without risk to their health status and can enhance their physiological and psychological well-being with regular exercise (Fillipas et al., 2006; Galantino et al., 2005; Gomes-Neto et al., 2013; Sax, 2006; Terry et al., 2006). A systematic review concluded that progressive resistive exercise may increase body weight and limb girth and aerobic exercise may improve adipose levels and lipid profiles by decreasing fat in tissues and blood in individuals with HIV (Fillipas et al., 2010). Another systematic review concluded that resistance exercise may improve body composition by decreasing body fat and increasing muscle strength, aerobic exercise may also improve body composition and increase aerobic capacity, and concurrent training may improve all outcomes evaluated in individuals with HIV (Gomes-Neto et al., 2013).

Furthermore, two recently updated meta-analyses suggest that aerobic exercise, either alone or in conjunction with

progressive resistance exercise, can be safely performed by adults with HIV/acquired immunodeficiency syndrome (AIDS) and may increase fitness and improve body composition and well-being (O'Brien et al., 2009, 2010). Recommended parameters include exercising at least three times per week for 20 minutes over a period of 5 weeks or more (O'Brien et al., 2010).

The effect of exercise on immune system markers (e.g., CD4 levels, CD4/CD8 ratio, or viral load) in people with HIV/AIDS is unclear. Reviews discuss the effects of exercise on immune function in individuals with HIV/AIDS and report conflicting findings (Anderson, 2006; Dudgeon et al., 2004). A meta-analysis compared aerobic exercise groups with nonexercising groups and found no significant differences in CD4 count, CD4 percentage, or viral load (Nixon et al., 2005). Similarly, meta-analytic data compared the combination of aerobic and progressive resistance exercise with no exercise and found no significant differences in CD4 count (O'Brien et al., 2004). Despite the fact that the CD4 count did not differ between exercising and nonexercising groups, there were significant beneficial changes in depressive symptoms, mean body weight, mean arm and thigh girth, and maximum heart rate for those in the exercising groups (Nixon et al., 2005; O'Brien et al., 2004). In another study, Jagers and colleagues (2015) examined the effects of combined aerobic and resistance training on the psychological well-being of adults with HIV and found significant decreases in depression and mood states (Profile of Mood States) for the exercise group. The control group, the members of which were allowed to engage in sedentary activities, showed a significant increase in the perception of stress (Perceived Stress Scale). Evidence suggests that regular exercisers and athletes are less likely to become ill than sedentary women (Nieman, 1994) and middle-aged men and women (Matthews et al., 2002). In direct contrast, evidence also suggests that athletes are also at increased risk of infection during increased periods of training or after competition (Nieman, 1994; Nieman et al., 1990; Pedersen & Bruunsgaard, 1995; Peters-Futre, 1997). Another reported finding is that after exercise, sedentary individuals have a higher risk of infection than active individuals (Kiwata et al., 2014). A recent review concluded that immune function, both innate and acquired, of athletes under heavy training is often observed to decrease by approximately 15% to 25%, but studies on whether this change increases infection risk remain inconclusive (Walsh et al., 2015).

Classic epidemiological studies indicate that a J-curve relationship may exist between the intensity of exercise and the risk of upper respiratory tract infection (URTI) (Nieman, 1994; Pedersen et al., 1998). That is, in theory, moderate exercise may decrease the risk of URTI below that of a sedentary individual, but high-intensity exercise may raise the risk above average. In direct contrast, Lee and colleagues (1992) concluded that immune function was not linked to the risk of URTI in a group of cadets during basic training, and Pyne and colleagues (1995) reported similar rates of URTI between elite swimmers under intense training and age- and gender-matched sedentary controls. Similarly, Gleeson and colleagues (2013) reported that high-exercising (≥ 11 h/wk) and medium-exercising (7–10 h/wk) groups had more URTI episodes than the low-exercising (3–6 h/wk) group. Factors that confound studies on the relationship

between exercise and URTI include failure to distinguish between new infection and the clinical manifestations of a dormant infection (Gleeson et al., 2002) and failure to distinguish between airway hyperresponsiveness and URTI (Langdeau & Boulet, 2001).

Immune system changes that are apparently related to the intensity of exercise have been identified. Moderate-endurance exercise stimulates the neuroendocrine system, which causes changes in the function and numbers of various immune system cells, such as the natural killer, CD4, and CD8 cells. Evidence also indicates that moderate exercise is associated with a prolonged improvement in the killing capacity of neutrophils (one of the most efficient phagocytes). Several immune marker changes suggest increased risk of illness in those who engage in high-intensity exercise, including a low level of salivary immunoglobulin (antibodies), low serum complement levels, low lymphocyte count, depressed natural killer cell activity, low helper and suppressor T cell ratio, and decreased neutrophil phagocytic capacity (Mackinnon, 1992; Nieman, 1994; Pedersen & Ullum, 1994). Most aspects of immunity in male and female athletes are not significantly different (Gleeson et al., 2011).

Changes in immune cell counts and activity may be related to hormonal immunoregulation. Moderate exercise increases the release of immunostimulatory hormones, such as growth hormone and endogenous opiates (β -endorphin and methionine enkephalin). The increase in the levels of β -endorphins with exercise seems to have a positive effect on natural killer cell activity. Conversely, intense exercise is associated with increases in the levels of catecholamine and corticosteroid (cortisol), which have immunosuppressive characteristics (Mackinnon, 1992). High-intensity exercise is also associated with muscle cell damage and inflammation. The immune system is involved in tissue repair. It is theorized that while immune cells are busy with the repair process, host protection may suffer. A window of opportunity for infection during recovery from high-intensity exercise appears to exist. Accordingly, rest is recommended after vigorous exercise to allow the body to recover, and moderate exercise may be the better choice for enhancement of health and well-being.

There is convincing evidence that exercise and physical activity have a significant protective effect on the gastrointestinal system, and, in particular, against colon cancer (Martin, 2011). However, there is less convincing evidence for the following conditions: gastric and pancreatic cancers, gastroesophageal reflux disease, peptic ulcer disease, nonalcoholic fatty liver disease, cholelithiasis, diverticular disease, irritable bowel syndrome, and constipation (Martin, 2011).

Evidence also suggests that physical activity is a modifiable risk factor for breast cancer (Bardi, 2007). Physical activity appears to lower the risk of developing many conditions, in particular breast cancer (Warburton et al., 2007). Unfortunately, physical activity during adolescence does not appear to play a protective role for the risk of breast cancer later in life (Gammon et al., 1998). A recent meta-analysis concluded that physical activity may reduce all-cause breast cancer-related deaths and breast cancer events in breast cancer survivors (Lahart et al., 2015). Another meta-analysis concluded that physical activity may decrease the risk of prostate cancer, and encouraged men to engage in regular physical activity (Liu et al., 2011b). A synthesis

of clinical practice guidelines, systematic reviews, meta-analyses, and individual studies suggests that exercise may minimize or prevent adverse physiological effects of cancer and its treatment (Ingram & Visovsky, 2007). A recent position statement on immune function and exercise (Walsh et al., 2011) offered the following conclusion: "There is consensus that exercise training protects against some types of cancers. Training also enhances aspects of antitumor immunity and reduces inflammatory mediators. However, the data linking immunological and inflammatory mechanisms, physical activity, and cancer risk reduction remains tentative."

Preliminary findings in the area of immunosenescence, the natural decline in immune function that occurs with aging, suggest that regular exercise and increased fitness may have potential immune restorative properties and improve the "immune risk profile" in elderly people (Simpson & Guy, 2010).

MENTAL HEALTH

People who exercise regularly generally state that they feel better, have increased self-esteem, and have a more positive outlook on life. Not only do they feel better physically, they also they feel better mentally. Epidemiological research with both men and women suggests that physical activity may be associated with improvements in positive affect and general sense of well-being (USDHHS, 2015). Much of the work has focused on depression (Cooney et al., 2013; Josefsson et al., 2014), anxiety (Bartley et al., 2013; Wegner et al., 2014), stress (Georgiades et al., 2000; Rimmele et al., 2007), and schizophrenia (Firth et al., 2015; Górczynski & Faulkner, 2010).

Evidence from a review of the literature (prospective studies, randomized controlled trials, and meta-analyses) found that exercise protects against and is an intervention for mild to major depression (Graven et al., 2011; Nahas & Sheikh, 2011). A recent meta-analysis concluded that exercise can reduce depressive symptoms in individuals with arthritis and other rheumatic conditions (Kelley et al., 2015). Research by the National College Health Assessment examined the association between vigorous/moderate or strength-training exercises and mental health in a national sample of college women (Adams et al., 2007). Both vigorous/moderate and strength-training exercises were positively associated with perceived health. Furthermore, both vigorous/moderate and strength-training exercises were negatively associated with several indicators of mental health (e.g., depression, anxiety, and suicidal ideation). Similarly, research examined the association between exercise and mental health and concluded that mental health is modifiable through exercise (Galper et al., 2006; Windle et al., 2010).

The mental health benefits of physical activity, as an intervention, have been summarized elsewhere and include promoting mental health and well-being in healthy adults, preventing and treating mental disorders, and supporting psychosocial rehabilitation (Nyström et al., 2015; C. W. Wang et al., 2014; F. Wang et al., 2014).

Investigations have focused on populations across the life span, including children, young adults, and older adults. Based on a limited number of small trials, a recently updated Cochrane

Review concluded that, when compared with no intervention, exercise reduces anxiety and depression in children and young adults (Larun et al., 2009). Another Cochrane Review suggests that long-term exercise, of various types, is most likely to have a beneficial effect on mood in adults; however, the magnitude of the effect is indeterminate at this point (Mead et al., 2009). Researchers examining major depressive disorder recommended an exercise prescription that is supervised, individually customized, at least 30 minutes, and at least three times per week (Nyström et al., 2015). Yoga has also been shown to be effective in treating depression (Cramer et al., 2013).

In a recent systematic review of the effect of exercise on cognitive function in older adults, Tseng and colleagues (2011) suggested that there were positive benefits to adopting unimodal, simple exercises for cognitively impaired older adults and a more diversified, multimodal program for healthy older adults. They also recommended an exercise regimen of 6 weeks in duration, at least three sessions per week lasting 60 minutes each, to increase the likelihood of a positive effect on cognition.

Furthermore, the effect of exercise on individuals with various disorders or diseases, such as schizophrenia, cancer, or other chronic illnesses, has been studied. In a systematic review, Herring and colleagues (2010) concluded that although exercise in sedentary persons with a chronic illness reduces anxiety, training programs lasting as few as 12 weeks and consisting of sessions of at least 30 minutes resulted in the largest reductions in anxiety. A Cochrane Review of the psychological and physical effects of dance and movement therapy on persons with cancer was unable to arrive at a conclusion because of a dearth of high-quality studies in this area, although there may be a positive effect on quality of life in persons with breast cancer (Bradt et al., 2011). Based on a limited number of small trials, an updated Cochrane Review concluded that regular exercise may improve both physical and mental health and well-being in persons with schizophrenia (Gorczyński & Faulkner, 2010). Exercise had been shown in two meta-analyses to improve health-related quality of life in those scheduled to receive, actively undergoing, or having completed cancer treatment (Mishra et al., 2014, 2015).

Various types and modalities of exercise have been used in studies; an example of one such intervention is tai chi. Tai chi significantly improved both psychological (perceived well-being) and physical (functional capacity, knee extension strength, and flexibility) health over baseline levels (Macfarlane et al., 2005). In a systematic review and meta-analysis of the effect of tai chi on psychological well-being, Wang and colleagues (2010) demonstrated an apparent association with reductions in anxiety, depression, mood disturbance, and stress, as well as improvements in self-esteem. A more recent review examining various populations again supported the benefits of tai chi for treatment of depression, treatment of anxiety, general stress management, and exercise self-efficacy (F. Wang et al., 2014). Yoga has also been shown to decrease depression and anxiety in a variety of conditions (Cramer et al., 2013; Pascoe & Bauer, 2015). Similarly, qigong exercise has been shown to reduce stress and anxiety in healthy adults when compared with waiting list controls (C. W. Wang et al., 2014).

EXERCISE PRESCRIPTION

The literature certainly reflects both the physiological and the psychological benefits that can be experienced with commitment to an active lifestyle. In short, regular physical activity or exercise can help people feel better, look better, and perform better. Unfortunately, as discussed, Americans have failed to embrace the concept and health value of an active lifestyle. Many have been overwhelmed by the misperception that to gain health benefits they must perform vigorous, continual exercise. The result has been discouragement in getting started and poor compliance in staying with it. “No pain, no gain” has been an unfortunate and common refrain (Box 12-7: Quality and Safety Scenario).

People need to be reminded that many of their daily physical activities are actually forms of exercise (Figure 12-3). This approach to physical activity serves as a good foundation to a healthy lifestyle. However, when possible, individuals should also be encouraged to include more formal exercise training in their overall activities to promote optimal cardiorespiratory fitness and significantly increase muscle strength and endurance. The amount of exercise required to achieve these goals is determined by the parameters of an exercise prescription:

F (frequency)	Aerobic exercise three to five times a week Resistance training two to three times a week
I (intensity)	Moderate to vigorous, by heart rate and perceived exertion Able to complete each resistance exercise, 8 to 12 repetitions, without strain
T (time)	20 to 60 minutes, plus warm-up and cool-down periods 15 to 30 minutes to complete a series of 8 to 10 resistance exercises
T (type)	Aerobic (walking, jogging, biking, swimming, rowing, cross-country skiing, elliptical trainer, NordicTrack, StairMaster, aerobics, dancing, skating, or rollerblading) Resistance training (weight machines, free weights, and calisthenics such as push-ups, sit-ups, or pull-ups) (ACSM, 2013)

Aerobic Exercise

The benefits of aerobic exercise are cumulative; therefore a frequency of three to five times a week is recommended. Every other day is a good frame of reference and allows recovery between training sessions, potentially decreasing the chance of overuse injuries. The benefits of exercising more than five times a week are outweighed by the risk of injury, especially with higher-impact activities. When more frequent exercising is a goal, cross-training is recommended. Cross-training means performing different types of exercise on different days of the week or performing different types of exercise within

BOX 12-7 QUALITY AND SAFETY SCENARIO

Less Pain, More Gain

In an attempt to encourage increased participation in physical activity, a panel of scientists from the CDC and the ACSM came together to review the evidence related to physical activity and to issue a public health message concerning the recommended types and amounts of physical activity. The evidence clearly indicates that the protective effects of exercise can be achieved at more moderate levels of intensity than had been recommended previously. The health and fitness benefits of exercise appear to be related more to the total amount of exercise performed (calories expended) rather than to the specific exercise intensity, frequency, and duration. The recommendations are as follows:

- Adults should perform 30 minutes or more of moderate-intensity (brisk) physical activity on most (or all) days of the week, for a weekly total of 3 to 4 hours.
- The activity need not be continuous; benefits can be realized with short bouts of activity (a minimum of 10 minutes) over the course of the day.
- This amount of activity will expend approximately 150 to 200 calories per day (the equivalent of walking 2 miles briskly) or 1000 to 1400 calories per week.

- All types of activity can be applied to the daily total (raking leaves, dancing, or gardening).
- Lower-intensity activities should be performed more often, or for longer periods, or both. More vigorous activities should be performed for shorter periods or less frequently.

Because most adults do not meet these standards, they have the most to gain by incorporating a few minutes of increased activity into their day, gradually building up to 30 minutes a day. People who are active on an irregular basis should strive to be more consistent. People who prefer more formal exercise can choose to participate in more vigorous, organized exercise regimens, sports, and recreational activities.

Sedentary individuals gain the most by increasing their activity to the recommended level. However, any person who already meets the standards can derive some additional benefit by becoming more active.

People who do a little bit of exercise are better off than those...who do none and those who do a little more are better off still (Franklin, 1993).

Franklin, B. (1993). How much exercise is enough? In *Encyclopedia britannica* (pp. 471–476). Los Angeles: Encyclopedia Britannica, Inc.

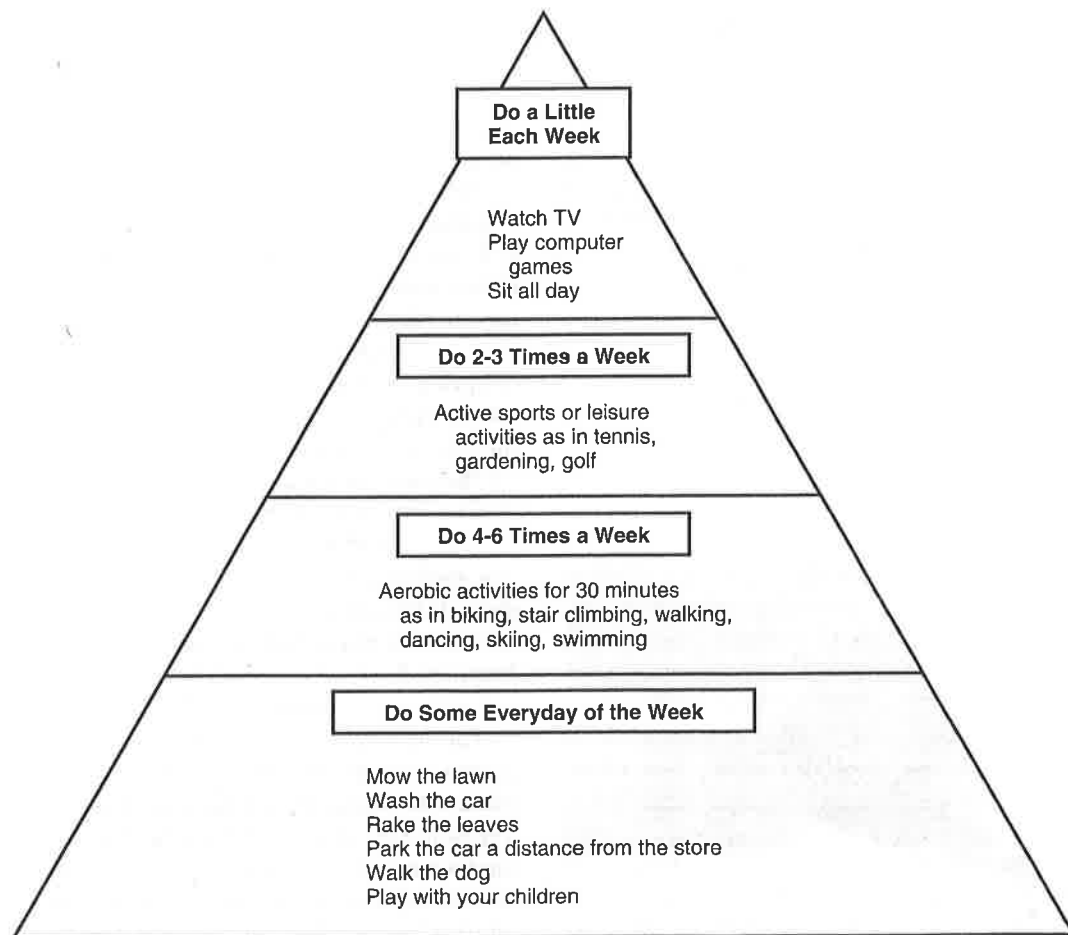


FIGURE 12-3 Physical activity pyramid.

one session. The benefits of cross-training include a decreased risk of musculoskeletal injury, an increased potential for total body conditioning, and improved long-term compliance because variety decreases boredom and eliminates the exercise barrier of limited choices.

The intensity of exercise that results in health and fitness benefits ranges from moderate to vigorous and is comfortable, but challenging (brisk). Intensity is defined by the objective measure of heart rate (HR) and the subjective measure of perceived exertion. The increase in HR during exercise has a strong linear relationship with exercise intensity and aerobic capacity. Resting heart rate is the HR measured at rest. Maximum heart rate is the rate measured at the highest workload tolerated during exercise. Maximum heart rate also decreases with age; a generic formula for determining maximum heart rate is 220 minus age. Formulas for determining appropriate exercise HRs have been developed that take resting heart rate and maximum heart rate into consideration.

The **Borg scale** for rating perceived exertion is a psychophysical category scale for the subjective rating of sensations associated with the intensity of physical work (Borg, 1973, 1982) (Figure 12-4). The scale uses ratings based on the individual's overall feeling of exertion and physical fatigue. These ratings correspond well with metabolic responses to exercise, such as HR and oxygen consumption. The strong linear relationship between HR and the rating of perceived exertion (RPE) was originally suggested by Borg and has been verified by subsequent studies. Correlation coefficients from 80% to 90% have been reported consistently with use of a variety of work tasks and exercise conditions (Borg, 1973, 1982; Skinner et al., 1973). A

meta-analysis has shown the Borg scale to be a valid measure of exercise intensity with a strong link between RPE and HR (Chen et al., 2002). In addition, recent studies support use of the Borg scale for various populations, including individuals with stroke (Sage et al., 2013), obesity (Coquart et al., 2012), and fibromyalgia (Soriano-Maldonado et al., 2015), and have quantified its ability to predict $\dot{V}O_{2\max}$ (or $\dot{V}O_2$ peak) (Coquart et al., 2014). However, perceptions of exertion and the relationship with HR are influenced by both physiological and psychological factors (aches, cramps, pain, fatigue, shortness of breath, anxiety, depression, and introversion or extroversion). Smutok and colleagues (1980) noted that some individuals are more accurate in regulating exercise intensity by RPE than are others and that this variability may be more the result of psychological than physiological factors. Other factors that may alter the strong relationship between HR and RPE are drug-related situations (β -blockers), age, and disease states (Hautala et al., 2013; Mampuya, 2012).

Despite this potential for variability in perception, RPE correlates well with HR clinically, and together they form a complementary means of helping individuals determine a comfortable, beneficial level of exercise intensity. An RPE of 11 to 14 corresponds well with 50% to 85% of maximum heart rate. Subjective parameters include being slightly short of breath, but not out of breath; being able to talk without difficulty, but unable to sing a song easily; being pleasantly fatigued, but not exhausted; and having mild musculoskeletal discomfort, but no pain.

Attention to RPE helps a person develop a sense of body awareness and an appreciation for the body's response to the stress of activity. Awareness of RPE helps people listen to their bodies and become aware of how it feels to move, where they carry tension, and where they have discomfort. With this increased awareness, individuals can choose how they want to respond, adjusting their exercise practice on a daily basis, making the activity more enjoyable, decreasing the risk of injury, and improving long-term exercise compliance.

The recommended duration of aerobic conditioning exercise is generally 20 to 60 minutes. Less than 20 minutes usually provides minimal benefit. However, for people who are unaccustomed to exercising or for those who are greatly deconditioned, short durations are permissible, gradually increasing to a beneficial, comfortable level as tolerance and confidence increase. Everyone has to start somewhere, and doing a little is much better than doing nothing at all.

The benefit of sessions longer than 45 to 60 minutes is again outweighed by the potential for injury. Exercising for more than 60 minutes on occasion is certainly not wrong, but a person who increases the duration should consider decreasing the intensity. Increases in cardiorespiratory fitness can also be accrued from intermittent bouts of moderate to vigorous exercise (10-minute segments) on a workout day. As discussed, longer bouts of exercise are more beneficial for weight loss. The range of acceptable duration allows greater flexibility, giving reassurance of benefit to the individual who varies exercise choices daily on the basis of capability, interests, and life demands.



FIGURE 12-4 Water skiing is a form of intense exercise. (From Cummings, N. H., Stanley-Green, S., & Higgs, P. [2009]. *Perspectives in athletic training*. St. Louis: Mosby.)

As mentioned, many different choices for the mode of aerobic exercise are available. A question that is often asked is "What is the best type of aerobic exercise?" The answer is "The one that the individual is willing to do on a regular basis." Different aerobic exercises have different benefits; they all have their advantages and disadvantages. From a cardiovascular point of view, with relative intensity, frequency, and duration being equal, the benefit is about the same for all modes. Probably the best scenario is cross-training, which results in the greatest number of optimal all-around benefits. However, the most important recommendation is that the person starts moving—choosing the person's favorite exercise will increase the likelihood of adhering to an exercise program.

Walking is probably the most accessible and popular form of aerobic exercise. Done briskly, walking provides a good cardiorespiratory challenge in 60% to 80% of the adult population. Walking is also an activity that nearly everyone can do, requires little equipment or cost, can be done almost anywhere, and can be a social or a solitary activity, depending on individual needs. Walking is often the recommended exercise of choice for people who are greatly deconditioned or for those who have physical limitations. Considered a low-impact activity, walking can be easily regulated to accommodate a wide range of fitness levels and motor abilities. Cycling, rowing, and swimming (or water walking or other water aerobics) are non-weight-bearing to low-weight-bearing activities that may be good choices for individuals with physical limitations. Aquatic exercise is a good alternative for individuals with musculoskeletal limitations who need some weight relief with exercise, such as individuals with advanced osteoarthritis. Although the buoyancy of the water provides this weight relief, the water also provides resistance to the limbs as they move, encouraging an increase in intensity and conditioning. Individuals should be encouraged to do the types of aerobic exercise that best fit their needs, interests, and lifestyles while providing reasonable benefits.

Warm-Up and Cool-Down Periods

In addition to the endurance phase of exercise, warm-up and cool-down periods should be a regular part of the exercise session. The **warm-up period** usually lasts 5 to 10 minutes and may include light stretching, calisthenics, or performance of the chosen aerobic activity at a low intensity. This approach prepares both the musculoskeletal system and the cardiorespiratory system for the transition from rest to exercise by increasing blood flow, respiration, body temperature, and muscle flexibility. The warm-up period decreases the risks of injury and heart irregularities.

The **cool-down period** follows the endurance phase and usually lasts 5 to 10 minutes. This phase allows the body to readjust gradually from the demands of exercise back to the baseline. Stretching and slow, rhythmical movement help to increase muscle elasticity, prevent blood pooling and hypotension, and facilitate dissipation of body heat and removal of lactic acid. The result is the prevention of injury, light-headedness, fatigue, and muscle soreness.

Yoga is an excellent example of one form of exercise to use during warm-up and cool-down periods. The word yoga means

union or "established in being," which implies a mind-body connection. Simply defined, yoga is mindful stretching. The mind is quiet, and awareness is focused on feeling the body as it moves. Movement into and out of yoga postures (called asanas) provides the necessary stimulation of weight-bearing activity to help keep bones strong, provides the movement to increase joint ROM, and stretches and tones muscles. The sun salute (*surya namaskar*), a series of 12 flexion-extension yoga postures linked together as one fluid movement by the breath rhythm, is a wonderful practice to include in the warm-up and cool-down phases of exercise, providing both physiological and mind-body benefits.

Yoga also helps develop an appreciation for the experience of the basic resting state, a mindfulness of how it feels to be relaxed physically and mentally during the activity. In this form, exercise becomes an inner experience: that is, quiet and settled on the inside, dynamic and lively on the outside. The yoga philosophy encourages an appreciation of body sensations, slow stretching, and maintenance of proper posture, all of which help to prevent injury and promote health. There is a growing body of evidence to support the use of yoga to increase ROM, reduce pain, improve posture, function, mental health, and sleep patterns, reduce disability, and improve quality of life in select populations (Alfonso et al., 2012; Bussing et al., 2012; Ebnezar et al., 2012; Holtzman & Beggs, 2013; Visceglia & Lewis, 2011).

Flexibility

Flexibility is a basic component of physical fitness. Warm-up and cool-down periods provide the opportunity to work on stretching muscles and increasing joint ROM. A safe stretch is one that is gentle and relaxing; a little discomfort may be felt as the muscle stretches, but the discomfort should never reach the point of pain. Stretching mindfully, as in yoga, will ensure a safe stretch. Holding the position for 10 to 20 seconds and repeating the stretch three to five times will encourage optimal flexibility (ACSM, 2013).

Resistance Training

Studies suggest that people who maintain or increase their flexibility and strength are better able to perform daily activities and avoid injury and disability (Pate et al., 1995). Resistance training increases muscle strength and endurance, increases muscle mass, increases metabolic efficiency, maintains or increases bone density, prevents limitations in performance of everyday tasks, decreases the effort required to perform these tasks, and decreases the potential for injury during physical activity.

On average, after their early 20s people lose approximately half a pound of muscle every year through lack of use. This reduction in muscle mass is largely responsible for a decrease in resting metabolic rate, which may translate into weight gain. Resistance training is recommended for the general population because it has a positive effect on many of the degenerative problems associated with the aging process.

Every individual should try to perform activities throughout the day that stimulate muscle strength and endurance. Activities that involve lifting, carrying, or performing repetitive movement against a resistance (vacuuming, raking, shoveling, or baking bread) help preserve lean body mass. If these types of activities

are not performed on a regular basis, then the guidelines for resistance training provided in Box 12-4 are suggested. These guidelines are not meant to represent workouts performed by bodybuilders and competitive weight lifters; they are not meant to result in significant muscular hypertrophy. The purpose of weight training from a health perspective is to develop healthy muscles that provide the strength to do daily activities without risk of injury and to stimulate bone health.

The figures in Box 12-4 demonstrate several suggested resistance exercises for upper body strengthening. Resistance training for all major muscle groups is appropriate, but individuals often choose to concentrate on the upper body because these muscles tend to be neglected in daily activity and other exercise regimens. The ACSM (2013) recommends the incorporation of bilateral and unilateral, and single-joint and multijoint exercises, including total body exercises. Although many people believe that they need to do three sets of each exercise, excellent results can be attained by doing one set (Hass et al., 2000). A recent meta-analysis of the effect of single versus multiple sets on muscle hypertrophy showed multiple sets yielded a 40% greater increase in muscle hypertrophy (Krieger, 2010). The ACSM recommends three to five sets of 8 to 12 repetitions (ACSM, 2013). The weight that is lifted should result in near muscle fatigue at the end of each set (this differs substantially depending on the muscle being trained, the amount of resistance, and the fitness level of the athlete) and should be performed without strain and while maintaining proper form. Once 12 to 15 repetitions can be completed without fatigue, the resistance can be increased (by 5% or less), or the same weight can be used to do an additional set to fatigue. The movements should be performed slowly, preferably coordinated with the breath. Rest intervals differ substantially in the literature; however, a review suggested that 3 to 5 minutes allows hypertrophy and power development and 1 to 3 minutes allows endurance gains (de Salles et al., 2009). The ACSM suggests 1 to 3 minutes of rest between sets to develop endurance and 3 to 5 minutes to develop strength and power. Slow, controlled movements result in greater benefits, lower risk of injury, and more appreciation of how the body feels as its muscles are challenged. The recommended frequency depends on the individual and should be two to three times per week for novice levels, three to four times per week for intermediate levels, and four to five times per week for advanced levels (ACSM, 2013). The exercise variables that constitute the exercise prescription must always be chosen to meet the specific needs and limitations of each individual.

EXERCISE THE SPIRIT: RELAXATION RESPONSE

Exercise should not be considered merely a physical regimen with objective outcomes (calories burned and repetitions completed). Exercise is also a process of challenging the body and the mind to gain a sense of well-being and a feeling of accomplishment, an opportunity to learn about who we really are.

Most people understand the physical benefits of exercise, and some people enjoy the challenge of being physically active, but few realize the learning potential inherent in physical activity. Success

in embracing a physically active lifestyle may involve a change in focus from the mechanics of exercise to an appreciation for how it feels and what it means to move. Physical activity can be time spent in meditation that fuels both the body and the spirit.

The **relaxation response** (RR) is an inborn set of physiological changes that offset those of the fight-or-flight (stress) response. When elicited, the RR results in a “letting go” of physical, emotional, and mental tension. It is a physiological response inborn in everyone and, although it can sometimes occur without the individual being aware of it, people generally need to develop techniques that help them let go on a more regular basis. Some techniques that are used commonly to elicit the RR include diaphragmatic breathing, meditation, imagery, mindfulness, yoga stretching, and repetitive exercise.

The RR can be combined with exercise to facilitate the release of tension and improve self-awareness and the feeling of well-being. However, a shift in attitude about exercise is also involved, with the focus becoming the process and awareness of movement. Successful elicitation of the RR involves two basic components: a repetitive focus (the breath, a mantra, and the cadence or rhythm of physical activity) and a nonjudgmental attitude (about everyday thoughts and the quality of performance) (Benson & Stuart, 1992). Berger and Owen (1988) have developed exercise characteristics that facilitate stress reduction and support an exercise environment that allows the successful elicitation of the RR. Activities must:

- Be pleasant and enjoyable.
- Be noncompetitive (competition implies judgment about the self and others).
- Be predictable (elicitation of the RR involves a shift in awareness from the external to the internal environment that will happen only with a sense of safety and reliability).
- Be repetitive and rhythmical (the cadence of activity provides a focus for awareness).
- Facilitate abdominal breathing (watching the breath serves to anchor thoughts in the moment; in combination with cadence, it provides a focused awareness).
- Continue for 20 to 30 minutes at a comfortable intensity on most days of the week (continuity restores a sense of serenity).

All forms of exercise can be used to gain this experience. As discussed, yoga involves mindful stretching with a breathing focus, providing an environment for successful elicitation of the RR. *Tai chi* is another exercise practice with roots in Eastern philosophy. Known as moving meditation, *tai chi* combines movement with focused awareness, involving a physical and cognitive focus for moving in choreographed forms that become a meditation.

The quality of body awareness can also be brought into a more traditional exercise practice. Aerobic exercise lends itself well to the elicitation of the RR, because it has rhythmical and repetitive form and because it facilitates abdominal breathing. The practitioner can focus on the breath rhythm, the step cadence of walking or jogging, the pedaling cadence of bicycling, or the stroke cadence of swimming. Mantras can be used to create a positive mindset and to focus the mind in the present moment as the experience unfolds. Resistance training takes on new

meaning when coordinated with the breath. Focusing on the muscles and how it feels to move through the ROM enhances the knowledge of what feels good and what does not, providing feedback on accepting physical challenge.

Exercise focus can and should vary on a daily basis depending on need, mood, and intent. Some days it feels right to focus on the more physical aspects of the activity, appreciating the challenge of working harder or longer. Other exercise sessions may be more contemplative, letting creativity run, working through the tension of a lingering stressor, quieting the mind for relaxation, listening to music, or appreciating nature. Focusing on the process rather than the outcomes brings meaning and purpose to the activity and helps achieve something more valuable than mere physical outcomes.

When exercise integrates mind and body, it stops being something that has to be done and instead becomes something desired. Being mindful during physical activity and exercising in the moment increase awareness. With awareness comes choices in the possibilities of self-care. Exercise for fitness of the spirit, walk for the soul, and just let the body do the work. There is a growing body of evidence to support the use of tai chi to improve balance in confidence, decrease pain, improve cognitive function, mental health, and functional mobility, decrease disability, increase self-efficacy and quality of life, and reduce fall risk in select populations (Hall et al., 2011; Huang et al., 2011; Leung et al., 2011; Rand et al., 2011; Wayne et al., 2014).

MONITORING THE INNER AND THE OUTER ENVIRONMENT

The primary purpose of exercise is to enhance health. However, because exercise involves stress to the body, the potential to cause or exacerbate health problems is inherent. When a person is not feeling well, the exercise effort should be decreased or stopped until the individual is feeling better. With an infection, a cold, or influenza, the body is under stress, and overexertion will only increase that stress and possibly lengthen the healing time. The level of activity should be adjusted to accommodate how the individual feels, slowly progressing to normal workout levels until strength and energy return. This philosophy also holds true for chronic diseases such as arthritis and HIV infection. During an acute exacerbation, activity should be limited to necessary activities of daily living, but on a regular basis staying active is important, adjusting activity levels as tolerated. Exercise can be a useful tool in coping with chronic illness.

Missing an occasional workout will not affect the fitness level; choosing to stop or reduce the amount of exercise when not feeling well is the right choice. However, after missing workouts for 2 weeks, a decline in fitness is inevitable. When one starts again, resumption of the activity should be slow, gradually working back to the usual level of activity. Inactivity for 3 to 5 months results in the loss of all conditioning benefits gained, and resumption of exercise involves starting over (ACSM, 2013). Being aware of the external exercise environment is also important. Extremes of heat and cold affect performance as the body adjusts to different temperatures and wind conditions. Changing the time of day for exercise (early morning and later evening are better choices

for humid days), adjusting fluid intake, and varying the length of warm-up and cool-down periods will increase tolerance for environmental conditions and enhance exercise safety.

Fluid News

Proper hydration before, during, and after exercise is an important component of a good fitness program. Extra fluid is needed to support physiological homeostasis during exercise, especially during hot weather. The following hydration recommendations are from the ACSM (2011). Before exercising, recommendations include drinking 16 to 20 ounces of water or sports beverage at least 4 hours before exercise and then drinking 8 to 12 ounces of water 10 to 15 minutes before exercise. According to the ACSM, a sports beverage should generally contain 4% to 8% carbohydrate, 20 to 30 meq of sodium per liter, and 2 to 5 meq of potassium per liter. During exercise, hydration recommendations include drinking 3 to 8 ounces of water every 15 to 20 minutes when exercising for less than 1 hour or drinking 3 to 8 ounces of sports beverage every 15 to 20 minutes when exercising for more than 1 hour. The ACSM also recommends not drinking more than 1 quart per hour during exercise. After exercise, the ACSM recommends drinking 20 to 24 ounces of water or sports beverage for every 1 pound lost. As noted earlier, under certain circumstances the ACSM recommends consuming beverages containing electrolytes and carbohydrates during exercise over water alone. For exercise routines lasting longer than 1 hour, a sports beverage with carbohydrates and electrolytes enhances performance and is recommended (Sawka et al., 2007). This type of liquid provides muscles with energy and helps delay fatigue while meeting fluid needs. Sports beverages containing a 4% to 8% carbohydrate concentration are designed to replace carbohydrates at the proper rate during exercise. They also contain sodium, which promotes fluid retention, enhances flavor, and protects against hyponatremia, which can occur with lengthy exercise sessions. Most sports drinks provide 14 to 20 g of carbohydrate per 8-ounce serving. The recommended intake is 5 to 12 ounces every 15 to 20 minutes. Which sports drink is the best? Several brands should be tried to determine personal preference in taste, but one should be chosen that contains approximately 50 to 80 calories per 8-ounce serving; any more and the carbohydrate concentration will inhibit fluid absorption. Table 12-1 provides choices for sports drinks that both hydrate and energize individuals.

SPECIAL CONSIDERATIONS

Most adults do not need to consult a physician before starting a moderate-intensity physical activity program. However, men older than 40 years and women older than 50 years who plan a vigorous program (intensity more than 60% of maximum heart rate or $\dot{V}O_{2\max}$) or who have either chronic disease or risk factors for chronic disease should consult an appropriate health care provider before starting exercise (Table 12-2 and Box 12-8).

People with CHD or diabetes have special exercise needs. Earlier in this chapter the ways in which exercise and physical activity positively affect primary and secondary prevention in both disease processes were discussed. Limitations in the ability to exercise are related to the severity of the disease and the signs

TABLE 12-1 Sports Drinks That Hydrate and Energize Individuals

Brand	Calories	Carbohydrate (g)
All Sport (20-oz size)	150	40
Cytomax	95–100	20
Endura	120	29
Gatorade	104	27
Hydra Fuel	100	17
Isostar	148	35
MET-Rx ORS	148	38
Perform	100	25
Powerade	109	27
Power Surge	200	48
Race Day	100	28
Vitamin Water	100	26
SoBe	80	20
Propel	20	6

All values are for 16 oz unless noted otherwise.

BOX 12-8 Symptoms and Signs Suggestive of Cardiopulmonary Disease

- Pain, discomfort (or other anginal equivalent) in the chest, neck, jaw, arm, or other areas that may be ischemic in nature
- Shortness of breath at rest or with mild exertion
- Dizziness or syncope
- Orthopnea or paroxysmal nocturnal dyspnea
- Ankle edema
- Palpitations or tachycardia
- Intermittent claudication
- Known heart murmur
- Unusual fatigue or shortness of breath with usual activities

These symptoms must be interpreted in the clinical context in which they appear because they are not all specific to cardiopulmonary or metabolic disease.

TABLE 12-2 American College of Sports Medicine Recommendation for Medical Examination and Exercise Testing Before Beginning an Exercise Program

	APPARENTLY HEALTHY			INCREASED RISK	
	Younger ^a	Older	No Symptoms	Symptoms	Known Disease ^b
Moderate exercise ^c	No	No	No	Yes	Yes
Vigorous exercise ^d	No	Yes	Yes	Yes	Yes

^aYounger implies age 40 years or younger for men, and 50 years or younger for women.

^bIndividuals with known cardiac, pulmonary, or metabolic disease.

^cModerate exercise is defined by an intensity of 40% to 60% of $\dot{V}O_{2max}$, or if the intensity is uncertain, an effort well within the individual's current capacity and that can be comfortably sustained for a prolonged period (60 minutes), slow progression, and generally noncompetitive.

^dVigorous exercise is defined by an intensity of more than 60% of $\dot{V}O_{2max}$, or if the intensity is uncertain, exercise intense enough to represent a substantial cardiorespiratory challenge or result in fatigue within 20 minutes.

From American College of Sports Medicine. (2014). *Guidelines for exercise testing and prescription* (9th ed.). Philadelphia: Lippincott Williams & Wilkins.

and symptoms of intolerance. For people with CHD and diabetes mellitus, safety with starting a new exercise program requires supervision and guidance from knowledgeable health care providers. Before starting the program, these individuals should have a medical evaluation, including an exercise tolerance test, to determine functional capacity and the severity of disease.

Coronary Heart Disease

Exercise plays a strong role in rehabilitation after a cardiac event such as myocardial infarction (MI), coronary artery bypass surgery, percutaneous transluminal coronary angioplasty or stent placement, and angina. Increased physical activity appears to benefit individuals from all these groups. The benefits include the following (Cornelissen et al., 2011; Heran et al., 2011; Lavie & Milani, 2011; Menezes et al., 2012; Milani et al., 2011; Oerkild et al., 2011):

- Reduction in blood pressure (systolic and diastolic)
- Reduction in total and cardiovascular mortality
- Reduction in hospital admissions

- Reduction of symptoms
 - Reduction in obesity
 - Increase in exercise tolerance and functional capacity
 - Increase in the confidence and ability to carry out usual activities of daily living
 - Improvement in psychological well-being and quality of life
- Despite the numerous benefits noted previously, cardiac rehabilitation and exercise training is underused by older adults (Menezes et al., 2012).

Generally, people with CHD demonstrate a reduction in $\dot{V}O_{2max}$ and the ability to do submaximal levels of work. With exercise training, the increase in $\dot{V}O_{2max}$ in persons with CHD averages approximately 20% after 3 months. This improvement in conditioning is the result of both central (cardiac) and peripheral (muscular) changes (ACSM, 2009b). Some of the most significant increases in exercise tolerance have been noted in individuals with angina. With a decrease in submaximal HR or a decrease in systolic blood pressure resulting from conditioning, myocardial oxygen demand is decreased and individuals are able to do a

greater amount of work before reaching the anginal threshold. This boost is reflected in an observed increase in the heart rate–pressure product (RPP: $HR \times SBP$) at the anginal threshold (ACSM/AHA, 2007). An increase in functional capacity allows progression of exercise tolerance and progression with daily activities and leisure or vocational activities.

Appropriately prescribed and conducted exercise training programs increase exercise tolerance and physical fitness in individuals with CHD. Moderate and vigorous regimens are of value, but care must be taken to determine safe exercise parameters for each individual. The parameters of the exercise prescriptions are the same as those for the general population, including frequency, intensity, duration, and mode of exercise.

Aerobic exercise increases cardiorespiratory fitness and functional capacity. Any of the aforementioned aerobic exercises are acceptable for this population, depending on the level of fitness and musculoskeletal limitations. Traditionally, resistance training was not commonly recommended for individuals with CHD. The belief was that lifting weights resulted in a disproportionate rise in blood pressure, increased the myocardial oxygen demand, and increased the risk of angina and MI. However, data from several studies indicate that moderate, supervised weight training is feasible, tolerable, and beneficial for individuals with hypertension and CHD. Strength training can keep the heart healthy by helping to control body weight, reduce cholesterol levels, and regulate blood glucose levels. Guidelines for determination of appropriate individual training include an aerobic capacity of at least four to five metabolic equivalents, an ejection fraction of greater than 30%, and the absence of severe, symptomatic aortic stenosis. However, clinical experience demonstrates that people with severer disease can use small hand weights to increase muscle tone without risk of cardiovascular compromise.

The exercise intensity for persons who have had a cardiac event but who have not had a symptom-limited exercise tolerance test should be kept at a low level based on an elevated heart rate of 20 to 30 beats per minute above the resting heart rate and an RPE of less than 12. After an exercise tolerance test has been performed, intensity should then be prescribed on the basis of 50% to 85% of maximum heart rate and an RPE of 11 to 14, or below the ischemic, anginal, or arrhythmic threshold. The duration and frequency recommendations are similar to those for the general population. People who are the most deconditioned may need to exercise at lower intensities, for short durations, and more frequently throughout the day. Generally, a reasonable goal is three to five times per week for 20 to 40 minutes, plus 5 to 10 minutes for each warm-up and cool-down period (ACSM/AHA, 2007).

Diabetes

Exercise has long been regarded as part of the triad in the management of diabetes in conjunction with diet and medication (insulin or oral medication). In the early 1900s it was determined that exercise lowers the blood glucose concentration of people with diabetes. After the introduction of insulin, studies revealed that exercise can potentiate the hypoglycemic effect of injected insulin. More recently, findings suggest that in individuals who have poor control (i.e., excessive blood glucose levels), exercise may induce

a further increase in blood glucose levels, resulting in ketosis. On average, people with diabetes have a lower maximum heart rate, achieve a lower cardiac output at maximal exercise, and have a higher blood pressure during exercise, resulting in lower maximal oxygen consumption. However, these individuals can increase their exercise capacity with training and can experience the benefits related to overall fitness and cardiorespiratory training similar to the benefits gained by people without diabetes.

Apparently, both benefits and risks from exercise exist for people with diabetes. The overall goals regarding physical activity should be to teach individuals to incorporate activity into their daily life, pursue an exercise program if they wish, and develop strategies to avoid the complications of exercise.

As discussed, in addition to diet and weight loss, regular physical activity is an important modality in the prevention and treatment of type 2 diabetes. Regular physical activity can prevent or delay type 2 diabetes, with up to a 58% risk reduction in high-risk individuals when combined with modest weight loss, as well as positively affecting lipid levels, blood pressure, cardiovascular events, mortality, and quality of life (Colberg et al., 2010). Furthermore, a recent meta-analysis found that lifestyle modifications, such as diet, exercise, and education significantly reduced risk factors (i.e., lower cholesterol, high blood pressure, and diabetes) associated with the development of CHD in individuals with type 2 diabetes (Chen et al., 2015).

People with type 2 diabetes should monitor their blood glucose levels and determine their responses to exercise. However, individuals with type 2 diabetes can usually follow the same exercise prescription parameters as those of the general population. Although the same exercise benefits can be achieved by people with type 1 diabetes, the inherent behavior and function of endogenous insulin makes exercising a more difficult proposition for these individuals. The major functions of insulin are to promote glucose uptake into the cells and to control metabolic homeostasis during exercise, working in synergy with the counter-regulatory hormones. With exercise, insulin secretion decreases slightly and the concentrations of counterregulatory hormones increase. This increase stimulates hepatic glucose production, which balances the increased use of glucose by the working muscles, maintaining normoglycemia. However, with injected insulin the plasma insulin concentration does not decrease with exercise, hepatic glucose is not produced as quickly as it is used, and a decrease in blood glucose concentration results. In contrast, people who have poorly controlled diabetes with decreased plasma insulin concentrations already have elevated blood glucose levels because there is insufficient insulin to assist glucose transport into cells. During exercise the liver is stimulated to produce more glucose, which causes a further elevation in blood glucose levels, worsening the hyperglycemic condition. Ketosis may also result from increased mobilization and incomplete combustion of free fatty acids in muscle cells and accelerated ketone body formation in the liver (Federici & Benedetti, 2006).

Although each person with diabetes should be evaluated and given individual exercise recommendations, the goals of an exercise program are universal:

- Maintain or increase cardiovascular fitness to prevent or minimize long-term cardiovascular complications.

- Increase flexibility that is impaired as muscle collagen becomes glycosylated.
- Increase muscle strength, which may deteriorate as a result of neuropathy.
- Allow people with type 1 diabetes to safely participate in and enjoy physical activities or sports.
- Assist with weight control for people with type 2 diabetes.
- Allow people with diabetes to experience and gain the same benefits and enjoyment from regular exercise as do people without diabetes.

Box 12-9: Innovative Practice presents a list of recommendations and precautions for people with diabetes who are interested

in regular physical activity and exercise. Table 12-3 presents recommended food adjustments when exercising. Table 12-4 presents the peak effects of different medications for diabetes. Box 12-10: Genomics presents findings from a meta-analysis that examines the association between genetics and the odds/risk of type 2 diabetes.

BUILDING A RHYTHM OF PHYSICAL ACTIVITY

Participation in regular physical activity increased gradually from the 1960s to the 1980s but seems to have plateaued in recent years. The progress made toward the *Healthy People 2020* physical

BOX 12-9 INNOVATIVE PRACTICE

Recommendations and Precautions for People With Diabetes Who Are Interested in Regular Physical Activity and Exercise

- Notify primary care physician, ophthalmologist, and podiatrist of intent to exercise.
- Monitor blood glucose level before and 20 to 30 minutes after exercise to determine the response to exercise.
- Be sure blood glucose level is less than 300 mg/dL in those with type 1 diabetes or less than 400 mg/dL in those with type 2 diabetes, and urine test results are negative for ketones (if blood glucose level is greater than 240 mg/dL). If blood glucose level is consistently equal to or greater than 250 mg/dL, improved control must be established before continuing exercise.
- If possible, exercise approximately 1 hour after meals, when blood glucose level is highest. This plan helps with weight loss, because extra food will not have to be eaten to ward off hypoglycemia. When exercising before meals, a snack may be necessary. (See Table 12-3 for suggestions on food adjustments to maintain blood glucose balance with exercise.)
- Know the action and peak times of insulin dosage and avoid exercising at the peak. (Table 12-4 shows the peak action of insulin preparations.)
- Consider adjusting oral medication or insulin dosage to prevent low blood glucose level during exercise. The adjustment will depend on the intensity of the exercise, the duration of the exercise session, and the type of insulin that is used during exercise.
- Be alert to the hypoglycemic lag effect that may occur 12 to 24 hours after vigorous exercise; an extra snack after exercise will help.
- Avoid injecting insulin into a muscle area that will be active during exercise; the pumping action of the muscle may accelerate absorption of the insulin and cause a rapid decrease of blood glucose level.
- Use proper footwear and frequently inspect the feet.
- Avoid high-impact activity when prone to neuropathy in the legs or feet or when there is a history of neuropathy.
- Keep systolic blood pressure below 180 to 200 mmHg in the presence of eye or kidney disease.
- Exercising every day is best, but should be done at least three to four times per week. Start with 10 to 20 minutes and gradually increase to 30 to 40 minutes at 50% to 75% of maximum heart rate. Continuous aerobic activity helps maintain good blood glucose level control better than intermittent activities. Do not forget the 5-minute to 10-minute warm-up and cool-down periods.
- Avoid high-intensity anaerobic exercise, but low- to moderate-intensity resistance training is acceptable.
- Carry a concentrated form of carbohydrate (sugar packets, glucose tablets, or hard candy) when exercising.
- Wear some form of diabetes identification.
- People with type 2 diabetes need to test blood glucose levels with exercise and potentially adjust oral medications. Consider decreasing medication if blood glucose level is less than 80 mg/dL after exercise. For weight loss, plan the best time to exercise so that snacks can be avoided.

TABLE 12-3 Food Adjustments

Duration and Intensity	Blood Glucose (mg/dL)	Suggested Food Adjustment
<30 min of moderate activity. Examples: walking 1 mile or bicycling for <30 min	<100	1 fruit + 1 bread + 1 meat
	100–180	1 bread or 1 fruit
	>180	May not need snack
30–60 min of moderate activity. Examples: tennis, swimming, jogging, bicycling, yard work, or housework	<100	1 fruit + 1 bread + 1 meat
	100–180	1 bread or 1 meat
	>180–240	1 bread or 1 fruit
	>240	May not need snack
60 min of moderate- to high-intensity activity. Examples: competitive sports, strenuous bicycling, long-distance running, heavy shoveling	—	—

If you are doing strenuous activity or playing sports, consult a physician or exercise physiologist for advice on blood glucose level management. Insulin adjustment may be required in addition to food adjustments (see Table 12-4). Blood glucose level should be tested hourly: 1 bread or 1 fruit per hour unless blood glucose level is 180 mg/dL or higher (snack may not be needed for that hour).

Modified from Beaser, R. S., & Campbell, A. (2005). *The Joslin guide to diabetes* (2nd ed.). New York: Simon & Schuster.

TABLE 12-4 Peak Action of Insulin Preparations

Rapid Acting	Intermediate Acting	Long Acting
Regular insulin peak action 2–4 h	Isophane insulin peak action 6–12 h	Glargine peak action 5–24 h
Aspart peak action 0.6–0.8 h	Insulin zinc peak action 8–12 h	Extended insulin zinc action 18–24 h
Lispro peak action 0.5–1.5 h		
Glulisine peak action 0.5–1.5 h		

From Ciccone, C. D. (2014). *Pharmacology in rehabilitation* (4th ed.). Philadelphia: F.A. Davis.

BOX 12-10 GENOMICS

Type 2 diabetes accounts for most diabetes cases, and it is affected by both genetic and environmental factors. A recent meta-analysis examined the effect of the hemochromatosis gene (HFE) on the odds/risk of type 2 diabetes. Findings from 23 studies were included, of which 23 examined the C282Y variant and 18 examined the H63D variant. The meta-analytic data included 5528 individuals with type 2 diabetes and 6920 controls from a variety of countries, races, and ethnicities. The results from the meta-analysis showed that the H63D variant significantly increased the odds of having type 2 diabetes (OR 1.20, 95% confidence interval [CI] 1.03–1.41) in a comparison of individuals carrying the D allele with those carrying the H allele. In contrast, the C282Y variant was not significantly associated with diabetes risk (OR 0.96, 95% CI 0.82–1.12). In conclusion the authors found that the H63D variant was associated with a moderate increase in the odds/risk of type 2 diabetes.

From Chen, L., Pei, J. H., Kuang, J., Chen, H. M., Chen, Z., Li, Z. W., et al. (2015). Effect of lifestyle intervention in patients with type 2 diabetes: A meta-analysis. *Metabolism: Clinical and Experimental*, 64(2), 338–347.

activity goals indicates that most of the population has not embraced a physically active lifestyle (USDHHS, 2010). Although the benefits of physical activity are common to all people, patterns of physical activity differ among population subgroups defined by sex, age, racial background, income, and body fat. The following generalities are true:

- Men are more active than women.
- Physical activity declines with age.
- Ethnic minorities are less active than white Americans.
- Higher education and income are associated with more leisure-time activity.
- People who are obese are usually less active than their leaner counterparts.

Adherence and Compliance

Physiological, behavioral, and psychological variables all influence the decision to adhere to diabetes treatment, including physical activity and medications. Each person is unique, and success with exercise over the long term comes from recognition of personal motivation or core desire and support from the social environment. Core desire defines the purpose behind putting the effort into developing and maintaining an active lifestyle; it

is what motivates the individual to exercise. People should be encouraged to spend some quiet time meditating on why being adherent is important to them.

Finding meaning and purpose in an active lifestyle can enhance behavior. Biopsychosocial and spiritual variables need to be considered in promoting physical activity. An individual's biopsychosocial factors and spiritual beliefs affect the behavioral and attitudinal factors that influence the motivation and ability to adhere to an active lifestyle. Generally, however, physical activity is more likely to be initiated and maintained if the individual (Pentecost & Taket, 2011):

- Perceives a net benefit
- Chooses an enjoyable activity
- Feels competent doing the activity
- Feels confident in overcoming barriers that may interfere with the activity
- Feels safe doing the activity
- Can access the activity easily on a regular basis
- Perceives no significant negative financial or social cost
- Experiences minimal musculoskeletal discomfort
- Is able to address competing time demands
- Is readily able to fit the activity into the daily schedule
- Balances the use of labor-saving devices with activities that involve physical exertion

In addition, measures to increase satisfaction and increase adherence to medication use have been explored and include (García-Pérez et al., 2013):

- Complexity of dosing regimens: reducing the complexity of therapy by fixed-dose combination pills and less frequent dosing regimens
- Safety and tolerability: using medications that are associated with fewer adverse events (e.g., hypoglycemia or weight gain)
- Perceptions of medication: educational initiatives
- Care recipient-provider interaction: improved care recipient–health care provider communication

Economic considerations: social support to help reduce costs. Educating the public about physical activity helps to provide guidelines for safe and effective exercise, to reinforce potential benefits, and to alleviate misperceptions that may interfere with the decision to change behavior. However, knowledge of exercise and the intent to exercise do not correlate well with long-term compliance. Confidence in the ability to be physically active—and the confidence that overcoming barriers produces positive benefits that are related to personal goals (self-efficacy)—is strongly related to participation and compliance (Figure 12-5). Exercise self-efficacy is increased when people perform exercise successfully, receive positive feedback about success, view exercise role models, and learn more about the relationships among exercise, health, and body awareness (see the case study and care plan at the end of this chapter).

Creating a Climate That Supports Exercise

Clearly exercise and fitness need to be social norms. A climate that supports and encourages physical activity should be fostered. Other people and organizations in the individual's social environment can influence the adoption and maintenance of physical activity.

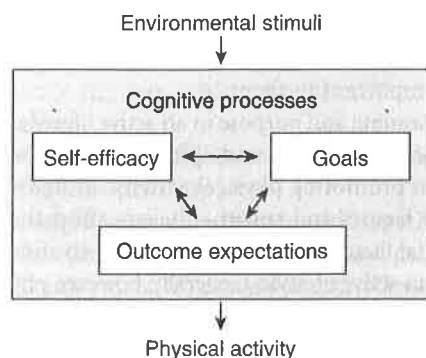


FIGURE 12-5 Three interacting cognitive processes of Bandura's social-cognitive theory. (Modified from Dziewaltowski, D. A. [1995]. Physical activity determinants: A social-cognitive approach. *Medicine and Science in Sports and Exercise*, 26, 1395–1399.)

Health Care Professionals

People are more likely to increase their physical activity if counseled to do so by clinicians. Clinicians inquire about exercise habits, communicate the benefits of increased activity, assist the person in initiating activity, and provide adequate follow-up. Challenging perceived individual barriers to exercise and offering alternative viewpoints can help create new exercise paradigms (Lascar et al., 2014; Leone & Ward, 2013; Veldhuijzen van Zanten et al., 2015). Teixeira and colleagues (2012) published an informative systematic review that summarizes the evidence for self-determination theory, which can be used to improve our understanding of exercise motivation and the importance of autonomous regulations in promoting physical activity. Clinicians also serve as role models by demonstrating enthusiasm for and the health benefits of being physically active.

Recognizing the stages of behavioral change helps in meeting people at their stage of readiness to change behavior. Providing information on physical activity designed for specific stages of readiness enables people to move from stages of contemplation and preparation into action. An individual in precontemplation is not ready to actively change behavior. This person may respond better to support and information about the benefits of changing behavior rather than being placed in an action environment. The decision to change may come gradually. After an individual has made the commitment to change, the action phase lasts approximately 6 months. Continued follow-up throughout the action phase into maintenance is valuable in helping the individual stay committed until the termination phase is reached and the behavior is secure.

Family and Friends

Social support can be a valuable resource for behavioral change. Significant others or friends can serve as buddies, providing a source of companionship and motivation. These people can offer to share daily responsibilities to make time for exercise (e.g., provide child care). Parents can support their children's activity by having family outings and providing transportation, praise, and encouragement. Joining a fitness club or an exercise group at work provides various forms of stimulation and

socialization, which increases the potential for new friendships grounded in an appreciation of the rewards of exercise.

Schools

Schools are one of the most important resources for increasing physical activity. Strategies must be developed to facilitate increased activity in children because it is clear that children are becoming less active and more obese. Schools are providing less opportunity and poorer quality time for physical activity during school hours. All schools should provide opportunities for physical activity that:

- Are appropriate and enjoyable for children of all skill levels and are not limited to competitive sports or physical education classes
- Appeal to girls and boys and to children from diverse backgrounds
- Are offered daily
- Can serve as a foundation for activities throughout life

Schools can also serve as a resource for the community. Expanding operating hours at either end of the school day creates a safe, indoor environment for hall walking.

Communities

Participation in regular physical activity at the community level depends in large part on the availability and proximity of facilities and safe environments. Community government agencies, local health agencies, schools, and places of worship have the potential to provide activity resources to the population at large. Churches seem to be particularly successful in reaching ethnic minorities and older adults. Making neighborhoods safe for outdoor activities can have a major effect on improving activity habits, especially among low socioeconomic and disadvantaged populations, who report lower levels of daily physical activity.

Recognizing that many of the previous recommendations require a financial commitment, government agencies must respond to reports by health agencies and establish public policies that support the importance of physical activity for the general population. Individuals should make a personal commitment to be physically active, but that commitment needs to be supported by a social and political environment that values this type of lifestyle choice.

SUMMARY

It is important that people incorporate increased activity into their lifestyles on a long-term basis; exercise in the short term is of little overall benefit. Helping individuals gain the knowledge (benefits of exercise and recommended parameters for exercise), skills (self-monitoring), and attitude (core desire) increases compliance. People need to be motivated enough to start the activity, enjoy the activity enough to want to continue, and appreciate the value enough to start again if they lapse. Lapses should be anticipated to avoid the unrealistic sense of total success or total failure. Behavioral change is cyclical rather than linear; success often comes with repeated movement through stages of change, and it helps to explore the reasons for the lapse and to view the lapse as a learning experience rather than a failure. The

CASE STUDY

Exercise Self-Efficacy: Sharon G.

Sharon G. is a 53-year-old account executive who is 2 years after menopause, has insomnia, and has chronic low back pain and knee pain.

History: Motor vehicle accident (2012), resulting in bone graft to left leg (her left leg is shorter than her right leg). As part of rehabilitation, Sharon started jogging, which was more comfortable than walking with chronic right-sided sacroiliac joint pain. She started running marathons in 2014 and continued until 2015. In 2015 she began to add more variety to exercise and decreased her running, but she still identified herself as being an athlete.

In 2016 Sharon had a fall that resulted in chronic low back pain, and she was unable to continue aerobic exercise. She began to experience depression and insomnia; exercise had been a significant coping mechanism in the past, and now her whole sense of well-being was being affected. As Sharon attempted

to rebuild her exercise practice, she would alternate between overexercising, exacerbating symptoms, and then having to stop and recuperate, reinforcing her negative self-image. Magnetic resonance imaging studies showed mild arthritis in her knees.

Reflective Questions

- What are some of her barriers to exercise?
- How will a regular practice of mindfulness and the relaxation response benefit Sharon's exercise practice?
- How would she benefit from cross-training?
- What exercise is she doing that is beneficial for helping to prevent osteoporosis?

CARE PLAN

Exercise Self-Efficacy: Sharon G.

***NURSING DIAGNOSIS:** Altered sleep pattern related to low back pain, depression, and recent weight gain

Medications

- Serax (oxazepam) 30 mg, four to six times a week
- Ginkgo biloba

Defining Characteristics

- Insomnia
- Chronic low back and knee pain
- Depression
- Upset about recent weight gain of 10 lb (61.5 inches, 118 lb); sees her ideal body weight as 108 lb

Expected Outcomes

- Walking, treadmill, bicycling, and low-impact aerobics (30 minutes, three to four times per week)
- Weights three to four times per week
- Stretching three to four times per week
- Daily relaxation response
- Build mindfulness into exercise practice

Interventions

- Treadmill and walking daily for 30 minutes
- Weights two to three times per week
- Yoga and stretching daily

*NANDA Nursing Diagnoses—Herdman, T. H. & Kamitsuru, S. (Eds.). Nursing Diagnoses—Definitions and Classification 2015–2017. Copyright © 2014, 1994–2014 NANDA International. Used by arrangement with John Wiley & Sons Limited. In order to make safe and effective judgments using the NANDA-I nursing diagnoses it is essential that nurses refer to the definitions and defining characteristics of the diagnoses listed in this work.

goal is to prevent a relapse that results in a more permanent noncompliance.

The benefits and enjoyment derived from a physically active lifestyle have a significant effect on the quality of life. However, this lifestyle is successful only when it is supported by a degree of self-awareness and self-care. People must realize that they are worth the effort of doing something good for themselves, that they have the right to be happy and healthy, and that exercise can help them achieve that end. By adding a mind-body component to physical activity and not regarding it solely as a physical regimen, people can experience true health rather than mere fitness. A great deal of body exercise is not required; 30 minutes a day can make a significant difference. Success comes with building a rhythm of physical activity into everyday life. The following are some suggestions for a lifestyle approach to exercise:

- Something is better than nothing.
- Attempt small changes over time (gradualism).
- Emphasize moderate intensity.
- Make activity an integral part of life.
- Focus on the process rather than the outcome.

- Clinicians can provide a knowledgeable, supportive, and enthusiastic environment to encourage the change to a healthier, more active way of life.

e EVOLVE CHAPTER FEATURES

<http://evolve.elsevier.com/Edelman/>

- Study Questions

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Stress Management

June Andrews Horowitz

OBJECTIVES

After completing this chapter, the reader will be able to:

- Analyze concepts of stress, stressor, eustress, and distress.
- Evaluate physical, psychological, social, spiritual, and behavioral stressors that are potential contributors to physical and mental health disorders.
- Analyze the pathophysiology of the stress response and effects on health and illness.
- Examine primary and secondary cognitive appraisals of stress.
- Develop evidence-based stress-management interventions that can be used in clinical practice.
- Explain the nurse's role in stress management and crisis intervention.

KEY TERMS

Active listening	Goal setting	Sandwich generation
Acupuncture	Healthy diet	Secondary appraisal
Affirmation	Healthy pleasures	Self-awareness
Anxiety sensitivity	Homeostasis	Sleep hygiene
Aromatherapy	Homeodynamics	Social support
Assertive communication	Humor	Sociophysiology
Burnout	Hypnosis	Spillover stress
Caregiver stress/burden	Interplay	Spiritual practice
Cognitive restructuring	Journal writing	Stress
Coping	Meridian	Stress management
Diabetes	Mindfulness	Stress response
Distress	Mini relaxations	Stress warning signs
Empathy	Presence	Stressor
Eustress	Primary appraisal	Values clarification
Exercise	Reflexology	Yoga
Expressive writing	Reiki	
Fight-or-flight response	Relaxation response	

THINK ABOUT IT

Do We Live to Work or Work to Live?

When asked about yourself, what is your first response? Do you say what you do for work, or do you describe your characteristics? For most of us, our work roles, including being students, define us to a great extent. For most adults who live in industrialized countries and many other societies, employment is a primary source of income and social connection; working also contributes to a personal sense of accomplishment. However, how much work is too much? Americans take fewer yearly vacation days than their counterparts in other industrialized countries, and workplace pressures can increase the risk of a variety of disorders. Work-related stress can be a significant problem.

- What aspects of work typically create stress?
- How do people manage work-related stress? Which strategies are effective and which strategies increase health risks?
- How do people manage the work-home life balance (spillover stress)?
- What health-promotion strategies could you implement to reduce your own work-related stress?
- What could you do to promote workplace health in your own practice?

Stress is an excellent paradigm for understanding the relationships among the determinants of health, the leading health indicators, and health outcomes. Stress has been shown to cause or exacerbate many of the leading health problems in the United States today, such as those related to obesity, alcohol and drug abuse, poverty, and sexually transmitted diseases (US Department of Health and Human Services [USDHHS], 2011). Consequently, helping individuals, families, and communities to find more effective ways to respond to stress is an important health-promotion goal. The Centers for Disease Control and Prevention (CDC) healthy communities program works to support people in making healthy choices where they live and work (CDC, 2012a).

Stress management has been an effective intervention framework for health promotion, disease prevention, and symptom management. Stress-management strategies such as relaxation and imagery, self-monitoring, goal setting, cognitive restructuring, mindfulness, and problem-solving have long been staples of community health-promotion programs, including Alcoholics Anonymous, Smokers Anonymous, YMCA (Y-USA), and Weight Watchers. These strategies help people to modify health risk behaviors and thereby improve quality of life. However, national health data (CDC, 2012b) indicate the need for continued and expanded use of these modalities across the life span. Although the United States health care system provides excellent, expensive, heroic care, it provides poor-quality low-cost health-promotion/preventive care, including stress management. Moreover, to ameliorate many harmful effects of stress, community-level health promotion is essential. Although shifting focus from providing acute care for individuals to enhancing the health of communities requires a revolution in our health care delivery systems and outlook, successful community health-promotion initiatives hold promise for the future (Fawcett & Ellenbecker, 2015).

The goal of stress management is to improve quality of life by increasing healthy, effective coping, thereby reducing unhealthy consequences of distress. This process produces a dynamic interaction of mind, body, and spirit, which influences physical health and well-being. Stress management is thus an essential tool for expert nursing practice, which recognizes the interface of knowledge on behavior change. The use of critical reasoning to examine multiple factors contributing to symptom development provides a valuable contribution to meeting the goals of *Healthy People 2020*. Stress management can have a significant impact on the following leading health indicators in *Healthy People 2020*: physical activity, obesity, tobacco use, substance abuse, responsible sexual behavior, mental health, injury and violence, environmental quality, immunization, workplace wellness, and access to health care (USDHHS, 2011). (See Chapter 1 for additional discussion of *Healthy People 2020*.) This chapter outlines the multifaceted psychophysiological aspects of stress, examines strategies shown to mediate its harmful effects, reviews examples of clinical situations in which stress management has been effective, and explores the unique perspective nurses bring that helps individuals identify healthy stress-management strategies.

SOURCES OF STRESS

A stressor is any psychological, social, environmental, physiological, or spiritual stimulus that disrupts the tendency of a system,

especially the physiological system of higher animals, to maintain internal stability, owing to the coordinated response of its parts to any situation or stimulus that would tend to disturb its normal condition or function. Although in use for more than 100 years, the term has suggested balance and stability but has also denoted interchange and continuous regulated or balanced change (Bortz, 2015). In other words, homeostasis has connoted a state of balance thereby requiring change or adaptation—not a static state (Figure 13-1). To reflect advances in science that underscore the continuously changing nature of and interaction among life processes in all of its manifestations, the term *homeodynamics* has emerged in the past decade (Bortz, 2015) as a better descriptor:

Homeodynamics extends homeostasis into a more inclusive term. It is evident that there is no stasis in life. All of life is dynamic. 98% of a body's atoms are replaced each year. The Krebs cycle turns over 2.66×10^{21} times per minute. The half-life of an intestinal cell is measured in days. Stasis is nowhere to be found. Life is a verb rather than a noun.

Then stress is understood as a state of threatened homeostasis/homeodynamics that triggers an array of adaptive physiological, behavioral, and even social responses in an effort to reestablish homeostasis or relative balance to avoid chaos. These descriptions of stress underscore important ideas: even welcome events, such as a child's wedding, are stressors because they precipitate change. Nonetheless, stress is not intrinsically bad or unhealthy, and stress is experienced psychophysiological and socially (i.e., as an *interplay* across all domains of individual and communal living). Stress is an essential component of being alive. Stress can be situational or maturational. One's coping strategies and resources will determine the outcomes of each stressful experience. Moreover, family and communal/social response will also affect many responses to shared

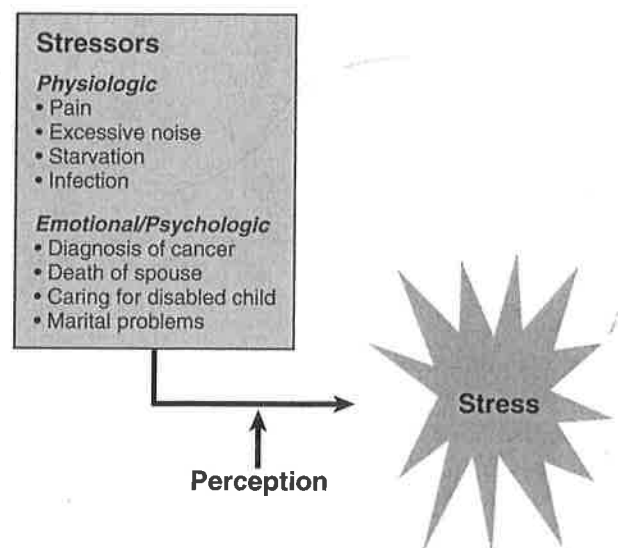


FIGURE 13-1 Stressors can be physiological or emotional/psychological. Perception of the stressors will determine whether they cause stress. (From Lewis, S. L., Dirksen, S. R., Heitkemper, M. M., & Bucher, L. [2014]. *Medical-surgical nursing: assessment and management of clinical problems* [9th ed.]. St Louis: Mosby.)

stress. In this age of instant messaging and 24/7 news cycles, the communal shared nature of stress is intensified.

Individuals encounter a variety of physical, psychological, social, spiritual, and environmental stressors. These stressors are not simply an additive but rather have an interactive effect within a homeodynamic human-ecological system. Stressors range from health and illness experiences, such as childbirth, physical illness, trauma, or blood loss, to activities of daily living, such as caring for children, meeting work deadlines, and cleaning or repairing the house, to less common events, such as taking a critical examination, experiencing the death of a relative, losing possessions in a fire, losing a job, getting a divorce, or getting married, and environmental contexts. As a useful rubric, stressors can be organized into three categories: stressors over which people have no control (extrinsic factors), such as the weather, a traffic jam, or the death of a spouse; stressors that individuals can modify by changing their environment, social interactions, or behaviors; and stressors created or exacerbated (intrinsic factors) by poor time management, procrastination, poor communication, catastrophic negative thinking (expecting the worst), or struggling with self-defeating behaviors. However, stressors can never be neatly boxed into simple categories: Stress is a person-environment process. The person-environment fit model indicates that the person appraises a situation as taxing or as exceeding his or her resources and endangering well-being. Moreover, links between biological pathways and social adversity to subsequent adverse health outcomes underscore the importance of stress as a health determinant (Berger et al., 2015; Lazarus & Folkman, 1984; Weber, 2011).

Stress appraisal is an important concept that helps to explain why two people react in different ways to the same situation. In addition, models of stress have evolved from an individualistic perspective to consideration of family-level and community-level stress and coping (Weber, 2011).

The shared situation of Ms. Hernandez (86 years old) and Ms. Goldman (86 years old), both in good health, provides a case in point. Both individuals are about to become new residents at an assisted living retirement community in their hometown. Ms. Hernandez perceives this move as an opportunity to increase the ease of her socializations and activities of daily living, and is looking forward to making new friends and participating in new recreational activities. In contrast, Ms. Goldman views this move as abandonment by her family and fears that the available resources will be inadequate. Although the event is virtually the same for both Ms. Hernandez and Ms. Goldman, the homeodynamic consequences are personalized because each woman perceives her situation differently. Even though the move to the new environment is the same, each woman has different coping styles and each has different support systems, so the experience will differ in its perception and thereby its level of stress.

Stress is the physical, psychological, social, or spiritual effect of life's pressures and events. Stress is an interactive hemodynamic process that involves appraisal and response to loss or the threat of loss of well-being at individual, family, and community levels (Weber, 2011). Canadian physiologist Hans Selye (1950, 1974,

1982) first introduced the general adaptation syndrome, which led the way to continual interest in stress and the effect on the body. Selye reported that, to a certain extent, stress can be challenging and useful, which he identified as *eustress*. Selye also observed that when stress becomes chronic or excessive, the body is unable to adapt and maintain homeostasis, and thus the process becomes *distress*. Stress can be both useful and harmful. As stress increases, efficiency and performance also increase, but not endlessly. At a certain point performance and efficiency start to decrease significantly if stress continues unabated. It is important to understand the many causes of stress and the negative physical, psychosocial, and spiritual consequences of distress. Understanding the many-sided sources of stress provides the rationale for a multifaceted approach to its management. It is noteworthy that even in its early understanding, scientists and clinicians recognized the dynamic changing nature of stress and its many human system responses (Box 13-1).

In nursing we have operated within multiple frameworks to understand stress and its outcomes. Historically nursing has been grounded in the biological and medical sciences because of our long-standing roles in health promotion and caring for people experiencing illness. Yet over many decades nursing frameworks have also embraced concepts of continuous change and interaction in human-environmental fields. Most notably Martha Rogers's science of unitary human beings (Phillips, 2015; Willis et al., 2015), Neuman's systems model, and Roy's adaptation model (Willis et al., 2015) have stressed the dynamic, interactive nature of human life. As a result, nurses have learned to balance and integrate the worldviews of traditional medical and bench science with the evolving and sometimes rather heretical nursing frameworks that focused more on continual change and interaction within and among human-environmental systems. Thus in this chapter, examining stress, its manifestations, and approaches to ameliorate distress and associated health problems involves weaving knowledge and understanding generated from diverse and sometimes conflicting perspectives.

The models for understanding human stress are multifaceted and complex. In the past, scientists and clinicians tended to examine and understand stress from their own disciplinary or scientific silos. In other words, understanding stress was typically split into neurobiological and psychosocial camps. However, in recent decades "sociophysiology" has emerged as a multidisciplinary perspective to integrate the "social" and "biological" worlds and answer the following question (Barchas & Barchas, 2011): "How do social processes impact the physiology of the organism and how does that altered physiology affect future social behavior?"

Nursing science has long held an interest in the dynamic interaction among human systems. Outstanding among nurses' voices calling for innovative perspectives to topple the traditional and accepted mechanistic, medical worldview was Martha Rogers's theory of unitary human beings (Phillips, 2015). Phillips, a valued colleague of Rogers, described her as a heretic and heroine because of her then revolutionary view about nursing and health and illness. Today her ideas resonate well with contemporary understandings of the rapidly evolving interplay across all spheres of human life.

BOX 13-1 Relationship Between Stress and Development of Breast Cancer and Survivorship

Nurses appreciate the multiple factors in the development of breast cancer and other diseases. Researchers exploring the relationship between stress and breast cancer have demonstrated a relationship among stress (personality traits, stressful life events, and responses to stress), the immune system, genetics, and environmental factors. The physiological influences of stress on breast cancer may be mediated by the immune system. Although women may be unable to prevent stress in their lives, they can learn stress-management strategies. Dealing positively with stress may improve the quality of life for individuals and their families with or at risk of breast cancer.

Growing research evidence supports this understanding of the complex interactions between life stress and breast cancer risk. For example, Kruk (2012) examined the relationship between severe life events and breast cancer risk. Kruk used case-control examination of 858 Polish invasive breast cancer patients and 1095 controls matched for age and place of residence. Data on life events, sociodemographic characteristics, reproductive factors, family history of breast cancer, current weight and height, and lifestyle habits were collected via a self-administered questionnaire. Unconditional logistic regression analyses with odds ratios with 95% confidence intervals were estimated. After adjustment for potential breast cancer risk factors, women with four to six individual major life events had 5.33 times higher risk of breast cancer compared with those in the lowest quartile. Similarly, women with a high lifetime life change score had approximately five times higher risk compared with women with corresponding scores in the lowest range. Several life events (death of a close family member, personal injury or illness, imprisonment/trouble with the law, retirement) were significantly associated with breast cancer risk. Those findings suggest that major life events may have an important etiological role in the development of breast cancer. Surviving breast cancer also poses ongoing challenges to women who experienced breast cancer and their partners (Gregorio et al., 2012).

From Gregorio, S. W., Carpenter, K. M., Dorfman, C. S., Yang, I. L. C., Simonelli, L. F., & Carson III, W. E. (2012). Impact of breast cancer recurrence and cancer-specific stress on spouse health and immune function. *Brain, Behavior, & Immunity*, 26(2), 228–233; Kruk, J. (2012). Self-reported psychological stress and the risk of breast cancer: A case-control study. *Stress*, 15(2), 162–171; National Cancer Institute. (n.d.). *Psychological stress and cancer: Questions and answers*. <http://www.cancer.gov/cancertopics/factsheet/Risk/stress>.

Thus understanding stress and its management involves attention to the *interactions* of social and biological life at individual and family/communal levels. It follows that stress-management strategies/interventions need to be multifaceted and could be aimed at neurophysiological and interpersonal/social stressors and/or interactions and responses. Establishing empathy by the nurse in understanding stress is beneficial in designing interventions aimed at primary, secondary, and tertiary levels of prevention.

PHYSICAL, PSYCHOLOGICAL, SOCIOBEHAVIORAL, AND SPIRITUAL/ HOMEODYNAMIC CONSEQUENCES OF STRESS

To begin, it is necessary to set the groundwork for understanding stress and its multifaceted/interactive consequences. In the discussion that follows, facets of human responses are artificially

categorized and discussed to assist the learner to discern the many aspects of stress responses. In no way should this content be interpreted as meaning that stress responses are isolated to specific human systems or simply additive. Growing understanding of the homeodynamic interplay, including epigenetics, within individuals and across human and ecological systems forces us to examine the ever-changing nature of our knowledge of our world. As a startling example, in 2016 the Zika virus emerged on the global stage to pose multiple human health risks, with a specific threat to pregnant women and their fetuses for microcephaly, a devastating birth anomaly: the effects reverberated across continents with lightning speed and had global effects on health, travel, and prevention efforts (Sifferlin, 2016). Thus we all must remain cognizant of the ongoing interplay within and among human, social, and ecological systems, even as we examine knowledge focused predominantly at specific response areas (i.e., human systems). Nevertheless, understanding stress effects at a variety of micro to macro levels is needed to comprehend a holistic picture. The future challenges to do so are indeed exciting!

Physiological Effects of Stress

An individual's homeodynamic response to stress provides a model to examine changes across biopsychosocial-spiritual domains. In response to a perceived threat (i.e., stressor), the body prepares to meet the challenge. Perception of threat stimulates a physiological pattern of neuroendocrine activation and behavioral changes mediated by the central nervous system. Moreover, chronic stressful life circumstances likely exacerbate conditions favorable to adverse health outcomes (Figure 13-2) (Berger et al., 2015). Nonetheless, in most cases this reaction is an adaptive, short-term, acute response to a stressor. First termed the *fight-or-flight response* (Cannon, 1914) and later called the *stress response* (Selye, 1950, 1974, 1982), the individual's reaction to a real or imagined threat prepares the body for emergency reaction and fosters survival in circumstances of immediate, time-limited threat. The hypothalamus signals the sympathetic nervous system to release epinephrine and norepinephrine, along with other related hormones. A resultant state of arousal is characterized by increased metabolism, pulse rate, blood pressure, respiration rate, and muscle tension. This physiological arousal proceeds along three main pathways: the musculoskeletal system, the autonomic nervous system, and the psychoneuroendocrine system.

The musculoskeletal system responds by increasing tension and tone. At the same time, the autonomic nervous system, via the sympathetic branch, orchestrates a generalized arousal that includes increases in heart rate, blood pressure, and respiration rate. Additionally, a heightened awareness of the environment is triggered, and blood shifts from the visceral organs to the large muscle groups. Concurrently the psychoneuroendocrine system stimulates the hypothalamic-pituitary-adrenal axis and the secretion of corticosteroids (primarily cortisol) and other neuroendocrine substances into the systemic circulation, increasing blood glucose levels, influencing sodium retention, and, in the acute phase, increasing the antiinflammatory response.

Study findings (CDC, 2012b) have shown that maladaptive stress can cause or exacerbate disease or symptoms of diseases.

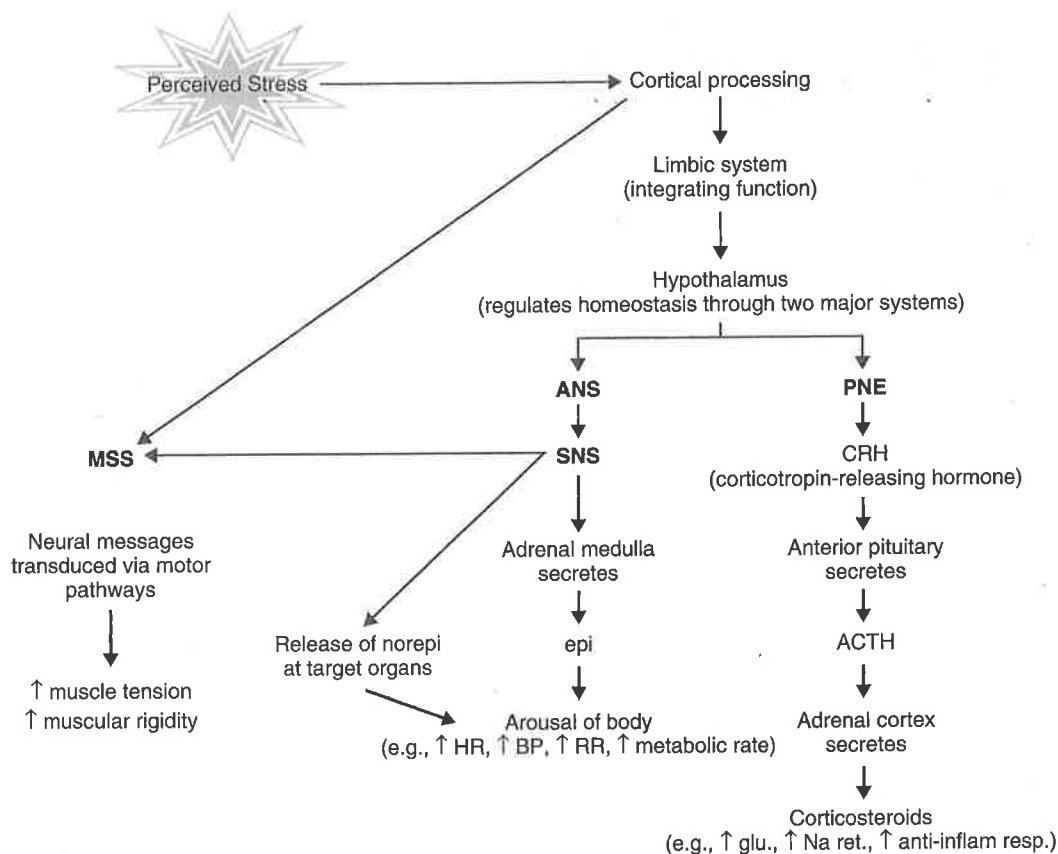


FIGURE 13-2 The stress response. *ACTH*, Adrenocorticotrophic hormone; *ANS*, autonomic nervous system; *anti-inflam resp.*, antiinflammatory response; *BP*, blood pressure; *CRH*, corticotropin-releasing hormone; *epi*, epinephrine; *glu.*, blood glucose level; *HR*, heart rate; *MSS*, musculoskeletal system; *Na ret.*, sodium retention; *norepi*, norepinephrine; *PNE*, pituitary-neuroendocrine system; *RR*, respiration rate; *SNS*, sympathetic nervous system. (From Wells-Federman, C., Stuart-Shor, E., Deckro, J., Mandle, C. L., Baim, M., & Medich, C. [1995]. The mind/body connection: The psychophysiology of many traditional nursing interventions. *Clinical Nurse Specialist*, 9, 60.)

Proinflammation associated with stress is emerging as a common pathway in a variety of diseases, such as asthma, angina, cardiac arrhythmias, pain, tension headaches, insomnia, depression, and gastrointestinal disorders. Additionally, stress can produce hyper-reactivity or hyporeactivity of hormones regulated by the psychoneuroendocrine system (Bonfiglio et al., 2011).

As mentioned previously, in most cases the stress response is a beneficial adaptive pattern that increases the efficiency and quality of performance, but it can prove maladaptive when a stressor continues indefinitely. Maladaptive stress (distress) is an enduring and sometimes self-sustaining cascade of responses that degenerate physical, psychosocial, and spiritual well-being. Not surprisingly, stress and specifically depression have been associated with increased susceptibility to cardiovascular disease, as well as poor response to its treatment. Inflammation has been suggested as one of the processes underlying the association between cardiovascular disease and depression, two debilitating conditions (Nikkheslat et al., 2015). Nonetheless, indirect influences of stress and depression on self-care health behaviors also help to explain associations between these diseases. Needless to say, further investigation is needed to demonstrate direct causal

links, as well as effectiveness of psychological interventions, for people with cardiovascular disease (Whalley et al., 2011).

Psychological Effects of Stress

The psychological effects of stress are best illustrated by its contributory role in negative mood states, including anxiety, depression, hostility, and anger. Exposure to stressful stimuli is associated with elevated cortisol levels and resultant effects on the immune system. The duration, intensity, and timing of a stressor have been shown to affect immune responses in animals. Although systematic studies to explain different patterns of immune response with humans are not yet adequate, the interactive nature of the mind and immune system is an exciting area of investigation that may contribute to future evidence-based practice (Hou & Baldwin, 2012).

A growing body of clinical research outcomes illustrates the interplay of stress and various health outcomes. For example, research evidence is convincing that individuals with eating disorders experience a high rate of stress, and that appraisal is more important than the nature of any stressful event itself (Courbasson & Jeyarajan, 2011). The relationship between stress

and cardiac symptoms also is well documented. Closa and colleagues (2010) demonstrated that for individuals awaiting angiography, stress and lack of social support predicted self-reported cardiac symptoms, regardless of actual disease severity. Clinical implications include reducing perceived stress and ruminative, angry coping styles by encouraging reappraisal and support seeking. In conclusion, the evidence to date demonstrates a strong association between chronic stress and negative health effects for individuals and their family members.

Sociobehavioral Effects of Stress

In response to stress, individuals often revert to or increase their reliance on less healthy behaviors, such as overeating, excessive use of alcohol or drugs, and smoking. Recognizing that such behaviors are inconsistent with the healthy behaviors needed to cope with stress is easy; however, stopping these behaviors and using health-promoting strategies instead is not. Risky behaviors and traits such as a sedentary lifestyle, obesity, overeating high-fat foods, smoking, substance abuse, and social isolation have been linked to morbidity and mortality (USDHHS, 2011). Conversely, **exercise, healthy diet, smoking cessation, healthy weight maintenance, and social interaction** have been identified as leading indicators of health in the United States (USDHHS, 2011). Encouraging these health behaviors supports the goals of *Healthy People 2020*. However, unless we understand how psychosocial factors affect health behaviors, promotion of effective self-care is an unrealistic goal (Box 13-2: *Healthy People 2020*).

Spiritual Effects of Stress

Interest in the connection between spirituality and health is significant. Spirituality is defined in many ways, but key components are typically that spirituality comprises feelings, thoughts, experiences, and behaviors that arise from a search for meaning and may include interconnectedness with self, others, nature, and a higher force called God, a life-force/higher power, nature, or the transcendent. Spirituality and religion intersect for many, yet they are not synonymous. Many individuals feel spiritual without a formal religious affiliation or practice. In response to stress, people often feel disconnected from life's meaning and purpose; harmful effects on their health and well-being can result.

Stressful events can shatter individuals' spiritual center or conversely can move individuals to seek comfort in spirituality or religious practice, beliefs, or community. Encouraging involvement with one's religious/spiritual practices is recommended as a helpful intervention for stress-related problems (Weber, 2011).

Examination of spiritual healing in the aftermath of men's childhood mistreatment through nursing research unearthed the following themes (Willis et al., 2015):

- Exploring spiritual faith traditions as a foundation for spiritual healing
- Being in spiritual community serves as a foundation for spiritual healing
- Being in spiritual community facilitates healing connections with other human beings and the transcendent
- Cultivating spiritual consciousness through prayer, music, yoga, nature, and reading spiritual material expands awareness of one's spiritual being
- Loving and letting go reflects one's spirituality and humanity
- Believing in a cosmic energy, divine purpose, or higher power can bring a sense of healing

These themes provide foundations for nursing interventions to be tested (Willis et al., 2015). Engaging a pastoral counselor of the individual's choice in the treatment team can be an effective strategy to promote spiritual healing. However, the source of mistreatment must be carefully explored sensitively with the individual in advance to determine the acceptability of engaging a member of the clergy.

The previous section discussed how stress can adversely affect biological, cognitive, emotional, behavioral, and spiritual well-being. This understanding of the psychophysiology of the mind-body-spirit connection is fundamental to the application of stress management in nursing and provides an obvious rationale for a multifaceted approach. Further support is provided from research endorsing the health-promoting effects of managing stress (Gregorio et al., 2012) (Box 13-3: *Research for Evidence-Based Practice*).

HEALTH BENEFITS OF MANAGING STRESS

A growing body of evidence underscores the importance of controlling stress to promote health and quality of life for people with a variety of health problems. "The association between stressors and biomarkers specific to physiological systems (i.e., cardiovascular, neuroendocrine, immune, etc.) is an emerging area of interest in biomedical research...with evidence that specific stressors may differentially affect various physiological systems" (Paradies, 2011). Thus interventions that reduce the stress response are an important component of comprehensive disease prevention and management. Psychotherapeutic approaches, such as interpersonal and cognitive-behavioral psychotherapies that focus on perception and management of life stressors, are effective treatments for depression and related mental health disorders (Sadock & Sadock, 2015). These psychotherapies have been incorporated into a range of treatment and secondary prevention programs, such as cardiac rehabilitation, with great potential for wider adapted use (Menezes et al., 2011). Targeting primary

BOX 13-2 HEALTHY PEOPLE 2020

Health-Related Quality of Life and Well-Being

Health-related quality of life (HRQoL) is a "multi-dimensional concept that includes domains related to physical, mental, emotional and social functioning." HRQoL is a new topic in *Healthy People 2020* and goes beyond "direct measures of population health, life expectancy and causes of death, and focuses on the impact health status has on quality of life. A related concept of HRQoL is well-being, which assesses the positive aspects of a person's life, such as positive emotions and life satisfaction." As explained in this chapter, stress is a challenge to HRQoL. Stress management is a key strategy to improving HRQoL.

From US Department of Health and Human Services. (2014). *Health-related quality of life & well-being*. <http://healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=19>.

BOX 13-3 RESEARCH FOR EVIDENCE-BASED PRACTICE

Impact of Breast Cancer Recurrence and Cancer-Specific Stress on Spouse Health and Immune Function

Spouses of people with cancer are often primary informal caregivers for their partners. As a group, they experience a variety of poor health outcomes. This study examined the relative contributions of cancer recurrence—a cancer-specific stressful event—and the subjective experience of cancer-specific stress in a sample of male spouses of breast cancer survivors. The investigators hypothesized that stress would contribute to poorer physical health and compromised immune function. Given the difficulty of random assignment for this type of study, the researchers used a matched-control design, comparing spouses of women with recurrence to a cohort of spouses whose wives were disease-free but had a history of breast cancer. Spouses of women experiencing a first recurrence were matched to spouses of women with no evidence of disease. The results showed that cancer recurrence status was not a significant predictor of spouses' physical health or immune function; however, among all spouses, cancer-specific stress symptoms were associated with increased physical symptoms and altered T-cell blastogenesis. These findings suggest that health effects for these caregiving spouses were more strongly connected to their subjective experience of cancer as stressful, rather than their partners' current disease status. A practice implication is that exploring spouses' appraisals of the experience should be an essential component of family care when one partner has breast cancer.

From Gregorio, S. W., Carpenter, K. M., Dorfman, C. S., Yang, H. C., Simonelli, L. E., & Carson III, W. E. (2012). Impact of breast cancer recurrence and cancer-specific stress on spouse health and immune function. *Brain, Behavior, & Immunity*, 26, 228–233.

prevention programs is the aim of nurses in assisting individuals with stress reduction before becoming symptomatic.

Promoting a positive attitude and development of skills to cope with stress is foundational to many stress-management interventions. As early as 1982, Kobasa and colleagues (1982) made a groundbreaking contribution to our understanding of the stress-illness relationship when they identified characteristics of hardiness. They described individuals with stress-hardy characteristics who, when exercising and accessing social support, were less vulnerable to stress-related symptoms and diseases. The characteristics of stress hardiness are control, challenge, and commitment. For stress-hardy individuals, stress is viewed as a challenge rather than a threat; they feel in control of situations in their lives, and they are committed to rather than alienated from work, home, and family. Hardiness continues to be assessed (recognized) by nurses in assisting individuals and families dealing with a crisis and promoting the strengths of survivorship in dealing with new stressors. Another term that is used is resiliency.

Stress management is especially important in situations such as caregiving that extend over long periods. Caregiver stress/burden can be described as the appraisal of the experience of caregiving including the taxing nature of behaviors of the recipient of care, role conflict or strain, and physical and mental health effects on the caregiver (McLennon et al., 2011). As the setting for care increasingly is the home and family members

take on mounting responsibility for care of loved ones (i.e., children, spouses, or aging parents with chronic conditions), the importance of caring for the caregiver to prevent significant burnout grows. As a result of current trends of delayed parenting and increased life span, the “sandwich generation” of middle-aged adults who have concurrent responsibility for their children and aging parents is at particular risk of severe caregiver burden. Research evidence supports the usefulness of interventions aimed at helping caregivers to find meaning in their activities and role in buffering caregiver stress (McLennon et al., 2011; Quinn et al., 2011; Wood et al., 2015). Moreover, the quality of the caregiver–care recipient relationship can affect the caregiver's well-being (Quinn et al., 2011).

In summary, the evidence is conclusive that thoughts, feelings, behaviors, beliefs, and biological activity are interrelated. Perceptions, or the way individuals view situations, can lead to stress and, in turn, adversely affect biological activity, emotions, behavior, and the connection with life meaning and purpose. This interaction among perceptions, stress, and multifaceted effects, in turn, can increase stress and foster a negative stress cycle. The remainder of this chapter presents assessment of stress relating to the homeodynamic framework, including the facets of physical, psychosocial, and spiritual health and well-being of individuals, and describes the application of a variety of strategies shown to help break the negative stress cycle and mitigate its harmful effects across the biological, psychosocial, and spiritual domains.

ASSESSMENT OF STRESS

Assessment of the stress-coping abilities of an individual, family, or community is part of a comprehensive health assessment that includes past and present subjective and objective data. Collection of these data enables the individual and the nurse to determine the status of the person's stress-coping pattern, and actual and potential strengths and weaknesses.

The nurse thoroughly collects data during the history, physical examination, and health patterns assessment (see Chapters 7–9). Identifying the stress-coping pattern is especially important. Asking for specific examples of events with probes to elicit the person's thoughts, feelings, and actions leads to discussion of appraisal and ideas for alternative actions in the future (see Chapter 4, Box 4-12 and Figure 4-4). Each individual is the primary data source; no other person can explain accurately the individual's perceptions of the stressors, stress responses, and resources to prevent or alleviate the stress.

Stress is experienced across biological, psychosocial, and spiritual domains; therefore all perceptions are important for the assessment. Throughout the assessment process, individuals may become aware of information of which they were previously unaware, or they may identify information related to their perceived problems. For example, a man may be aware of the stress of his job but may be unaware that his high blood pressure was caused at least in part by this stress.

Lazarus and Folkman (1984) proposed a theory comprising primary and secondary appraisals of stressful events, situations, or demands and the effectiveness of an individual's coping skills. Primary appraisal of coping includes descriptions of perceived

actual and potential positive and negative outcomes. Negative outcomes refer to harm, whereas positive outcomes refer to the challenges resulting from stressors that an individual perceives can be overcome. Examples of negative outcomes include physical injury; disease; loss of a cherished relationship, position, or possession; and death. Positive outcomes include graduation, promotion, and development of important relationships (see the case study and care plan at the end of this chapter).

Secondary appraisal follows primary appraisal. Secondary appraisal consists of the individual's identification of choices to cope with the actual or potential harm, threat, or challenge. The choices may be internal or external resources and responses. For example, a social resource in coping with the needs of a toddler might be learning strategies in a parent-effectiveness training course. A coping response to the challenges of parenting a toddler might be restructuring the toddler's and parent's schedules to allow for more frequent cycles of activities and rest.

The individual's primary and secondary appraisals of stress provide opportunities to consider the stress experiences in different ways. Resources that had been forgotten may be remembered, or a threat may be newly viewed as a challenge and an opportunity for enhanced development and status. The appraisal process mediates stress responses. This understanding supports use of cognitive-behavioral therapy (CBT) as an effective intervention approach for stress-related problems (Wood et al., 2015). Nurses appropriately may refer individuals for CBT and are also encouraged to obtain advanced training in CBT to integrate this evidence-based intervention into their practice. Use of good-quality health texts aimed at the general population is also an effective psychoeducational approach. For example, Marchant's (2016) highly readable book *Cure: A Journey Into the Science of Mind Over Body* and Kaku's (2014) interesting text *The Future of the Mind* are examples of materials that can serve as springboards for discussion of ways to adjust the meaning of life stressors, responses, and ways to cope.

Measuring stress and related symptoms/responses is important in assessment and evaluation of treatment outcomes. By using measurement instruments with established reliability and validity, nurses can improve assessment of an individual's stress and coping. Tools can help nurses distinguish between diagnoses that have many signs and symptoms in common. For example, disturbances in thinking and feeling processes can be difficult to distinguish and may have confounding clinical pictures. These disturbances can occur separately or simultaneously in the same person. An example of this complexity is the overlapping symptoms of depression and dementia. The nurse determines whether one health problem is actually the cause of the other so as to develop an effective plan of care (see the case study and care plan at the end of this chapter).

A wide variety of instruments are available to help nurses assess orientation, attention, cognitive skills and patterns, traits and states of emotions, symptoms of mental health distress and disorders, and overall quality of life. For example, the Schedule of Recent Experiences (Holmes, 1981) and the Impact of Event Scale (Horowitz et al., 1979) are two well-established instruments used widely in clinical assessment and research to measure stress associated with life changes and events. Burnout, be it work

related or personal, is understood as emotional exhaustion; depersonalization, and a sense of reduced personal accomplishment. The Maslach Burnout Inventory (Maslach & Jackson, 1986) is a psychometrically robust instrument to assess perception about work-life balance. Before using any instrument, clinician and researchers need to check information about its reliability and validity, updates/revisions, training requirements, and copyright restrictions (e.g., purchase requirements) that can affect access to its use. Older instruments typically have a long established record of demonstrated reliability and validity; however, phenomena may evolve with time, and revised version may have been developed and tested for specific populations. Therefore exploration of the literature to seek updated information to inform use is always wise. Additionally, the seeking of consultation from clinical experts/researchers regarding instrument selection is recommended.

Use of standardized instruments promotes accuracy in developing diagnoses and care plans and assists in evaluating the effectiveness of care. For example, a nurse may compare an individual's self-evaluation and/or symptom preintervention scores with postintervention scores and revise the care plan accordingly. Additionally, nurses may analyze population baseline scores for relevant characteristics and develop programs of research and quality improvements aimed at improving outcomes.

Assessment at the family and community levels is also recommended. Family assessment consists of three major categories: structural, developmental, and functional components of the family (Wright & Leahey, 2013). Environmental factors also contribute to the determinants of health and thus to stress, so a thorough nursing assessment requires consideration of the community. For example, examination of community-level data for unemployment, population density, housing, school quality, crime, suicide incidence, and disease occurrence patterns (i.e., health profiles of the community), as well as availability of various amenities such as green space and access to transportation and healthy foods, provides a more complete stress assessment than does individual assessment alone (DeMarco & Segraves, 2011). Moreover, family and community assessment can point to possible stress-reduction interventions, such as marshaling available social support or engaging in outdoor activities and exercise.

STRESS-MANAGEMENT INTERVENTIONS

Stress-management strategies are beneficial to people across a broad spectrum of chronological, gender, cultural, and ethnic characteristics. Men and women, young and old, from divergent socioeconomic, cultural, and ethnic backgrounds can benefit from stress-management interventions. Sensitivity to the needs and values of individuals and communities, particularly for high-risk groups (i.e., vulnerable populations), guides assessment and intervention techniques. The language, belief system, and cultural distinctions of individuals and families in the community guide the choice and adoption of stress-management strategies. Understanding stress and its management involves attention to the interactions of social and biological life at individual and family/communal levels (Barchas & Barchas, 2011); therefore interventions may need to encompass a variety and combination

of psychosocial and biological approaches at the primary, secondary, and tertiary levels of prevention. Population-based interventions may be expanded from the individual to the community and to a system- or population-focused practice (Harkness & DeMarco, 2012).

Developing Self-Awareness

Self-awareness is one of the most effective stress-management tools. Self-awareness helps people learn about interactions among mind, body, and spirit; increases a sense of control; and counters self-defeating perceptions. Interventions that promote self-awareness help people make sense of life events and circumstances that may be bewildering or discomforting. Many experiences in life lead to feelings of emptiness and disharmony because people are unable to connect the experience with thoughts, feelings, actions, and physiological responses. Self-awareness helps individuals recognize stress that they create through negative, exaggerated, unrealistic thinking. This recognition affords an opportunity to change these negative thought patterns, thereby decreasing stress and increasing control. Strategies that increase self-awareness can empower individuals to make new connections and to reframe and reinterpret their experiences in light of their own inner strengths and wisdom.

A closely related concept is mindfulness, nonjudgmental self-awareness characterized by intentional acceptance of the unfolding of experience in the moment. Mindfulness can be understood as having two components: “the intentional self-regulation of attention so that it remains focused on present-moment experiences (i.e., thoughts and feelings) as they arise” (Baer, 2014) and “an attitude of openness, acceptance, and curiosity toward whatever arises” (Baer, 2014). Mindfulness requires dedicated practice both to achieve and to use to reduce negative stress effects. A variety of mindfulness approaches have been proposed and tested. Those with the best empirical support are mindfulness-based stress reduction, dialectical behavior therapy, and acceptance and commitment therapy (Baer, 2014). Mindfulness interventions can be combined with other efficacious treatments or can serve as primary interventions for stress management. Mindfulness as both a state and an intervention is not simple although it may appear so at first. Therefore nurses are urged to obtain specialized training in mindfulness approaches so they can use them in their practice. Mindfulness interventions have shown promise to improve quality of life in coping with various health conditions. For example, Lengacher and colleagues (2015) demonstrated the cost-effectiveness and efficacy of a mindfulness stress-reduction program in improving quality of life for breast cancer survivors.

The neuroscience basis of mindfulness remains a fruitful field of investigation. As is common to new areas of research, the studies to date generally lack robust methods and offer only speculative conclusions (Tang et al., 2015). Nonetheless, there is developing evidence that mindfulness meditation may precipitate neuroplastic changes “in the structure, and function of brain regions involved in regulation of attention, emotion and self-awareness” (Tang et al., 2015). The horizons are vast and exciting for future nurse scientists to engage in team science to explore the underpinnings of interventions such as mindfulness.

Techniques for Developing Self-Awareness

Monitoring stress warning signs. The negative stress cycle can be difficult to interrupt. Recognizing warning signs of stress is a necessary first step. Often individuals have long ignored physical, emotional, or behavioral cues or reactions to a stressor that are stress warning signs. A man who has chronic, intermittent backaches and ignores the daily muscle tension caused by poor posture that precedes the backaches provides an example. If he had attended to his early stress warning signs of poor posture and muscle tension, he might have avoided the backache that kept him from exercising and socializing. Becoming aware of these stress warning signs is the first step. Attending to these cues is the next step. After this connection has been made, the development of skills to reduce negative mood states, unhealthy behaviors, and physical symptoms becomes much easier. Furthermore, some people misinterpret physiological signs of anxiety (e.g., shortness of breath, racing heartbeat) as indicative of serious physical danger (e.g., suffocation, myocardial infarction). This tendency to misinterpret physical anxiety cues is referred to as anxiety sensitivity, a belief that body sensations associated with anxiety indicate imminent and dangerous outcomes, and is associated with various anxiety disorders and health anxiety. In a study of gender differences in anxiety sensitivity, Thompson and colleagues (2011) found that distraction worked better than sensation focusing in reducing stress for males. By assisting individuals who are prone to anxiety sensitivity to interpret body sensations accurately or to distract from the sensation, nurses can help reduce individuals’ misinterpretations, as well as the likelihood of escalation of anxiety symptoms and possibly even development of anxiety disorders.

Nurses teach people to identify their warning signals of stress and to stop, take a few breaths, and break the cycle. Figure 13-3 shows a sample form for identifying and recording this information. These signals or cues differ among individuals and can be physical, emotional, behavioral, cognitive, relational, or spiritual. When asked to monitor their responses to a particular event, individuals become more consciously aware of these cues. Although this heightened awareness initially may increase an individual’s consciousness of physical pain or emotional discomfort, awareness is a necessary first step in recognizing the negative effects of stress and the relationship of thoughts, feelings, behavior, and biological processes. In addition, nurses and other clinicians have a responsibility to screen individuals for emotional distress to help them recognize and monitor their own physical and mood states. For individuals with health conditions such as coronary artery disease, which is known to have high comorbidity with emotional distress and specifically depression, routine screening should be the standard of care (Menezes et al., 2011).

Try this: Ask an individual to identify a stressful experience and the physical or emotional reactions (stress warning signals) to that particular experience. For example, after being instructed to stop, take a breath, and notice the physical and emotional response to a stressful situation, one woman related the following

On my way to work yesterday, I sat in a huge traffic jam. I noticed that my heart was racing, my breathing had changed,

Physical Symptoms	
☐ Headaches	☐ Back pain
☐ Indigestion	☐ Tight neck and shoulders
☐ Stomachaches	☐ Racing heart
☐ Sweaty palms	☐ Restlessness
☐ Sleep difficulties	☐ Tiredness
☐ Dizziness	☐ Ringing in ears
Behavioral Symptoms	
☐ Excess smoking	☐ Grinding of teeth at night
☐ Bossiness	☐ Overuse of alcohol
☐ Compulsive gum chewing	☐ Compulsive eating
☐ Attitude critical of others	☐ Inability to get things done
Emotional Symptoms	
☐ Crying	☐ Overwhelming sense of pressure
☐ Nervousness and anxiety	☐ Anger
☐ Boredom (no meaning to things)	☐ Loneliness
☐ Edginess (ready to explode)	☐ Unhappiness for no reason
☐ Feeling powerless to change things	☐ Easily upset
Cognitive Symptoms	
☐ Trouble thinking clearly	☐ Inability to make decisions
☐ Lack of creativity	☐ Thoughts of running away
☐ Memory loss	☐ Constant worry
☐ Forgetfulness	☐ Loss of sense of humor
Spiritual Symptoms	Relational Symptoms
☐ Emptiness	☐ Isolation
☐ Loss of meaning	☐ Intolerance
☐ Doubt	☐ Resentment
☐ Unforgiving	☐ Loneliness
☐ Martyrdom	☐ Lashing out
☐ Looking for magic	☐ Hiding
☐ Loss of direction	☐ Clamming up
☐ Cynicism	☐ Lowered sex drive
☐ Apathy	☐ Nagging
☐ Needing to "prove" self	☐ Distrust
	☐ Lack of intimacy
	☐ Using people

FIGURE 13-3 Stress warning signals. (From Medical symptom reduction clinic patient notebook. [n.d.]. Boston: The Benson-Henry Institute for Mind Body Medicine of Massachusetts General Hospital, Harvard Medical School.)

and my hands were gripping the steering wheel. I felt angry and frustrated because I was going to be late for work.

Although these responses seem quite obvious, most people are unaware of the effects of stress on their minds and bodies. In the preceding example, the building of the woman's stress may continue to escalate at work, influencing her interactions with

coworkers. Once individuals become aware of these effects, they may be able to release tension more easily, countering the negative effects of stress and increasing a sense of control. Techniques that help to reduce negative effects of stress include use of distraction by purposefully shifting focus to pleasant thoughts or engaging in a diversion activity, and use of a relaxation response technique, as described in the following section.

Learning and practicing a relaxation response technique.

Eliciting the relaxation response is another technique to help people develop awareness and counter the negative effects of stress. Relaxation response techniques oppose the stress response by reducing sympathetic arousal (Benson, 1975). The immediate physiological effects of relaxation are decreases in heart rate, blood pressure, respiration rate, and muscle tension. The long-term physiological effect is a decrease in central nervous system arousal with a concomitant decrease in musculoskeletal system, autonomic nervous system, and psychoneuroendocrine system arousal. To the extent that stress causes or exacerbates a symptom, elicitation of the relaxation response can break this stress-symptom cycle. In addition to these physiological changes, psychological changes such as improved mood and behavioral changes, including a reduction in risky behaviors, can occur. The relaxation response can counteract stress-related disease processes, particularly processes associated with immunological, cardiovascular, and neurodegenerative disorders (Walsh, 2011).

The relaxation response is an innate physiological response (Benson, 1975); therefore a number of techniques that involve mental focusing can be used. Details on these techniques and guidelines for clinical applications can be found in Chapter 14. All of these techniques have two basic components:

- The repetition of a word, sound, phrase, prayer, image, or physical activity
 - The passive disregard of everyday thoughts when they occur
- Electronic recordings (e.g., DVDs, CDs, MP3/MP4 files, and mobile apps/downloads) can be used to help guide this process of focusing, especially during the initial learning phase.

Nurses can often introduce individuals to the immediate calming effects of the relaxation response in less than 5 minutes. One effective way is to have the person make a fist and notice what happens to the breathing pattern. Most people have a tendency to hold their breath while tensing a body part. Now ask the person to take a few deep diaphragmatic breaths while making a fist. Most people will notice that the tension is much harder to maintain while taking a deep breath. This awareness helps to recognize the relationship between breath and tension. Lamaze techniques for helping women manage pain during labor and delivery are based on this connection between breathing and relaxation. Most people hold their breath when they perceive a threat (stress), feel anxious, or become angry. By stopping and taking a few deep breaths when they become aware of physical changes (holding the breath or clenching the jaw) or emotional changes (feeling anxious or angry), individuals can elicit the relaxation response, reduce sympathetic arousal, calm negative mood states, and gain a sense of control. Yoga and deep breathing can assist with mindfulness (i.e., awareness of perception) and promote relaxation.

Using mini relaxations. Mini relaxations can be taught quickly and used throughout the day to help develop awareness and to counter the negative effects of stress on the mind, body, and spirit. Individuals can be taught to monitor minor stress warning signs (jaw and shoulder tension) and to use a mini-relaxation exercise to keep these initial symptoms of stress from developing into an incapacitating tension headache. A mini-relaxation exercise can be anything from a few conscious, deep diaphragmatic breaths

 BOX 13-4 QUALITY AND SAFETY SCENARIO
A Stress-Management Strategy for Nurses

Develop the skill of personal presence. Presence is the gift of self through availability and attention to needs. Presence means “being there” for another person. To be available to others in this way, first practice the skill of being present with yourself. One effective way of developing this skill is through mindfulness, which is the ability to focus attention on what you are experiencing from moment to moment. Mindfulness encompasses the abilities of slowing down and bringing your full attention (thoughts, feelings, and body sensations) to the action in which you are engaged at the moment. The practice can be particularly useful in allowing yourself to extend the benefits of eliciting the relaxation response in more areas of your daily life.

The following are some ideas for practicing personal presence (mindfulness):

- When you awaken each morning, bring your full attention to your breathing. Allow your awareness to expand gradually into the room and then slowly begin to listen to the sounds of the outdoors.
 - On your way to work, focus on how you walk, drive, or ride the transit. Take some deep diaphragmatic breaths and relax your body as you travel.
 - Take a moment to attend to your breath, relax your body, and focus your mind before entering a care recipient’s room.
 - As you eat a meal, carefully examine it through all of your senses—the sight, smell, touch, taste, and the sound of each bite. Mindfully enjoy this new experience.
 - Recurring events of the day can become cues for a mini relaxation (the ringing telephone; auscultating a heartbeat; answering a call light, before, during, and after rounds or report).
 - Make the transition home from work mindful. Leave thoughts and worries of work at work and be conscious of your home environment each day.
- Once again, focus on your breathing and become completely aware of your surroundings as you go to sleep. Practice mindfully letting go of today and tomorrow as you allow your mind and body to get some much-needed rest.

Modified from Benson-Henry Institute for Mind Body Medicine of Massachusetts General Hospital. (n.d.). *Stress*. <https://www.bensonhenryinstitute.org/>

to several minutes of sitting quietly (Box 13-4: Quality and Safety Scenario). Practice is needed to elicit the response quickly when stress, pain, or tension is recognized. The power of using relaxation, including visualization, and breathing techniques is illustrated by the personal experience of a nurse who had coached pregnant women and partners in Lamaze preparation for childbirth for 10 years before having her third baby. During pitocin induction due to a postdate determination, the woman was experiencing significant contractions. Her very experienced labor nurse commented that she was an advertisement for childbirth preparation. The woman managed a smile in response. The woman reflected:

The contractions were tough. I think that the pitocin escalated the process so that contractions increased quickly from mild to intense. Did my Lamaze relaxation techniques help? Oh yes. Was it still painful—Oh yes. However, I was able to make it through this and two previous labors and deliveries without an epidural by using relaxation techniques that I had taught and practiced. I cannot emphasize enough that

relaxation techniques including breathing, visualization, distraction, and partner/nurse coaching support are powerful tools. These techniques require practice to be called upon in an instant of pain or stress. Medication and/or anesthesia remain as helpful tools in situations of acute pain such as labor, surgery, injury, or ongoing stress, but the power of our capacities to harness our own abilities are powerful and should not be overlooked. Let's empower ourselves so that pharmacotherapeutics is not the immediate go-to solution for stress and pain!

Alternative and complementary therapies. A variety of alternative and complementary therapies can prevent and reduce harmful effects of stress (Snyder & Lindquist, 2010). These therapies include acupuncture, hypnosis, aromatherapy, reflexology, reiki, and chiropractic and herbal therapies. These approaches have developed outside the mainstream of traditional Western medicine; however, developing evidence of efficacy has promoted growing acceptance of some of these approaches. People are increasingly using alternative and complementary practices as self-help measures, and research to study their effects has exploded in recent years. Nurses can help individuals evaluate the safety and efficacy of various alternative and complementary therapies. In particular, herbal remedies require cautious use because they can have harmful, as well as beneficial, effects, and they sometimes interfere with other treatments and medications. Among the alternative therapies available, there is strong evidence of effectiveness of acupuncture and hypnosis, and they are becoming widely accepted within mainstream health care.

Acupuncture is an ancient Chinese technique used to reduce pain and to prevent and manage various disorders by placement of fine needles at specific **meridian points** on the body. Acupuncture is not a self-help approach, so seeking treatment from an experienced acupuncturist is required. The Western scientific community cannot explain why acupuncture works but acknowledges its effectiveness. Even the World Health Organization has listed illnesses that can be managed with acupuncture (Stuart, 2013), and some health insurance plans provide reimbursement for acupuncture treatments.

Hypnosis comes from a Greek word meaning sleep. Hypnosis narrows consciousness and elicits relaxation, inertia, and passivity, like sleep, yet awareness is never lost completely and the hypnotized person can respond (Brann et al., 2011). The exact mechanisms through which hypnosis works are not known, although perhaps its ability to induce deep relaxation and its possible action in shifting brain activity from the “analytical” left side to the “nonanalytical” right side might be explanatory. Nevertheless, its effectiveness in managing a variety of conditions, notably smoking and anxiety-related problems, and managing pain is well recognized. Trained therapists provide hypnotherapy to manage stress and various mental health problems, including phobias, addictions, and posttraumatic stress disorder. Self-hypnosis, a form of deep relaxation similar to the relaxation techniques described in this chapter, can be a useful stress-reduction tool. Self-help guides provide safe and easy-to-follow guidelines. One note of caution is warranted: hypnosis is not recommended for people with organic brain disorders, psychotic disorders, or other

severe mental disorders. For individuals with trauma histories, practice with an expert clinician is recommended.

Reiki (pronounced ray-kee) is made up of two Japanese words: *rei*, or universal spirit (sometimes thought of as a supreme being), and *ki*. Thus the word reiki means universal life energy. Reiki is a therapy that uses energy fields with the intent to affect health. To transmit *ki*, believed to be a life-force energy, the reiki practitioner places hands on or near the person receiving treatment. In the United States, reiki is designated as a form of complementary and alternative medicine (National Center for Complementary and Alternative Medicine, n.d.; Snyder & Lindquist, 2010).

Expressive writing. Transforming thoughts and emotions related to stressful experiences into written language has demonstrated positive effects on health (North et al., 2011). In its therapeutic meaning, expressive writing involves telling a “story” about traumatic, emotionally charged, or stressful events and personal reactions. **Journal writing**—more specifically, self-confessional writing—is a form of expressive writing that is typically done via entries in a journal over time that describe unfolding personal responses to life events. Expressive writing is useful in disclosing and processing emotions, and in measurably improving physical and mental health.

Expressive writing, including journaling, can help people reflect on stressful events and their reactions to these events. Such reflection is an opportunity to reform perceptions and to consider alternative ways to manage stress. Individuals may find resolutions to conflicts that work uniquely for them. These resolutions may then increase a sense of control and mediate negative consequences of stress. This self-reflective process shares elements of CBT—an intervention effective in reducing harmful effects of stress. (See Chapter 4, Figure 4-4.)

Nurses can advise people to get a special notebook or a journal (or use an electronic tablet or computer) and write about a stressful event for 15 minutes a day in a setting in which they will not be interrupted. From a health perspective, people will be more effective when they make themselves the only audience. The nurse should warn the individual that he or she may feel sad or depressed immediately after the writing session, but these feelings usually dissipate within an hour. Nonetheless, exploring deep thoughts and feelings on paper is not a panacea. When an individual is coping with death, divorce, or some other major stressor, feeling better instantly after writing cannot be expected. A person can, however, develop a clearer understanding of feelings and of the situation through journal writing. In other words, journal writing helps people objectify experiences, identify the influence of stress on symptoms, and develop insights into more effective problem-solving. Some individuals may recognize the need for psychotherapeutic support through journal writing, and an appropriate referral can then be made. Nurses can use the same approaches to examine their own stressful work-related situations to reflect, analyze their responses/reactions, and generate effective responses to similar experiences in the future.

Nutrition: Healthy Diet

Countering negative effects of stress requires caring for physical health and well-being. The mind and body are connected;

therefore paying attention to one while ignoring the other does not promote overall health. The body requires rest, a healthy diet of balanced food choices, and exercise. In the last few decades, nutrition has moved to the forefront as a major component of health promotion, disease prevention, and symptom management. Food is now viewed as a positive influence on health, physical performance, and state of mind rather than simply a fuel needed to prevent disease and sustain life. Adaptive eating is characterized by balanced eating patterns and calorie intake as well as appropriate body weight for height. Nutrition is an important component of early intervention strategies to improve physical, cognitive, emotional, social, and spiritual functioning.

However, the American lifestyle has made practicing healthy eating habits increasingly difficult. Americans frequently replace nutritionally balanced meals with readily available high-fat, high-calorie food (US Department of Agriculture, 2012). One of the frustrations that nurses experience is trying to help children and adults develop healthy eating habits. This effort requires planning and correctly choosing a variety of foods and eating a diet low in fat, saturated fat, and cholesterol, with plenty of vegetables, fruits, and grain products. The current US dietary guidelines (US Department of Agriculture, 2012) are based on the following two overarching concepts: focus on calorie balance over time to achieve and maintain a healthy weight; focus on consuming nutrient-dense foods and beverages. Daily food choices should be made from the five food groups. Key recommendations also highlight the importance of calorie control and physical activity. Guidelines continue to undergo evaluation and revision; for example, guidelines about “healthy foods” are under ongoing review, so nurses are urged to check for updated guidelines. A detailed discussion of the health benefits of balanced nutrition and guidelines throughout the life span can be found in Chapter 11.

Encouraging healthier dietary choices helps people to recognize that control over their health and well-being is possible. This knowledge, in turn, helps counter the negative effects of stress and lower the stress-disinhibition effect that can influence poor dietary choices. Nurses encourage people to monitor their daily dietary patterns to gain awareness of how they use food in times of stress. Tools such as food diaries (24-hour recall) help people to monitor the amount and quality of what they eat and drink and to set realistic goals. An example of an on-line free program is MyFitnessPal (2015), which combines nutrition tips and a way to monitor exercise in a journal format.

Physical Activity

Combining a healthy diet with a regular exercise routine has many health benefits and can positively affect quality of life. For example, one of the most effective ways to lose weight and improve self-esteem is to combine exercise with nutritious eating. Exercise (physical activity that increases strength and flexibility and improves conditioning) and balanced nutrition serve as protective factors against several major chronic diseases. Regular physical activity decreases the risk of death from heart disease, lowers the risk of developing diabetes, and is associated with a decreased risk of colon cancer (USDHHS, 2011). Exercise helps prevent high blood pressure and helps lower blood pressure in people with elevated levels. Regular physical activity, even at

moderate levels, is associated with lower death rates for adults of any age. Psychological well-being is enhanced, and the risk of developing depression can be reduced; regular physical activity appears to reduce symptoms of depression and anxiety and to improve mood.

Additionally, children and adolescents need weight-bearing exercise for normal skeletal development, and young adults need this type of exercise to achieve and maintain peak bone mass (USDHHS, 2011). Regular physical activity also increases the ability of older people, and those with certain chronic, disabling conditions, to perform activities of daily living. Nevertheless, high stress could increase injury risk for athletes, and injured athletes may experience greater stress than noninjured peers when they are sidelined from competition. Chapter 12 provides a comprehensive discussion of the benefits of exercise and its clinical application throughout the life span.

Regular physical activity helps people adopt a more active lifestyle as they begin to feel better physically and emotionally, thereby breaking the negative stress cycle (Figure 13-4). Positive effects can be obtained with exercise of only moderate intensity. For example, a brisk walk of 30 to 60 minutes, 3 to 5 times a week, promotes fitness and decreases the risk of disease. Being physically active on a daily basis is extremely important; therefore nurses can help individuals increase their physical activity by suggesting a variety of activities in which they might engage each day (Box 13-5). An exercise diary can generate a baseline for usual activity to set realistic goals and monitor progress. By simply changing a few daily routines, individuals can gain enormous physical, psychosocial, and spiritual rewards that promote health and break the negative stress cycle.

Sleep Hygiene

Health and the ability to meet life's many demands and manage stress effectively require proper rest. Many people experience sleep deprivation and sleep disorders (e.g., sleep apnea) that can cause or exacerbate conditions such as depression and fatigue and contribute to poor concentration and ineffective problem-solving. Insomnia can be induced by stress or other cognitive-behavioral factors, such as unrealistic expectations, inappropriate scheduling of sleep, trying too hard to sleep, consuming caffeine,



FIGURE 13-4 Regular physical activity helps individuals adopt a more active lifestyle.

BOX 13-5 Helping Individuals Increase Physical Activity

Nurses can suggest ways for individuals to increase physical activity throughout the day, including:

- Have fun and play active games with children.
- Engage in a sport.
- Find a friend with whom to walk or jog.
- Take a class in yoga or tai chi.
- Get and walk a dog.
- Garden on the weekends.
- Walk or bicycle to school or work.
- Take the stairs, never the elevator.
- Park the car at the farthest point in the parking lot at work, at school, or when shopping.

By simply changing a few daily routines, a person can gain enormous physical, psychosocial, and spiritual rewards that promote health and break the negative stress cycle.

getting inadequate exercise, and a number of other factors, including illness, alcohol use, or drug use (Stuart, 2013). Determining the extent to which sleep disturbance is the result of behavior or stress-related issues is a necessary assessment. Overcoming sleep disturbances cannot be done quickly. Changing these behaviors requires patience and persistence. Once the factors associated with sleep disturbance have been identified, nurses can help individuals improve their sleep patterns by counseling them to follow several sleep hygiene or behavior guidelines (keeping a sleep diary, having a regular sleep-wake cycle, and making prudent dietary changes). Referral for appropriate evaluation of possible disorders such as sleep apnea is also a necessary nursing intervention. Assisting people to make healthy behavior changes in their sleep habits provides another opportunity for people to increase self-regulation, confidence, and control, thereby reducing stress and improving quality of life. Box 13-6 presents several sleep hygiene strategies.

Cognitive-Behavioral Restructuring

Many stressful situations can be created or exacerbated by negative, exaggerated, catastrophic thinking. CBT is a conceptually based short-term intervention to modify this thinking and related behaviors, and thereby reduce stress. In the context of therapy, cognitive-behavioral restructuring is a technique or a series of strategies that help people evaluate their thoughts, challenge them, and replace them with more rational cognitive and behavioral responses (Beck, 1976, 1979; Clark & Beck, 2012; Dowd et al., 2015). Although advanced training is needed to provide CBT and nurses are encouraged to do so, nurses can safely and effectively use basic strategies. A helpful resource for nurses is the Beck Institute for Cognitive Behavior Therapy (2012).

Appraisal, or the way in which a situation is viewed, can be a major cause of stress, making CBT especially suited for stress management. When situations are viewed in a negative, distorted, or illogical manner, such perceptions can adversely affect emotions, behaviors, beliefs, and physiological parameters. Cognitive-behavioral restructuring teaches people to recognize that negative

BOX 13-6 Sleep Hygiene Strategies

Nurses find the following suggestions to be helpful for individuals with sleep disturbance resulting from behavioral or stress-related issues:

- Keep a sleep diary, which helps determine sleep patterns more accurately, assess progress, and reinforce behavior change.
- Challenge irrational beliefs.
- Reduce consumption of alcohol and caffeine. (Chapter 11 gives some tips.)
- Avoid use of sleeping pills.
- Have a regular sleep-wake schedule, even on the weekends.
- If you are unable to fall asleep within 20 to 30 minutes, or if you wake up and are unable to fall back to sleep within that time, get out of bed and do something until you are groggy and sleepy again.
- Focus on relaxation, not sleep. Use a relaxation tape, and practice diaphragmatic breathing. Limit naps during the day to less than 45 minutes. Longer naps reset the biological clock and disturb nighttime sleep.
- Exercise within 3 to 6 hours of bedtime. Exercise improves sleep by producing a significant rise in body temperature, followed by a compensatory drop a few hours later, making it easier to fall asleep and stay asleep. Furthermore, because exercise is a physical stressor, the brain compensates for this by increasing the amount of deep sleep.
- Take a hot bath 2 hours before bedtime. The temperature drop after the bath helps to induce sleep.
- Sleep in a cool room. Individuals become sleepier and less active when body temperature falls.

From Stuart, G. W. (2013). *Principles and practice of psychiatric nursing* (10th ed.). St. Louis: Mosby.

thinking often causes emotional distress and associated behaviors. This recognition, in turn, alters problematic thinking and behavior, reduces the negative consequences of stress, and enhances health (Stuart, 2013).

Cognitive-behavioral restructuring does not gloss over or deny misfortune, suffering, or negative feelings. Many circumstances exist in peoples' lives for which it is appropriate to feel sad, anxious, angry, or depressed. More accurately, cognitive-behavioral restructuring is a technique that helps some people become unstuck from these moods so that they can experience a broader range of feelings and try out new behaviors (Stuart, 2013). In this structured method, individuals are asked to consider their cognitive appraisal of a situation and how this assessment affects feelings, behaviors, and physiological processes. Reframing, or cognitive reappraisal, educates individuals in monitoring thoughts and replacing those that are negative and irrational with those that are more realistic and helpful. Adding behaviors that are consistent with reframed thinking follows.

For example, a woman may have had plans to meet a friend for lunch on a day she woke up with a migraine headache. She might begin to think such thoughts as "This always happens to me when I have plans," "This headache will never go away," "I shouldn't have to deal with this," or "My day is ruined." The result of this negative, irrational self-talk is disappointment, frustration, and anger. This emotional arousal will, in turn, increase muscle tension and a variety of other stress-related symptoms, which may exacerbate the headache. To help individuals develop the skill of cognitive-behavioral restructuring, nurses can teach them to examine a stressful situation using the four-step innovative practice CBT approach highlighted in Box 13-7: Innovative Practice.

BOX 13-7 INNOVATIVE PRACTICE**The Four Step Approach to Cognitive Restructuring Enhanced With Technology**

To help individuals develop the skill of cognitive restructuring, nurses can teach them to examine a stressful situation using the following four-step approach:

- *Stop* (break the cycle of escalating, negative thoughts).
- *Breathe deeply* (elicit the relaxation response and release tension).
- *Reflect* (ask "What is going on here? What am I thinking? Is the thought true? Is the thought helpful? Am I jumping to conclusions or magnifying the situation?").
- *Choose* a more realistic, rational response. Try out the alternative response in a future situation.

Alternative Approach

Teaching/coaching can be done face-to-face or can be provided via technology (e.g., a website and/or smartphone application that shows the previous steps with a feedback interface). Via technology, feedback can be given via text or e-mail messages to correct negative thoughts and to provide suggestions and positive reinforcement for steps 2 to 4 when success is reported. Phone and/or face-to-face interaction can augment contact via technology when possible. Tracking successful cognitive restructuring via on-line entry can provide useful outcome data. As Internet and smartphone penetration increase and costs decrease, use of such technological interventions will increasingly be cost-effective ways to reach more individuals and can be applied across a range of technological platforms (e.g., computers, smartphones, and tablets). Reminder generic affirmations also can be added via text messaging at very low cost to encourage practice of the steps.

Modified from Clark, D. A., & Beck, A. T. (2012). *The anxiety and worry workbook: The cognitive behavioral solution*. New York: Guilford Press; Stuart, G. W. (2009). Psychophysiological responses and somatoform and sleep disorders. In G. W. Stuart & M. T. Laraia (Eds.), *Principles and practice of psychiatric nursing* (9th ed., p. 241). St. Louis: Mosby; Stuart, G. W. (Ed.) (2013). *Principles and practice of psychiatric nursing* (10th ed.). St. Louis: Mosby.

In the previous example, the woman may reflect that "I am having a migraine headache, and I hate that it is on a day that I had made plans, but I will take my medication, listen to my relaxation tapes, and rest. I'll call my friend and see if we can change our plans. Perhaps she can come over to visit me for tea this afternoon if I feel better." Although it is understandable that anyone would be disappointed and upset over this situation, application of the four-step cognitive restructuring technique can help individuals identify healthy choices and gain a sense of control.

Based on the work of pioneers such as Aaron Beck (1976, 1979) and Albert Ellis (Ellis, 1962; Ellis & Dryden, 1987), cognitive therapy has emerged during the past several decades as a treatment designed to alter dysfunctional beliefs and thoughts associated with depression, anxiety disorders, and other emotional problems (Clark & Beck, 2012). Over time, theorists, clinical researchers, and clinicians recognized the effectiveness of this approach for many people, as well as the value of linking helpful alterations in thinking to complementary behavioral changes. As a result, CBT emerged. CBT is an efficacious treatment approach for many stress-related and mental health disorders. For example, researchers have shown that CBT is effective, alone or with other

BOX 13-8 DIVERSITY AWARENESS**Social Stressors Can Lead to Discrimination for Vulnerable Populations**

Health is perceived through one's spiritual beliefs, holistic practice, and biomedical perspectives. Nurses understand cultural sensitivity when providing care and the importance of clear communication in multicultural care. Greater concern for health literacy and improved coordination with support organizations are needed. Barriers such as discrimination and geopolitical tension may affect the ability to cope through frustration and may influence health care outcomes. *Healthy People 2020* identifies the need to close the gap and supports health equity by addressing chronic disease and infant mortality rates. For example, social stressors have been linked to increased depressive symptoms among antepartum black American women (Dailey et al., 2011). Thus in addition to the need for universal symptom screening, it is essential that nurses develop and test interventions to ameliorate effects of social stressors such as discrimination for vulnerable populations.

From Dailey, D. E., Dawn, E., & Humphreys, J. C. (2011). Social stressors associated with antepartum depressive symptoms in low-income African American women. *Public Health Nursing*, 28, 203-212.

therapies or medication, in alleviating postpartum depression (Bobo & Yawn, 2014). Evidence provides strong support for use of cognitive-behavioral restructuring as a stress-management approach. A comparison of an on-line mindfulness-based cognitive therapy intervention (Mindfulness in Action) with on-line pain management psychoeducation showed positive outcomes in self well-being from both approaches, yet Mindfulness in Action was associated with more pronounced positive outcomes (Dowd et al., 2015). Although the results were promising, more research is needed to demonstrate efficacy. Sensitivity to stress appraisals is also situated within a person's culture and experience. Cultural sensitivity to such influences is critical to providing quality care. Box 13-8: Diversity Awareness presents relevant information related to the effects of racial/ethnic discrimination on cognitive appraisals of interactions as threatening and harmful, resulting in increased overall stress burden.

Affirmations

Affirmations can be an effective stress-management and cognitive-behavioral restructuring skill because they are a method of countering self-defeating negative thoughts and attitudes in addition to being helpful in addressing spiritual needs. An affirmation is a positive thought, in the form of a short phrase or saying, which has meaning for the individual. By reinforcing new ways of thinking or behaving in the present moment, affirmations are statements that people can use to reaffirm new intentions and to clarify goals.

Nurses coach individuals to create an affirmation as a way of developing a more helpful, realistic belief system. For example, thoughts such as "I can't handle this" and "My day is ruined" can be countered with "I can handle this" and "I know ways to increase my comfort." Repeating an affirmation often throughout the day, perhaps after elicitation of the relaxation response or as part of a breathing exercise, can become second nature and can help to enhance self-esteem and reduce stress.

Social Support

Having supportive family, friends, and coworkers is for many individuals an important contributor to effective coping and stress hardiness (Kobasa et al., 1982). Many people believe that confiding in others and talking out problems can be a helpful way to get good advice or uncritical support. Social support comprises a network of close family, friends, coworkers, and professionals. The social support literature notes that both the number of supports and the quality of the relationships are important (van Woerden et al., 2011).

Research outcomes demonstrate the protective health effects of social support. However, influences may differ by type or source of support. For example, van Woerden and colleagues (2011) examined the effects of social support from personal, professional, and community networks and other factors in relation to self-rated health using a cross-sectional postal and Web-based survey with a random sample of 10,000 households in Wandsworth, London. The results demonstrated that social support from family or friends, at work, and by civic participation was associated with a lower likelihood of poor self-rated health, but that social support from neighbors was associated with a higher likelihood of reporting poor health. The outcomes suggest that most of the health effects of social support are complementary. Nonetheless, the finding that the health effects of family social support were insignificant after the other social support variables had been controlled for suggests that it can be compensated by support from other sources. Sociodemographic variables (e.g., sex, age, being married, being employed, and owning a home) were also associated with better self-rated health. The principal message is that a variety of sources of social support may promote health and that nurses should ask individuals about all types of social support so as to help them cultivate and use support from many sources. In addition, substituting support from a different source when it is lacking from one usual source such as the family can be a helpful strategy.

Nursing interventions are aimed at facilitating social support to promote effective coping and reduce stress. Using information available in their local communities or through national organizations, nurses suggest support groups (see Chapter 8), website chat rooms, social networking sites, educational classes, and exercise facilities. Individuals and their families are often referred to volunteer organizations such as the American Lung Association, the American Heart Association, the American Cancer Society, and the Arthritis Foundation for resources related to specific health-promotion/maintenance needs that also may provide social support opportunities.

Assertive Communication

Effective communication is an important stress-management skill. An important coping and problem-solving skill, communication can be adversely affected by exaggerated negative thoughts and deeply held negative beliefs and assumptions (Stuart, 2013). (See Chapter 4 for additional discussion of communication.) People who have difficulty with communication usually have one or all of the following problems:

- Disparity between what they say (statement) and what they want (intent)

- Confusion about or resistance to stating clearly how they feel, what they want, or what they need (lack of assertiveness), with either a tendency to deny their own feelings (passiveness) or indifference toward the feelings of others (aggressiveness)
- Difficulty listening to others

The importance of matching the statement with intention is illustrated by the following example:

As Timothy is leaving for his basketball game on a Saturday afternoon, his mother tells him, "Remember to be home early tonight." When Timothy arrives home at 9:00 pm, his mother, who is waiting at the front door, yells, "Where were you? Is this your idea of early? You know your father and I had plans tonight. We were counting on you. You think only of yourself. This always happens. You'll never change. You'll always be irresponsible and selfish."

The first guideline for effective communication is that people need to be clear about what they want and what they need (intent) in statements to others. Although it would be wonderful if a son or daughter, spouse, friend, or others were great mind readers, assuming that people automatically know what is meant does little to help with communication. Nurses help individuals match statements with intentions. This process requires that individuals recognize distorted, exaggerated thoughts and emotions and take responsibility for their part of the conversation. Communicating effectively is a learned art and skill.

In our reviewing the previous example, it is helpful to note that if the mother's intention was to have her son home before 8:00 p.m., then her statement needed to indicate this. She could have said "I hope you enjoy the game, but remember your father and I are going out tonight. We need to have you home before 8:00 p.m. to take care of your sister." It is important that the person understands that the other person in the conversation is not obligated to respond as one would wish. However, a request can be much clearer when the statement reflects the intent.

The next guideline for effective communication is to be assertive. **Assertive communication**, in most cases, is the most effective way to communicate. An assertive statement is nonjudgmental, expresses feelings and opinions, and reaffirms perceived rights. The general format of an assertive statement is: *I feel* [emotion], *when you* [the behavior], *because* [explanation].

The formula requires that all three elements be included. **Cognitive restructuring**, as described earlier, facilitates assertive communication because it requires individuals to identify their thoughts and feelings. In the previous example, Timothy's mother could:

- **Stop** (breaking the cycle of escalating, negative thoughts)
- **Breathe deeply** (releasing physical tension; promoting relaxation)
- **Reflect**:
 - How do I feel emotionally? (e.g., frustrated)
 - What are my automatic thoughts? ("If he cared about us, then he would have been home on time. He's always selfish and irresponsible. He's never going to change.")
- **Choose**:
 - A more realistic, helpful way of thinking ("He's not always selfish and irresponsible. Even though it feels like he doesn't care about us when he does this, I know he cares.")

Becoming aware of her automatic thoughts and feelings would help Timothy's mother plan an assertive statement when Timothy comes home. She could then say "I feel frustrated [emotion] when you are late [behavior] because I expected you would be home in time to care for your sister while your father and I went out, or that you would have called if you were going to be late [explanation]." This statement both makes her feelings clear and explains why she feels this way, which in turn provides a better opportunity to work on problem-solving. When people cannot verbalize both their feelings and their needs, others are forced to figure out what they are. When others fail to do so correctly, individuals may feel victimized and blame the others for not understanding. Nurses help people recognize that they have a right and a responsibility to speak up and to do so in an assertive manner. The nurse helps individuals in matching their emotions with the explanation (frustration equals unmet expectation). It is important to remind them that this way of communicating may feel awkward and uncomfortable at first. Practicing this technique many times will be required before communication improves. Role play can be a useful technique to practice. Other people need time to become accustomed to the changes. Effective communication takes both practice and patience with everyone involved.

Empathy

Empathy is an effective stress-management intervention because it assists with communication. Empathy is the ability to consider another person's perspective and to communicate this understanding back to that person. Empathy guides individuals to become better listeners.

Empathy can be facilitated through the technique of active listening. Active listening requires conscious, empathic, non-judgmental awareness. Listening also helps clarify the issues involved and can deescalate many emotional exchanges. The use of focus groups can assist the nurse in understanding concerns, such as a parent group concerned about nutrition choices in the lunch room. For example, during a situation in which a parent announces "I'm fed up with the food selection in the cafeteria," the response may be important to resolving the issues without promoting further miscommunications and increasing problems. Rather than being caught by a defensive, emotional reaction, individuals can learn to communicate empathetically using the four-step approach:

- *Stop* (breaking the cycle of escalating, negative thoughts)
- *Breathe deeply* (releasing physical tension; promoting relaxation)
- *Reflect*:
 - How do I feel emotionally? (hurt, angry)
 - What are my automatic thoughts? ("How could [person] say that? It's not my fault. I have things to do. [Person] always accuses me. This is never going to change.")
 - What are the thoughts and emotions being expressed by the other person?
- *Choose*:
 - "My feelings are hurt, but I don't have to react defensively."
 - "I'm going to try to understand [person's] perspective using this phrase: 'You sound ____ about ____' and listen to [person's] response."

By using this phrase ('You sound ____ about ____'), an individual can gain awareness from another person's perspective (Rogers, 1951). If we continue with the scenario, the response might be "You sound upset about the choice of food available...." Possible responses to this empathetic statement might include "It's not just about that. Everything went wrong today, and this was just one more thing when my child complains about lunch" and "You're right. I hate having to pay for food that my child will not eat."

When one uses active listening, the other person often feels heard. An opportunity to clarify any misunderstanding becomes available. This exercise may help reduce emotional arousal, defensive behavior, and conflict. Active listening allows the individual to buy time and to get a better perspective on what the other person is thinking and feeling. Individuals can then make a choice as to how they want to respond. They may choose to use assertive communication or to step away from the interaction. Active listening promotes empathic, objective, and nonjudgmental communication. Nurses recommend use of stress-management skills that include active listening techniques to facilitate effective communication, which, in turn, reduces conflict and stress.

Healthy Pleasures

Engaging in healthy pleasures (activities that bring feelings of peace, joy, and happiness) is, for most individuals, an important part of life. However, for individuals who are feeling overwhelmed with daily hassles of work-life balance, illness, or loss, this practice may have been lost. Individuals may feel that they do not deserve to have pleasure or that they are waiting for happiness until they feel better, until the stressors are resolved, or until they go away. This belief makes breaking the stress cycle even more challenging; however, rewards motivate behavior (Stuart, 2013). By nurses asking people to pursue a healthy and pleasurable activity every week, motivating them to become more involved in their lives and break this cycle is often easier. The activity can be simple, and it need not cost money. For example, people often find pleasure in enjoying nature, spending time with a friend, reading a book, or watching a movie. Hobbies are purposeful leisure-time activities that can balance hectic, stressful lives. A hobby should be chosen from interest and/or talent. Many hobbies have added benefits of increasing activity (e.g., gardening) or promoting social engagement (e.g., a book club or chorus). Nurses advise individuals to make leisure-time activities a regular part of the week as a purposeful and conscious plan to break the stress cycle.

Spiritual Practice

In response to stress, people can feel disconnected from life's meaning and purpose, which in turn affects spiritual health and well-being. Meeting spiritual needs may be facilitated by spiritual practice or activities that help people find meaning, purpose, and connection. For example, individuals may choose to elicit the relaxation response through prayer. This focused, relaxed state of mind might help them develop a spiritual perspective that can engender a shift in values and beliefs to help them cope with a stressor they cannot change, such as chronic illness or loss of a loved one. Expression of anger or confusion in the face of difficulties, trauma, or tragedy also can provide a therapeutic

outlet, but conversely may engender spiritual or religious doubt, or a sense of alienation from one's beliefs. Nurses suggest a referral to a chaplain or clergy member, provide spiritual music or art work, recommend spiritual reading material, and provide personal presence (see Box 13-4: Quality and Safety Scenario). Willis and colleagues (2015) explicated how spiritual healing manifested itself in the aftermath of childhood maltreatment and point out the potential helpfulness of "constructing caring-healing interventions aimed at both cultivating spiritual consciousness and facilitating loving-kindness and acts of letting go in the healing process."

Nurses propose activities that provide a sense of meaning and purpose. Keeping a journal can be an important strategy to help individuals focus on aspects of life that are more positive and that become clouded from view when a person is feeling overwhelmed by stress. Finding ways of helping others (e.g., tutoring children, reading to the blind, or visiting an older adult) can have a positive influence on spiritual health and well-being. Altruism, generosity, kindness, and service to others are more than moral virtues. These attributes not only help to make the world a better place but also help people find meaning and purpose in life. Religious and existential well-being has provided some defense against depression for people with chronic and life-threatening conditions. Older, chronically ill, and homebound people can be encouraged to produce written or oral histories that can be a legacy or, when able, to contact others needing care or to make telephone calls to raise funds for a favorite charity. In addition, nurses and other health care professionals can assist individuals and families to describe and clarify their personal religious and spiritual perspectives, especially in light of evolving practices/meaning structures and high rates of interfaith marriages/partnerships (Walsh, 2011). Spirituality and religious affiliation cannot be equated. Additionally, being part of a "faith community" may provide an important source of social support for many people. Within faith communities, nurses (also known as "parish" nurses) act as facilitators, educators, and referrers to individuals and families in promoting holistic care. Nurses can encourage individuals to search for a community that is comfortable, accepting, and supportive.

Clarifying Values and Beliefs

To manage stress and develop a balanced lifestyle, people must recognize the things and values that are important to them, reflect on where they are in life, evaluate what needs to be changed, and generate an action plan for that change (see Chapter 4). This process is known as *values clarification*. The first step is to identify what is important, meaningful, and valuable so as to assess whether actions are consistent with beliefs. What people believe and value guides their actions by endorsing certain behaviors and changing others. When people assess their values and beliefs, they use the ability to make their own choices rather than relying on beliefs and values dictated to them by others.

One method nurses use to help people identify what they value and, ultimately, to help them clarify the relationship between their beliefs and actions is to ask them to identify what is important or meaningful to them. The form in Figure 13-5 is an example of questions used in the Medical Symptom Reduction Program at the Benson-Henry Institute for Mind Body Medicine

of Massachusetts General Hospital (n.d.) in Boston. Individuals are asked to identify what is important and meaningful to them in eight domains. Nurses change the domains to reflect more accurately the values and beliefs of the individuals they are counseling. After reviewing the results, individuals may find that they have not been doing certain things that are important to them (becoming more physically active, eating a healthier diet, volunteering, or spending time with their children). When people detect inconsistencies between their values and their actual living habits, they can begin to develop a working plan for correcting these inconsistencies. This process enables them to make conscious choices and to have more control (see Figure 13-5).

Setting Realistic Goals

Developing an action plan for change to work toward a more balanced health-promoting lifestyle that is consistent with a person's values and beliefs is an important stress-management strategy. Setting realistic, attainable goals facilitates this exercise. Goal setting is a dynamic process that involves both the individual and the nurse. Goals should be specific, concrete, measurable, and achievable. Nurses facilitate this process by respecting the individual's input and using a values clarification exercise (such as the one mentioned) to facilitate a more complete database to guide individuals to identify and prioritize problems to be addressed, and set mutually agreed on long-term and short-term goals. Nurses encourage individuals to challenge themselves when their behaviors are not consistent with what they identified as important and meaningful to them. For example, when an overweight man with hypertension and high cholesterol levels continues to smoke and eat high-fat foods, nurses help him to look at these behaviors relative to what is meaningful to him, such as his family. The cost and benefit are usually clear, and the responsibility for the change is with the individual, not the nurse. Nurses ask the following questions to help individuals clarify long-term goals:

- What is important to you?
- What would you like to change about your life?
- What can you do to start that change?
- When will you take that action?
- How will you measure success?
- How will you maintain the desired change?
- How can I help you to reach your goal?

Setting realistic, attainable goals helps to create a sense of confidence and achievement and to build enthusiasm to set future goals. This process, in turn, increases a sense of control and mitigates the negative effects of stress.

Humor

Humor is an enjoyable and effective antidote to stress for many people. Humor can have health-promoting properties (Konradt et al., 2013; Stuart, 2013). When acting as a stress reducer, humor produces laughter. Laughter creates predictable physiological changes in the body. Similarly to how it behaves with other forms of exercise, the body responds in two stages: an arousal phase with an increase in physiological parameters, and a resolution phase, during which these parameters return to resting values or lower values (Wooten, 2009).

"What Is Important and Meaningful to You in Life?"

In each of the following areas, what do you want for yourself, today, next week, a year from now?

Under each of the following categories, please ask yourself these important questions.

Professional, educational, and intellectual

Today _____

Next week _____

A year from now _____

Relationships

Today _____

Next week _____

A year from now _____

Creative things

Today _____

Next week _____

A year from now _____

Spiritual

Today _____

Next week _____

A year from now _____

Volunteer and altruistic

Today _____

Next week _____

A year from now _____

Health

Today _____

Next week _____

A year from now _____

Fun and play

Today _____

Next week _____

A year from now _____

Material objects

Today _____

Next week _____

A year from now _____

FIGURE 13-5 What is important and meaningful to you in life? (From Medical symptom reduction program patient notebook. [n.d.]. Boston: The Benson-Henry Institute for Mind Body Medicine of Massachusetts General Hospital, Harvard Medical School.)

Humor can open different perspectives on problems and facilitate objectivity, which increases a sense of self-protection and control. Finding humor in a stressful situation can help people to reframe perceptions of the event. Some hospital staffs are using laughter libraries, humor rooms, comedy carts that can be wheeled into an individual's hospital room, and clowns to bring laughter and joy to the bedside. Humor has potential as a possible, enjoyable, and inexpensive stress-reduction that can offer people new perspectives on their world

and themselves. Nevertheless, recognizing that humor can mask conflict or be hurtful is critically important in judging when and how to use it in clinical and work setting encounters (Box 13-9).

Engaging in Pleasurable Activities

A variety of activities can promote the relaxation response. Finding activities that are enjoyable to the person can be a key strategy to reduce stress and promote healthy behaviors. For example, Wong in her engaging book *Scales to Scalpels* (Wong & Viagas,

BOX 13-9 Humor Strategies for Stress Reduction

Nurses help individuals use humor for health promotion and stress reduction in a variety of ways, including:

- Keeping a humor journal: looking for the unintentional amusing remark, watching for funny things young children say or do, and looking in the newspaper for humorous grammatical errors or an inappropriate choice of words and writing them in a journal
- Looking on the Internet for humorous resources
- Creating a scrapbook of humorous cartoons, pictures, stickers, poems, and songs
- Reading a cartoon or joke in the newspaper every day and sharing it with a friend
- Watching funny movies or reruns of old television programs
- Finding and spending time with funny, light-hearted people

For more information about using humor to reduce stress, see Box 6-4.

2012) described how the Longwood Symphony Orchestra in Boston, a talented group of medical professionals who practice at an elite center of health care and research, helps them to thrive as artists. Carving out the time to create music within this ensemble in the midst of demanding clinical and academic lives allows these musician/clinicians to practice the healing art of music for themselves and in turn to be better healers. Wong's engaging narrative underscores the value of integrating various art therapies into our care plans as a valuable strategy for health promotion and stress reduction. Additionally, it points to the importance of self-care for clinicians.

EFFECTIVE COPING

When people believe that they can cope effectively, the harmful effects of stress can be minimized. The stressful situation is perceived as a challenge rather than a threat. This often elusive difference has vital mind, body, and spirit effects. When people believe that their lives are more balanced and under control, they are productive, but not driven; are aroused, but not anxious; and may even be physically or mentally tired, but not exhausted.

Effective coping helps people face great adversity (such as illness) and recognize the opportunity that the situation often presents. First and foremost, individuals must recognize that coping is the ability to find a balance between acceptance and action, between letting go and taking control. Many stress-management strategies help individuals distinguish these differences by providing a format for observing or objectifying their experiences. Other strategies such as exercise and balanced nutrition help individuals promote physical health and well-being to counter the harmful effects of stress. In addition, epigenetics (i.e., how environmental factors such as nutrition and stress trigger or mute the expression of genetic traits) is a vast canvas for the exploration of causes and intervention across a variety of physical and mental health disorders for individuals and populations (Dauncey, 2014) (Box 13-10: Genomics).

Nurses help individuals improve effective coping by guiding them in the art of choosing the right strategy at the right time. In doing so, people gain a sense of control that minimizes or

BOX 13-10 GENOMICS

Epigenetic regulators modify gene expression without changes in DNA sequence. Nutrition is such a regulator that affects the brain throughout life, with profound implications for cognitive decline and dementia. Effects are mediated by changes in expression of multiple genes, and responses to nutrition are in turn affected by individual genetic variability. Epigenetic mechanisms are central to brain development, structure, and function. Epigenetics promote cell-specific and age-related gene expression that can be highly stable but also reversible in response to factors such as nutrition. Health and brain function, in particular, result from highly complex interactions between numerous genetic and environmental factors, including nutrition, physical activity, age, and stress. The interplay of genetic and environmental factors, including nutrition and stress, is critical to our understanding the causes of many health disorders and developing effective interventions.

Modified from Dauncey, M. J. (2014). Nutrition, the brain and cognitive decline: Insights from epigenetics. *European Journal of Clinical Nutrition*, 68(11), 1179–1185.

buffers harmful effects of stress. Nurses use the interventions described in this chapter to assist individuals to manage extrinsic and intrinsic stressors.

When individuals cannot control or influence the situation (extrinsic stressors), nurses advise them to do the following:

- Take care of physical health and well-being: exercise; eat healthy, balanced meals; and practice sleep hygiene.
- Accept: learn to accept that some situations or people cannot be changed or avoided. Forgiveness and letting go of resentment are often a part of acceptance.
- Use distraction: distraction involves putting a worry aside, when necessary, until the situation can be dealt with directly. This prioritizing is quite different from procrastinating or denial, because it is a necessary delay rather than avoidance.
- Reduce emotional arousal: practice mini relaxations, listen to a relaxation recording, use the four-step cognitive-behavioral restructuring technique, exercise, seek social support, pray, meditate, use humor and affirmations, write in a journal, or engage in a healthy pleasure.

When individuals can alter or influence the situation, or when they are contributing to or creating the stress (intrinsic stressors), nurses advise them to do the following:

- Take care of physical health and well-being: exercise; eat healthy, balanced meals; and practice sleep hygiene.
- Reduce emotional arousal: practice mini relaxations, listen to music or a relaxation DVD or CD, engage in exercise, seek social support, pray, meditate, use humor and affirmations, write in a journal, engage in a healthy pleasure, and/or use the four-step cognitive-behavioral restructuring strategy:
 - *Stop* (breaking the cycle of escalating, negative thoughts)
 - *Breathe deeply* (eliciting the relaxation response and releasing tension)
 - *Reflect* (asking “What is going on here? What am I thinking? Is the thought true? Is the thought helpful? Am I jumping to conclusions or magnifying the situation?”)
 - *Choose* a more realistic, rational response and related behavioral reaction.

- *Problem-solve:*
 - Clarify values, beliefs, and expectations.
 - Gather information.
 - Seek advice, support, assistance, or information.
 - Use assertive communication and empathy.
- Set realistic goals, design action strategies, and determine the best steps to handle the problem.
- Take action.

See the care plan for John DeMarco for an example of a plan for effective coping.

CASE STUDY

Health Assessment: John DeMarco

John DeMarco, a 29-year-old man separated from his wife, walked into the health maintenance organization stating he had a severe sore throat, could not eat, had not worked for a day, and was feeling "awful." He wanted to see the physician and get a prescription for an antibiotic. The medical record revealed two episodes within the last 9 months of reports of a sore throat, culture of organism, and antibiotic treatment. The separation from his wife occurred 1 year ago. He had not had a physical examination in 2 years. During the assessment interview, the nurse gathered the following information: John DeMarco appeared tired; he presented his problem in short, terse statements; he was irritable about the clinic's slow service; and he expressed a need to get back to work. Within the last 3 weeks he had been required to work overtime because he faced deadline penalties, and his boss said that Mr. DeMarco's promotion, due in 2 months, depended on his performance now. The company is struggling, and layoffs may be pending. Mr. DeMarco said that, in general, things were fine.

His wife was apparently happy without him, and he was too busy to care or to think about that relationship. He made one remark about his boss: "What do you do with a nervous boss?" He described his diet as fast food "taken on the run." He said he gets about 6 hours of sleep per night and awakens one to two times near morning. He has infrequent contact with family members, who live in the area. In accordance with the clinical protocol for the health center, the nurse collects a throat culture.

Reflective Questions

- As Mr. DeMarco's nurse, how would you comprehensively assess his health?
- What are several different diagnoses and possible individual, family, and etiological factors to consider?
- What work-related health issues may be a concern?
- What other issues may impact the community where Mr. DeMarco is employed?

CARE PLAN

Plan for Effective Coping: John DeMarco

*NURSING DIAGNOSIS: Ineffective coping related to increased stress at work and limited coping strategies

Defining Characteristics to Assess

- Physiological disturbances
- Abuse of alcohol or drugs
- Participation in potentially dangerous activities
- Engaging in lifestyle with risk to health
- Impairment of social role functioning:
 - Nonproductive lifestyle
 - Failure to function in usual social roles
 - Nonperformance of activities of daily living
 - Inappropriate behaviors in social situations
 - Self-absorption
 - Lack of concern for or detachment from usual social supports
- Poor morale:
 - Unhappiness
 - Lack of future orientation
 - Hopelessness
 - Unacceptable quality of life
 - Pessimism
- Defensive patterns:
 - Inflexibility
 - Hypervigilance
 - Avoidance
 - Inertia
 - Refusal or rejection of help

Expected Outcomes

Mr. DeMarco will:

- Report increased information on and consequences to himself of stressors experienced.
- Practice the relaxation response for 20 to 30 minutes every day through prayer or contemplation; use multiple mini relaxations throughout each day.
- Report increasing weekly exercise or activity and healthy changes in nutrition and sleep or rest patterns.
- Develop effective coping and problem-solving abilities to manage stress, beginning with the stress at work.
- Evaluate the result of throat culture and consult with his primary care provider if the result is positive and an antibiotic is indicated.

Interventions

- Promote an attitude of openness to new information.
- Enroll him in a cognitive-behavioral group program to learn stress-management strategies and health promotion.
- Monitor his daily practice of relaxation response.
- Monitor his changes in exercise or activity, nutrition, sleep or rest patterns, and mood.
- Guide him to develop two coping strategies through cognitive-behavioral restructuring.
- Schedule a follow-up appointment or telephone check-in to monitor his well-being.

*NANDA Nursing Diagnoses—Herdman T. H. & Kamitsuru, S. (Eds.). Nursing Diagnoses—Definitions and Classification 2015–2017. Copyright © 2014, 1994–2014 NANDA International. Used by arrangement with John Wiley & Sons Limited. In order to make safe and effective judgments using the NANDA-I nursing diagnoses it is essential that nurses refer to the definitions and defining characteristics of the diagnoses listed in this work.

SUMMARY

Health and the ability to cope effectively with the many demands of work-life balance require management of stress. Combining careful assessment and choice of strategies, thoughtful and honest feedback, and continued support, nurses assist people to cope more effectively with the innumerable actual and potential stressors they may encounter. Research to discern the interplay of homeodynamic physiological, psychological, social, and spiritual responses to stress has yielded important knowledge for practice. However, uncovering the intricate workings of the brain within the context of human stress and coping experiences is a daunting and critical challenge for today's health researchers.

Stress-management strategies provide an opportunity for individuals to acquire the necessary skills to cope more successfully and become confident in self-management. Such awareness enables the individual to challenge and change perceptions, decrease stress reactivity, improve self-management skills, and minimize the harmful consequences of stress. This process positively influences health promotion, disease prevention, and symptom management. Challenges remain to expand intervention testing to families and communities. Understanding the influences of stress on health and illness is essential to all nursing practice.

 EVOLVE CHAPTER FEATURES

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- Study Questions

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Complementary and Alternative Strategies

Donna Dellolacona

OBJECTIVES

After completing this chapter, the reader will be able to:

- Compare holistic, allopathic, and complementary and alternative health modalities.
- Describe the nursing role in complementary health therapies.
- Explain the origin and practice of selected holistic health strategies.
- Identify complementary and alternative medicine resources and guidelines.
- Discuss complementary and alternative medicine safety and effectiveness.

KEY TERMS

Acupressure	Genetics	Pet therapy
Acupuncture	Healing touch	Physical therapy
Affordable Care Act	Health	Polarity therapy
Allopathic medicine	Herbal therapy	Prayer
Allopathy	Holism	Presence
Alternative therapy	Holistic health	Probiotics
American Holistic Nurses Association	Homeopathy	Qi
Aromatherapy	Hydrotherapy	Qigong
Attunement	Hypnotherapy	Reflexology
Ayurvedic medicine	Imagery	Reiki
Biofeedback	Integrative therapy	Shiatsu
Centering	Jin Shin Jyutsu	Spinal or bone manipulation
Chi	Massage	Tai chi
Chiropractic medicine	Meditation	Therapeutic presence
Complementary and alternative medicine	Meridians	Therapeutic touch
Complementary therapy	Moxibustion	Touch therapies
Cranial and craniosacral therapies	Music therapy	Traditional Chinese medicine
Dance therapy	National Center for Complementary and Integrative Health	Visual or guided imagery
Distant healing	National Prevention Strategy	Wellness
Energy healing or therapy	Naturopathy	Whole medical systems
Energy therapy	Nursing presence	Yoga
Energy work	Nutritional counseling	

THINK ABOUT IT

Ms. Gonzalez is 45 years old in her usual state of good health working as a teacher, until she receives a diagnosis of with lung cancer. She has never smoked, has no family history of smoking, but worked as a waitress in a diner for 10 years as a young woman. Smoking in restaurants was not restricted at that time. Her presenting symptoms were hemoptysis, low-grade fever, fatigue, and persistent cough. Her family and friends are very concerned and have provided her with various complementary and alternative medicine (CAM) modalities to help to treat her. She goes to the preoperative clinic for surgery, and in addition to 650 mg aspirin she has been taking coenzyme Q₁₀, amygdalin/laetrile, milk thistle, and green tea as treatment for her cancer and kava kava to help her relax and rest since her diagnosis. She has begun yoga classes at a local spa. She is frightened, and she believes that she feels less fatigued since starting these therapies. She has never taken prescription medications and is afraid of addiction if she takes prescribed pain medication. The local hospital offers a center for wellness classes involving alternative and complementary therapies, including

reiki, yoga, acupuncture, massage, and dietary supplements, to assist with treatment effects. She understands that these complementary therapies may help relieve her symptoms, but she believes they will also treat her cancer. After looking at sites on the Internet, including <http://cam.cancer.gov> and <http://www.nccih.gov>, she feels overwhelmed and confused as to what is best for her.

- What is the difference between reiki and massage?
- What occurs in a usual visit for acupuncture or a reiki session?
- How do these therapies work?
- Are these therapies evidence-based?
- What is the best understanding of the biological and physiological mechanisms for these therapies?
- What is the best understanding of the safety of these therapies?
- Which therapies are covered by her insurance?
- Would Ms. Gonzalez's therapies be considered complementary, alternative, or integrative?

BACKGROUND

Although many complementary and alternative therapies date back more than 5000 years to the Han Dynasty, Hippocrates, and Indian cultures with Ayurveda, only a few have been evaluated with well-conducted research (National Center for Complementary and Integrative Health [NCCIH], 2015b). In the United States the CAM movement is far more modern, with herbal agents used by Native Americans, chiropractic, meditative, and a variety of therapies beginning in the 19th century. The first center for alternative medicine, the Office of Alternative Medicine, was commissioned by Congress only in 1991 (NCCIH, 2015b). The working definition of CAM at that time was "a group of medical, health care, and healing systems other than those included in mainstream health care in the United States" (NCCIH, 2015b). CAM now includes an ever-increasing array of theories, modalities, products, and practices that are used to treat illnesses and/or promote health and well-being.

The field is broad and constantly changing, but an authoritative and governmental source, the National Institutes of Health's National Center for Complementary and Integrative Health (NCCIH), currently defines CAM as "a group of diverse medical and health care systems, practices, and products that are not generally considered part of conventional medicine or Western allopathic medicine and the traditional medical providers in the United States health care system" (NCCIH, 2015b). NCCIH has separate definitions of complementary, alternative, and integrative therapy. It defines **complementary therapy** as the use of CAM in conjunction with and as a complement to allopathic traditional medicine. One example is the use of acupuncture to help lessen some side effects of cancer treatment. **Alternative therapy** uses CAM instead of standard medicine. One example is the use of a special diet or herbs to treat cancer instead of anticancer drugs prescribed by an oncologist. **Integrative therapy** is a total approach to medical care that combines standard medical and surgical interventions with the CAM practices that have been shown to be safe and effective. They treat the client's mind, body, and spirit. There is an emphasis on safety and effectiveness (NCCIH, 2015c). Complementary and alternative therapies are more holistic than traditional medicine practices have been in

the past. The most common of these from a national survey can be seen in Figure 14-1.

Although heterogeneous, the major CAM systems have many common characteristics, including a focus on individualizing treatments, treating the whole person, promoting self-care and self-healing, and recognizing the spiritual nature of individuals. A large gap exists between our current level of scientific evidence and what we need to provide to clients in terms of evidence-based advice. More rigorous scientific research is being conducted by many countries to enrich our knowledge base.

Some Known Facts

- The World Health Organization estimates that more than 80% of the world's population uses some form of herbal medicine.
- Seventy-five percent of Americans use some herbal supplement; most do not report them to providers.
- Approximately 26% of people scheduled for surgery use herbal products that have an adverse impact on their surgical outcome; 19 agents are associated with abnormal bleeding (Wong et al., 2012).
- Accurate risk assessments are unknown as there is:
 - No regulation of these agents.
 - No standard manufacturing process.
 - No method to determine ingredients.
 - No quality controls.
 - No protection against contamination.
 - No Food and Drug Administration (FDA, 2015) required reporting of adverse reactions from alternative therapies.
 - No evidence base for most of the claims.
- A large national survey found that:
 - Seventy-seven percent of Americans believed that the government reviewed the safety of supplements and approved them before they were marketed.
 - Sixty-eight percent of Americans believed that supplements had to list potential side effects on their labels.
 - Fifty-five percent of Americans believed that supplement labels could not make claims of safety without scientific evidence.

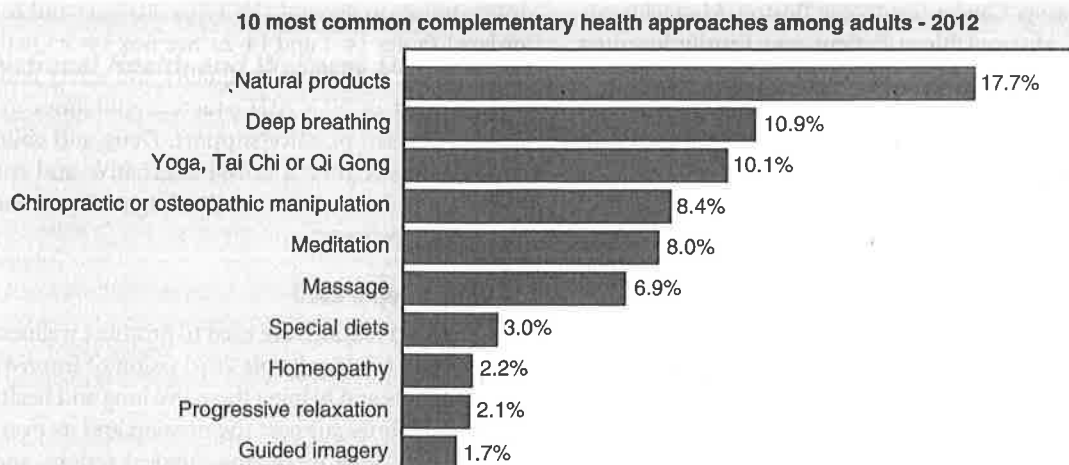


FIGURE 14-1 Ten most common complementary health approaches among adults. (From Clarke, T. C., Black, L. I., Stussman, B. J., Barnes, P. M., & Nahin, R. L. [2015]. *Trends in the use of complementary health approaches among adults: United States, 2002–2012*. National health statistics reports no. 79. Hyattsville, MD: National Center for Health Statistics. <http://www.cdc.gov/nchs/data/nhsr/nhsr079.pdf>.)

- Americans were unaware that herbal-pharmaceutical interactions occur (Clarke et al., 2015).

WHAT IS THE DIFFERENCE BETWEEN HOLISM AND ALLOPATHY?

Health care and delivery in the United States is most often **allopathic medicine**, a system in which physicians and other health care professionals, such as nurses, pharmacists, and therapists, treat symptoms and diseases using medications, radiation, lasers, or surgical interventions. **Allopathy** is also called biomedicine, conventional medicine, mainstream medicine, orthodox medicine, and Western medicine (NCCIH, 2015c).

Holistic health considers the whole person and how he or she interacts with his or her environment. It emphasizes the connection of mind, body, and spirit. **Holistic health** is a system of preventive care that takes into account the whole individual, one's own responsibility for one's well-being, and the total influences—social, psychological, environmental—that affect health, including nutrition, exercise, and mental relaxation. **Holism** entails a focus on proactive, healthy living and considers not only prevention of illness but also the root cause of the illness. When disease occurs, holistic practitioners seek to support the person's natural healing systems, to consider the whole person, and to consider the environment, both physical and mental, surrounding the person. This movement in the healing arts reflects the theory of holism and recognizes that all aspects of the person must be considered when care is being planned and delivered (NCCIH, 2015c).

Person-Centered Care

There are a variety of reasons why people seeking care seek a more holistic approach to care, and use CAM. Those receiving traditional medicine therapies are often disappointed in the lack of effective treatments or cures for many disorders, have fear of

the safety and long-term effects of “drugs” or treatments, believe herbal products are safe because they are derived from “nature,” and have a desire to have control of their own health, so they choose alternative and/or complementary methods. There is a great deal of advertising, media, and peer influence that impacts their holistic choices.

Many people are seeking alternative styles of health care that focus on seeing care recipients as whole people, increasing well-being, and giving them greater control over self-care. The 2012 National Health Interview Survey (NHIS) (Clarke et al., 2015) identified that people in the United States use CAM modalities and they spent \$33.9 billion out-of-pocket on CAM. CAM costs are 11.2% of total out-of-pocket expenditures on health care. The \$14.8 billion spent on nonvitamin, nonmineral, natural products is equivalent to approximately one-third of the total out-of-pocket spending on prescription drugs (\$47.6 billion), and the \$11.9 billion spent on CAM practitioner visits is equivalent to approximately one-fourth of the total out-of-pocket spending on physician visits (\$49.6 billion) (NCCIH, 2015d).

CAM practices are moving into mainstream medical practice. Many traditional medical centers now include a holistic viewpoint and integrative therapies, including Harvard, Stanford, Duke, and the Mayo Clinic. Most of them offer acupuncture, massage, healing gardens, and nutrition counseling. The Van Elslander Cancer Center at St. John Hospital and Medical Center in Detroit, Michigan, has a clinic that also offers qigong, tai chi, yoga classes, hypnotherapy, and guided imagery (St. John Providence, 2015). With a vision “to promote health and healing of body, mind, and spirit,” the Woodwinds Health Campus located in Woodbury, Minnesota, offers complementary therapies, including the use of essential oils, energy-based therapies, imagery, music, acupuncture, acupressure, and massage (Woodwinds Health Campus, 2015). The Birchtree Center in western Massachusetts offers professional holistic development classes for nurses that can help them prepare for holistic nursing certification (Birchtree Center, 2015).

At the Dana Farber Cancer Institute in Boston, Massachusetts, the Eleanor and Maxwell Blum Patient and Family Resource Center provides individuals undergoing cancer therapies and their family members with a comfortable environment to learn more about disease treatment and management, including nutrition, palliative care, spirituality, stress management, and emotional health (Dana-Farber Cancer Institute, 2016). This integration of holistic practices with standard allopathic medicine (Box 14-1: Genomics) serves to introduce more people to complementary therapies and may give these practices more credibility, especially with those who currently question their value. Alternative/complementary therapies are used as an adjunct to conventional medical care, and many are now covered by insurers, meet consumer demand, and thus satisfy the definition of patient- or person-centered care.

Health and Wellness

The World Health Organization's timeless definition of health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 1948). The Wellness Initiative (Substance Abuse and Mental Health Services Administration, 2015) defines wellness as "overall well-being. It includes the mental, emotional, physical, occupational, intellectual, and spiritual aspects of a person's life." Working toward health and wellness is an ongoing process that includes self-knowledge and self-care (Definition of Wellness, 2015). The wellness-related reasons that people use a variety of nontraditional therapies analyzed for this report include:

- Treatment of a specific health condition
- General wellness or disease prevention
- Improve immune function
- Improve energy
- Focus on the whole person—mind, body, and spirit
- Improve memory or concentration

Use of holistic modalities can also help meet the goals of *Healthy People 2020* (United States Department of Health and Human Services, 2015). This includes increasing quality and number of years of life, improving nutrition, increasing physical activity, and decreasing illegal substance abuse and harassment throughout the life span (Box 14-2: *Healthy People 2020*). The Affordable Care Act includes provisions that allow CAM providers to participate in health care delivery teams.

Health Policy

Clinical Practice Guidelines

Clinical practice guidelines for CAM modalities exist to identify and describe evidence-based recommended courses of

intervention in general (NCCIH, 2015g,i) and for specific disorders (Tables 14-1 and 14-2). See Box 14-3: Quality and Safety Scenario for guidelines on quality and safety and Box 14-4 for a partial list of NCCIH practice guidelines to provide best evidence-based practice support. Deng and colleagues (2013) provided more than a dozen alternative and complementary therapies to be included in the diagnosis and management of the disease process.

Healthy People 2020

Holistic interventions are used to promote wellness and are used to meet the *Healthy People 2020* vision of improving the health of Americans and helping them live long and healthy lives. Many CAM modalities support the mission and its overarching goals. Examples include increasing physical activity and flexibility in all age groups, decreasing pain, and reducing substance abuse (<http://www.healthypeople.gov>).

Affordable Care Act and National Prevention Strategy

The Affordable Care Act (<https://www.healthcare.gov>) mandates that insurers not discriminate against licensed health care providers, including those who practice alternative medicine, such as naturopaths, massage therapists, and acupuncturists. CAM practitioners and integrative practices are mentioned in several areas of the law, including workforce planning; patient-centered medical homes; wellness, prevention, and health-promotion services; comparative effectiveness research; and birthing services. The National Prevention Strategy, released in June 2011 as a result of the Affordable Care Act, has the following four strategic directions:

- Healthy and safe community environments: Create, sustain, and recognize communities that promote health and wellness through prevention.
- Clinical and community preventive services: Ensure that prevention-focused health care and community prevention efforts are available, integrated, and mutually reinforcing.
- Empowered people: Support people in making healthy choices.
- Elimination of health disparities: Eliminate disparities, improving the quality of life for all Americans.

The second direction has a holistic objective: "enhance coordination and integration of clinical, behavioral, and complementary health strategies." Inclusion of CAM into future research and evaluation and integration into care are mentioned several times throughout the document (National Prevention Council, 2011).

Nursing and Nursing Education

A variety of holistic, complementary, and alternative practices are now very prevalent and part of mainstream health care practice; therefore nurses must understand the nature of these interventions to provide safe, effective care and to discuss these practices with individuals who are using them so as to facilitate integrative care. Nurses who understand holistic practices will be able to make appropriate referrals to alternative/complementary practitioners. Nurses also find that holistic interventions such as energy work, bodywork, aromatherapy, prayer, meditation, massage, imagery, music therapy, and the movement arts of yoga, tai chi, and qigong provide a useful adjunct to current nursing theory (Dossey & Keegan, 2013) and practice.

BOX 14-1 GENOMICS

Genetics contributes to people's risk of developing many common diseases. Diet, lifestyle, and environmental exposures are factors in many conditions, and risk factors for many types of cancer. A better understanding of the interface of CAM practices with genetics may identify measures to mitigate health risks. Mapping the genetic components of cells, explaining how all the various elements work together to affect the human body in both health and disease, and developing targeted therapies will help providers better educate and advise those in their care.

 BOX 14-2 HEALTHY PEOPLE 2020
Selected National Health and Wellness Objectives

- (Developmental) Increase the proportion of insured persons with coverage for clinical preventive services.
- (Developmental) Increase the proportion of persons who receive appropriate evidence-based clinical preventive services.
- Increase the proportion of adolescents who have had a wellness checkup in the past 12 months.
- Increase the proportion of schools with a school breakfast program.
- Reduce the proportion of adolescents who have been offered, sold, or given an illegal drug on school property.
- Increase the proportion of adolescents whose parents consider them to be safe at school.
- (Developmental) Increase the proportion of middle and high schools that prohibit harassment on the basis of a student's sexual orientation or gender identity.
- Increase the proportion of elementary, middle, and senior high schools that provide comprehensive school health education to prevent health problems in the following areas: unintentional injury; violence; suicide; tobacco use and addiction; alcohol or other drug use; unintended pregnancy; HIV/AIDS; and infection with sexually transmitted diseases; unhealthy dietary patterns; and inadequate physical activity.
- Increase the proportion of elementary, middle, and senior high schools that provide school health education to promote personal health and wellness in the following areas: hand washing or hand hygiene; oral health; growth and development; sun safety and skin cancer prevention; benefits of rest and sleep; ways to prevent vision and hearing loss; and the importance of health screenings and checkups.
- Increase the proportion of college and university students who receive information from their institution on each of the priority health risk behavior areas (all priority areas; unintentional injury; violence; suicide; tobacco use and addiction; alcohol and other drug use; unintended pregnancy; HIV/AIDS; and infection with sexually transmitted diseases; unhealthy dietary patterns; and inadequate physical activity).
- (Developmental) Increase the proportion of work sites that offer an employee health-promotion program to their employees.
- Increase the proportion of persons who report that their health care providers always involved them in decisions about their health care as much as they wanted.
- (Developmental) Increase the proportion of individuals whose physician recommends personalized health information resources to help them manage their health.
- Increase the proportion of adults who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity.
- Increase the proportion of adolescents who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity.
- Increase the proportion of physician office visits that include counseling or education related to physical activity.
- Health-related quality of life and well-being is a new topic area for *Healthy People 2020*. Health-related quality of life is a multidimensional concept that includes domains related to physical, mental, emotional, and social functioning. It goes beyond direct measures of population health, life expectancy, and causes of death, and focuses on the impact health status has on quality of life. A concept related to health-related quality of life is well-being, which assesses the positive aspects of a person's life, such as positive emotions and life satisfaction.

From US Department of Health and Human Services. (2011). *Healthy People 2020*. <http://www.healthypeople.gov/2020/about/default.aspx>.

TABLE 14-1 Herbs as Medicine

Drug Name	Plant/Tree
Digitalis (heart drug)	Foxglove plant
Paclitaxel (cancer drug)	Pacific yew tree
Aspirin	Willow tree
Quinine (malaria drug)	Cinchona tree
Morphine	Opium poppy
Galantamine (Alzheimer disease drug)	Daffodil bulb
Vincristine (cancer drug)	Rosy periwinkle
Reserpine (blood pressure drug)	Indian snakeroot plant

What are herbs? An herb (also called a botanical) is a plant or plant part used for its scent, flavor, and/or therapeutic properties. An herbal supplement is a type of dietary supplement that contains herbs, either alone or in mixtures.

From National Center for Complementary and Integrative Health. *Herbs at a glance*. http://nccam.nih.gov/sites/nccam.nih.gov/files/Herbs_NIH_Herbs_at_a_Glance.pdf.

The American Holistic Nurses Association (AHNA) defines holistic nursing as nursing practice that heals the whole person. It is a "specialty practice that draws on nursing knowledge, theories, expertise and intuition to guide nurses in becoming therapeutic partners with people in their care. This practice recognizes the totality of the human being—the interconnectedness of body,

mind, emotion, spirit, social/cultural, relationship, context, and environment" by integrating CAM modalities into clinical practice to broaden and enrich nursing treatment of physiological, psychological, and spiritual needs. Florence Nightingale is thought to be one of the first holistic nurses because she believed in care of the person, focusing on unity, wellness, and the interrelationship of human beings with their environment. Holistic therapy is considered an "attitude, a philosophy, a way of being" although some holistic nurses specialize in one or more modalities (AHNA, 2015a,b; Dossey & Keegan, 2013).

The AHNA "advances the profession of holistic nursing by providing continuing education in holistic nursing, helping to improve the health care workplace through the incorporation of the concepts of holistic nursing, educating professionals and the public about holistic nursing and integrative health care, and promoting research and scholarship in the field of holistic nursing" (AHNA, 2015a). The AHNA website offers a variety of resources, including a directory of holistic practitioners based on modality and location, descriptions of healing modalities (AHNA, 2015a,d), and guidance on starting a holistic private practice.

INTERVENTIONS

NCCIH divides CAM modalities into several loose domains and an additional "whole medical system category" that incorporates

TABLE 14-2 Commonly Used Herbs: Safety Profile

Herb	Uses	Side Effects	Interactions	Evidence
St. John's wort	Depression	Dizziness, restlessness, sensitivity to sunlight, sleep disturbances, constipation	Seizure medications, alcohol, warfarin, calcium channel blockers, digoxin, oral contraceptives, statins	No statistically significant effect other than placebo effect on depression scores
Ginseng	Depression, anxiety, energy, concentration, immunity	Chest pain, headache, hypertension, impotence, palpitations	Diabetic agents, including insulin	Some evidence for concentration, no benefit for energy, mood, or immune modulation
Milk thistle	Liver ailments	Laxative effects	Flagyl	Cirrhosis; patients may have longer survival; may be protective against hepatotoxic agents
Black cohosh	Menopausal symptoms	Low blood pressure; dizziness	Iron, antihypertensive drugs, warfarin, aspirin	No better than placebo
Echinacea	Immune system booster	Well tolerated	Immunosuppressants	Decreases time to resolution of symptoms; no preventative effect
Saw palmetto	Benign prostate hyperplasia	Abdominal issues headache, urinary retention	Hormones: leuprolide, birth control agents	As effective as many prescribed medications for benign prostate hyperplasia
Ginkgo biloba	Memory, asthma, vision	Gastrointestinal upset, seizures, bleeding or bruising	Anticoagulants, warfarin, aspirin, acetaminophen, seizure medications, antidepressants	No measurable long-term benefit
Garlic	Asthma, diabetes, high cholesterol level, cancer	Dizziness, rash, diaphoresis, bleeding	Antiplatelet drugs, warfarin, aspirin, HIV medications	No long-term benefits
Cranberry	Urinary tract infection, cancer	Diarrhea	None	Reduces risk of infection; no effect on treatment
Soy	Menopause, cancer, heart disease		Antibiotics, estrogens, warfarin, tamoxifen, losartan, carvedilol, levothyroxine	No effect on blood pressure Inconclusive results for hot flashes to date
Fish oil	Cholesterol; blood pressure, and heart disease	Prolonged bleeding, negative impact on immunity	Anticoagulants, birth control agents	May worsen depression
Glucosamine	Joint health	Gastrointestinal upset	Blood thinners, insulin, heart medications	Those with a shellfish allergy should avoid it
Coenzyme Q ₁₀	Heart, fatigue, immunity	Rash, gastrointestinal upset	Chemotherapy, blood pressure medications, coumadin	
Ephedra	Weight loss	Heart attack; respiratory depression, death	Theophylline, digoxin, caffeine, but available on the Internet	Banned by the US Food and Drug Administration in 2003

From National Center for Complementary and Integrative Health. (2015). *Herbs at a glance*. <http://nccam.nih.gov/health/herbsataglance.htm>.

all domains. The domains are not formally defined but include biologically based practices, mind and body techniques, manipulative body-based practices, energy therapies, and ancient medical systems. See Table 14-3 for examples of these categories. These domains are neither mutually exclusive nor mutually inclusive because many could belong to several categories.

Because each modality has its own identified guidance for purpose, efficacy, and safety, this section will not be specific but will briefly define many of the modalities and highlight a few of the more common ones with current known evidence.

Whole Medical Systems

Whole medical systems are complete systems of theories and practices that have evolved culturally over time, and because

they are different from Western allopathic medicine, they are considered CAM. Examples include traditional healers and traditional or folk healers. The 2012 NHIS (Clarke et al., 2015) found that although there was less use of traditional healers than in 2007, there was an increase in the use of most other CAM modalities.

Ayurvedic Medicine

Ayurvedic medicine has evolved over thousands of years in India. This treatment utilizes herbs in their natural state, as prepared herbal drugs, massage, and special individualized diets, based on the seasons of one's life and one's constitutional type; there are ten. Ayurvedic supplements can be made either of herbs only or a combination of herbs, metals, and minerals. Some of these

BOX 14-3 QUALITY AND SAFETY SCENARIO**How Should Complementary and Alternative Medicine Be Evaluated?**

- What standards of proof should the nurse require before adopting an alternative/complementary therapy in clinical practice?
- Have all (or even some) of the alternative/complementary therapies commonly used by nurses today been subjected to these standards?
- Have all (or even most) of the standard therapies commonly used by nurses and medicine today been subjected to these standards?
- Government and consumer advocates are beginning to require the same oversight, regulation, and monitoring of some CAM practices.

From Coakley, A. B., & Barron, A. (2012). Energy therapies in oncology nursing. *Seminars in Oncology Nursing*, 28(1), 55–63; Faculty of Harvard Medical School & Natural Standard. (2008). *Complementary and alternative medicine: Therapeutic touch*. <http://www.intelihealth.com/IH/ihltlH/WSIHW000/8513/34968/358873.html?d=dmContent>; Herman, P. M., D'Huyvetter, K. D., & Mohler, M. J. (2006). Are health services research methods a match for CAM? *Alternative Therapies in Health and Medicine*, 12(3), 78–83.

BOX 14-4 Complementary and Alternative Medicine Clinical Practice Guidelines: Featured Guidelines**Allergy and Immunology**

- Diagnosis and Management of Food Allergy (*Journal of Allergy and Clinical Immunology*)
- Guidelines for the Diagnosis and Management of Asthma (National Heart, Lung, and Blood Institute)
- 2011–2012 Influenza Antiviral Medications: Summary for Clinicians (Centers for Disease Control and Prevention)

Cardiology

- Soy and Cardiovascular Health (*Circulation*)

Family Medicine

- Clinical Use of Dietary Supplements and Nutraceuticals (*Endocrine Practice*)
- Dietary Reference Intakes for Calcium and Vitamin D (Institute of Medicine of the National Academies)
- Herbs and Supplements in Managed Care (*The Permanente Journal*)
- Evaluation and Management of Chronic Insomnia in Adults (*Sleep*)
- Psychological and Behavioral Treatment of Insomnia (*Sleep*)
- Adjunctive Therapies for Dermatitis (American Academy of Dermatology)
- Vitamin Supplementation to Prevent Cancer and Cardiovascular Disease (United States Preventive Services Task Force)
- Dietary Reference Intakes for Calcium and Vitamin D (Institute of Medicine of the National Academies)

Gastroenterology

- Probiotics and Children (*Journal of Pediatric Gastroenterology and Nutrition*)

Neurology

- Alternative Therapies for Parkinson's Disease (*Neurology*)
- Migraine Headaches in Children and Adolescents (*Journal of Pediatric Health Care*)
- Complementary and Alternative Medicine in Multiple Sclerosis (American Academy of Neurology)
- NSAIDs and Other Complementary Treatments for Episodic Migraine Prevention in Adults (*Neurology*)

Oncology

- Complementary Therapies for Patients With Lung Cancer (American College of Chest Physicians)
- American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention (*Cancer*)
- Exercise Guidelines for Cancer Survivors (*Medicine & Science in Sports & Exercise*)

- Integrative Oncology: Complementary Therapies and Botanicals (Society for Integrative Oncology)
- Integrative Oncology in Lung Cancer (*Chest*)
- Use of Integrative Therapies as Supportive Care in Breast Cancer Patients (*Journal of the National Cancer Institute*)

Pain Management

- Chiropractic Management of Fibromyalgia (Council on Chiropractic Guidelines and Practice Parameters)
- Chronic Pain Management (*Anesthesiology*)
- Diagnosis and Treatment of Low-Back Pain (*Annals of Internal Medicine*)
- Management of Fibromyalgia Syndrome in Adults (University of Texas, School of Nursing)
- Osteopathic Manipulative Treatment for Low-Back Pain (*Journal of the American Osteopathic Association*)
- Pain Management Task Force Final Report (Office of The Army Surgeon General)

Pediatrics

- Migraine Headaches in Children and Adolescents (*Journal of Pediatric Health Care*)
- Probiotics and Children (*Journal of Pediatric Gastroenterology and Nutrition*)
- The Use of Complementary and Alternative Therapies in the Treatment of Fragile X Syndrome (The Fragile X Clinical and Research Consortium)

Psychiatry and Mental Health

- Management of Post-Traumatic Stress Disorder and Acute Stress Reaction (Department of Veterans Affairs/Department of Defense)
- Posttraumatic Stress Disorder—Associated Nightmares (*Journal of Clinical Sleep Medicine*)

Rheumatology/Orthopedics

- Osteoarthritis of the Hip and Knee (*Osteoarthritis Cartilage*)
- Osteoarthritis of the Knee (*The Journal of the American Academy of Orthopaedic Surgeons*)
- Manual Manipulation for Musculoskeletal Injuries (Academy for Chiropractic Education)
- Vitamin D and Calcium Supplementation to Prevent Fractures in Adults (US Preventive Services Task Force)
- Nonpharmacologic and Pharmacologic Therapies for Osteoarthritis of the Hand, Hip, and Knee (American College of Rheumatology)

Women's Health

- Botanicals for Menopausal Symptoms (*Obstetrics and Gynecology*)

From National Center for Complementary and Integrative Health. (2015). *Clinical practice guidelines*. <http://nccam.nih.gov/health/providers/clinicalpractice.htm>.

TABLE 14-3 Categories and Examples of Complementary and Alternative Therapies

Whole medical systems	Chinese, ayurvedic, traditional/folk healers, naturopathy, homeopathy
Biologically based practices	Herbal remedies, vitamins, dietary supplements, diets, probiotics, chelation therapy, hydrotherapy, aromatherapy
Manipulative and body-based practices	Massage, reflexology, chiropractic, craniosacral therapies, physical therapy
Mind-body techniques	Meditation, guided imagery, hypnosis, music, biofeedback, yoga, tai chi, qigong, acupuncture, dance
Energy therapies	Magnetic field therapy, reiki, therapeutic touch, prayer

products may be harmful if used improperly or without the direction of a trained practitioner (NCCIH, 2015a).

The goals are treatment of disease, prevention of disease, and improving a person's quality of life, by balancing the body, mind, and spirit. Basic premises include the beliefs that all living and nonliving things in the universe are joined together and good health is achieved when one's mind and body are in harmony (NCCIH, 2015a). Two ancient books, more than 2000 years old and written in Sanskrit, are considered the heart of the practice and identify eight branches of ayurvedic medicine: internal medicine; surgery; treatment of head and neck disease; gynecology/obstetrics; pediatrics; toxicology; care of the elderly and rejuvenation; and sexual vitality. Treatment practices include eliminating impurities, decreasing symptoms, increasing resistance to disease, and reducing worry and increasing harmony. Nearly 80% of the Indian population continues to use ayurvedic medicine. No states in the United States currently license ayurvedic practitioners.

Traditional Chinese Medicine

Traditional Chinese medicine (TCM) has evolved over thousands of years in China and includes herbs, acupuncture, and other CAM treatments. The theoretical framework includes the complementary yet opposing yin and yang life forces, and the balance and harmony of the vital energy, or life force (qi), circulating through the body's pathways. TCM describes the organs and tissues in the body through corresponding elements of fire, earth, metal, water, and wood. It also uses eight principles to analyze symptoms and categorize conditions, including cold/heat, interior/exterior, excess/deficiency, and yin/yang (NCCIH, 2015e).

Naturopathy

Naturopathy, also called naturopathic medicine, evolved from a combination of traditional and other modalities in 19th-century Europe guided by the healing power of nature (NCCIH, 2015f). The underlying principles are first do no harm; illness is seen as a purposeful process of the organism; symptoms are viewed as life forces attempting to heal the organism. Practitioners do not use prescription drugs, injections, X-rays, or surgery, but instead implement a variety of CAM modalities, emphasizing the adoption of a healthy lifestyle, strengthening and cleansing

the body, special diets, therapies, and use of manipulation and exercise (NCCIH, 2015f).

Homeopathy

Homeopathy principles have been documented since at least the time of Hippocrates, but not until early in the 19th century were they brought into modern usage. Samuel Hahnemann, a German physician and chemist, is credited with founding homeopathy (National Center for Homeopathy, 2015). When Hahnemann first named the discipline in 1807, mainstream medicine involved ineffective practices such as bloodletting and purging. Homeopathy treats the whole person and believes that symptoms are a body's effort to rid itself of disease. It is based on four principles: the law of similars, or like cures like; the minimum dose, determining the least amount of medicine needed to treat a disease; totality of symptoms, matching the complete symptom profile of the person to the symptom profile of the remedy; and single remedy, administration of one remedy at a time (National Center for Homeopathy, 2015).

Homeopathy is based on the whole person rather than on the symptoms. Treatment stimulates the body's healing ability through the administration of small amounts of dilute substances that are believed to cause illness or symptoms. There is wider acceptance of homeopathy in other countries, including France, Germany, Mexico, Argentina, India, and Great Britain. The World Health Organization estimates that homeopathy is currently practiced by more than 500 million people worldwide. In April 2015 (National Center for Complementary and Integrative Health, 2015) the FDA held a hearing on homeopathic product regulation, safety, and efficacy. Most of the testimony cited the lack of scientific evidence, the lack of consumer understanding, the lack of regulation, and the harm that has come from some of these practices. Further analysis and decisions may be forthcoming.

Biologically Based Practices/Natural Products

Biological or natural products are the oldest form of CAM. Medicinal herbs were found in the personal effects of a mummified prehistoric man in the Italian Alps (NCCIH, 2015b). Botanical remedies were inventoried in great detail in the Middle Ages. The 2012 NHIS found that nearly 40% of American adults use natural products as CAM. This area of CAM includes nutritional counseling, herbs, vitamins, minerals, probiotics, and aromatherapy. According to NCCIH, daily multivitamin and calcium supplements are not thought of as CAMs.

According to the US *National Nutritional Research Roadmap* (Interagency Committee on Human Nutrition Research, 2015), nutritional counseling uses education and diet and supplementation therapeutically as the primary or adjunctive measure to prevent or treat illness. Multiple studies have demonstrated the efficacy of nutritional interventions, vitamins, therapeutic diets, and individual instruction. Diet teaching for those receiving hemodialysis showed efficacy in stabilization of laboratory values (Garagarza et al., 2015), and nutritional interventions for those undergoing chemotherapy not only helped people maintain weight and muscle mass but also improved survival over the control group (De Waele et al., 2015).

Herbal therapy is the use of herbs or their chemical properties to treat specific conditions or to enhance the function of various

body systems, such as boosting the immune system, treating allergies, or preventing a cold. Herbal medicines may act on the body like prescription drugs and may interact with prescription medications; thus it is important to elicit a full profile of what care recipients are taking and in what doses as part of medication reconciliation. A table of common agents, their common uses, side effects, and interactions, and the current evidence has been compiled from NCCIH data (NCCIH, 2015h); see Table 14-2.

Probiotics are live microorganisms found in the human digestive tract, such as “friendly bacteria.” They are taken to enhance the digestive system either as a supplement or in natural forms, such as yogurt or other fermented foods.

Hydrotherapy, or water therapy, is the use of water at various temperatures or as ice or steam to relieve discomfort and promote physical well-being. Treatments include full-body immersion, hydrotherapy, steam baths, saunas, spas, and the application of hot and/or cold compresses.

Aromatherapy, also referred to as essential oil therapy, is defined by the National Association for Holistic Aromatherapy (2015) as the art and science of using naturally extracted oils from plants to balance, harmonize, and promote the health of body, mind, and spirit. The therapeutic use of the oils may be via inhalation, external application, or ingestion. The use of aromatherapy, like that of many CAMs, without professional clinical training is strongly discouraged. Individuals must be trained to know the specific warnings and contraindications for each oil, as well as to understand how to handle the oils.

Manipulative and Body-Based Practices

Manipulative and body-based practices focus on the manipulation of bones and joints, soft tissues, and the circulatory and lymphatic systems. According to the 2012 NHIS (Clarke et al., 2015) these ranked in the top 10 CAM therapies.

Spinal or Bone Manipulation

Spinal or bone manipulation is the application of controlled force on a bone or joint and is performed by chiropractors, physical therapists, osteopathic physicians, and some conventional physicians. Spinal manipulation was recorded in ancient Greece and became foundational to chiropractic and osteopathic medicine in the late 19th century.

Chiropractic medicine focuses on manipulation of the spine and joints, focusing on spinal alignment for optimal functioning. Chiropractors often integrate other CAMs such as massage, nutrition, and specialized kinesiology into their practice.

Cranial and craniosacral therapies also focus on a natural configuration of the skeletal system, focusing on the skull and flow of cerebrospinal fluid for the treatment of body imbalances. Craniosacral therapy originated in osteopathy and focuses on the bones of the cranium, spine, and sacrum, using gentle pressure to restore free movement of cerebrospinal fluid, allowing normal functioning.

Physical therapy integrates a variety of modalities, including massage, manipulation, heat and cold, movement, and electrical impulses, to treat the body after damage or injury, reduce swelling, relieve pain, and restore function and range of motion to the body.

Massage

Massage incorporates different techniques in the manipulation of muscles and soft tissues of the body, such as rubbing or kneading, to increase circulation, facilitate healing, and reduce stress and increase relaxation. It is one of the oldest therapies and is referred to in writing in ancient China, Japan, India, Egypt, Greece, and Rome. Even Hippocrates mentions it in his writings. Different types of therapies have different techniques and purposes, such as lymphatic therapy, neuromuscular therapy, and trigger point therapy.

Reflexology is mixed method of CAM as it involves a type of manipulation and the concept of energy fields. A reflexologist applies pressure with the thumbs to mapped points on the feet or hands, or both, by pressing deeply into the point to release tension and stimulate circulation of blood, lymph, and energy. Reflexology is more than massage because practitioners believe that the points correspond to the organs of the body and that stimulating the points will stimulate the organs to heal (Reflexology Association of America, 2015).

Mind-Body Medicine

Mind and body practices focus on the interactions between the brain, the body, and behavior, using the mind to affect the body and the body to affect the mind. Categories include meditation, imagery, and various methods of body movement. This concept dates back 2000 years to TCM and ayurvedic medicine practices (NCCIH, 2015a). Hippocrates noted that treatment relied on attitude, environmental influences, and natural remedies. Deep breathing, meditation, yoga, guided imagery, and progressive relaxation were in the top CAM therapies according to the 2012 NHIS (Clark et al., 2015). Visual or guided imagery encourages individuals to relax by focusing on calming thoughts or experiences. Imagery is “a gentle but powerful technique that focuses and directs the imagination” so as to, among other things, promote a sense of well-being and to help people relax (http://www.healthjourneys.com/what_is_guided_imagery.asp). In a randomized control study (Bozas et al., 2015), men with prostate cancer and women with breast cancer undergoing chemotherapy had a better quality of life and less depression and there was some positive impact on laboratory values if they used relaxation training and guided imagery as compared with the control group.

Meditation

Meditation is a method of focused attention to increase relaxation, quiet the mind, and reduce stress. Although it is often a part of many religious cultures, it is not necessarily a religious activity and can be practiced while one is still or while one is active, such as during walking. Like massage, different types have a variety of purposes and techniques. Breath meditation is the simplest because it can be done anywhere and can evoke the relaxation response (Box 14-5). It can be taught and is useful for anyone. Centering focuses on a chosen word. Mindfulness meditation is a way of paying attention to or being mindful of a variety of topics, such as thoughts, actions, or the environment. Walking meditation is a form of mindfulness because the individual is mindful of the interaction of the inner body, the external body, and the environment with each step.

BOX 14-5 Teaching the Technique of Breath Meditation

- You may stand, sit, or lie quietly as you begin to focus on your breath.
- Inhale and feel the air come into your nostrils, move down your throat, and into your lungs. Do not try to control the breath. Just observe it.
- Exhale and feel the air move up from your lungs and into your throat. Feel the warmth of the exhaled air in your nostrils.
- Breathe. Feel the air move in and out. Concentrate on the breath. Do not try to control the breath. Just observe it.
- Continue watching the breath for 5 to 10 minutes. As other thoughts come into focus, notice them and let them go. Focus again on the breath.
- As you become comfortable with breath meditation, you may easily add simple imagery to this technique.
- As you inhale, imagine breathing in peace or love or wellness.
- As you exhale, imagine breathing out pain or sorrow or grief.
- As you inhale, breathe in whatever it is that you need.
- As you exhale, breathe out whatever you wish to be free of in your life.

Hypnotherapy is a form of guided relaxation and focused attention of the unconscious mind. It is used with differing success for memory recall of suppressed events and for behavior changes such as discontinuation of the use of tobacco products. Biofeedback is a relaxation technique concentrating on vital functions such as heart rate, breathing rate, and blood pressure. This visualization identifies which actions can change the rates and is used for stress and an irregular heart rate. Neurolinguistic programming changes behavior by changing patterns of thinking and speaking (NCCIH, 2015a).

Movement Therapy

Movement therapies use movement and bodywork to promote physical, mental, emotional, and spiritual well-being. The movement arts such as qigong, tai chi, and yoga are helpful for body, mind, and spirit, and, although technically not energy work, do manipulate life energies. Qigong (pronounced chee gung) is part of TCM, combining relaxed movements with a meditative aspect and controlled breathing to move qi energy through the energy channels and increase vital energy. Tai chi (pronounced tie chee) began as a Chinese martial art and combines physical movement, breath control, and meditation in a dance-like sequence of poses based on the movements of animals. One pose flows into the next in a slow, relaxed, gentle, unbroken rhythm, bringing an awareness of the moment-to-moment state of the body and producing a meditative state.

Yoga is a meditative movement practice that originated in India as a form of spiritual practice and aids in flexibility, agility, balance, and relaxation. The postures have names such as proud warrior, waterfall, runner's pose, downward-facing dog, mountain pose, and eagle pose. There are many types and branches of yoga. Several studies of individuals with a variety of diagnoses have documented several health-related benefits from the practice of yoga, including reducing stress and anxiety, improving pain management, increasing flexibility, and increasing strength (Clarke et al., 2015; McCall et al., 2015). The 2012 NHIS (Clarke et al., 2015) reported yoga use up from 6% in 2007 to almost 10% in 2015. Given the increase in this practice in traditional medicine centers, the prevalence of yoga will likely rise.

BOX 14-6 Feel Your Own Energy

This exercise will help you feel your own energy, or chi.

- Sit quietly, back straight, feet touching the floor.
- Place your hands in your lap.
- Take a few deep breaths. Become quiet and still.
- Breathe slowly in and out for a few minutes.
- Slowly raise your hands in front of you, palms facing you, hands approximately 15 inches apart. Cup your fingers as though you are holding a basketball between your hands.
- Concentrate on the space between your hands. What is there? Can you feel anything?
- Slowly bring your palms closer together, focusing on the space between your hands.
- Can you feel warmth? Does it feel spongy? Can you move your hands around a shape?
- What you are feeling is the energy coming from the energy centers in your hands. Focus on the energy. Try to increase the sensation of fullness in the space between your hands.
- If you do not feel anything immediately, bring your hands back out to 15 inches apart and slowly move your hands together again. Try this no more than three times each time you attempt the exercise.

Dance therapy is another movement-based mind-body modality, using dance to allow the body and mind to move freely in response to music.

Energy Therapies

Energy healing or therapy is practiced in many cultures and involves the use of assumed energy fields to heal and maintain wellness (Box 14-6). Believers in energy therapy describe disruptions in the energy field as a cause for illness and teach that balancing energy can aid in healing when this is done by an energy practitioner. Certain types of body energy are well known. Electrical energy in the body is reflected in diagnostic studies including electrocardiographic, electromyographic, and electroencephalographic tracings. Nerves and cells have an electromagnetic action potential. Magnetic resonance imaging uses powerful magnets to measure the array of charged particles in the human body and produce diagnostic images. People can be affected by the energy of their environments, including the energy of other people. For example, anxiety is contagious and moves readily and quickly from person to person.

There are medical uses for energy that come from the environment. The energy of radiation is used to shrink tumors; sound energy, in the form of ultrasound waves, is used to break kidney stones. Lasers, focused light energy, are used in many types of surgery and to treat disorders such as psoriasis (Neumayer & Vargo, 2012). Light energy is useful in treating seasonal affective disorder. Color, another form of light energy, has been shown to have an effect on emotions and behaviors.

Energy fields may be characterized as measurable or as yet unmeasured. Practices based on measurable forms of energy include those involving electromagnetic fields such as magnet therapy and light therapy. Practices based on other energy fields, also called biofields, generally reflect the concept that human beings are infused with subtle forms of energy, and various CAM therapies aim to treat these biofields (NCCIH, 2015b).

BOX 14-7 DIVERSITY AWARENESS

Hot and Cold Diseases

- Hispanic culture considers disease causation as an imbalance between hot and cold. Specific diseases are classified by their causation, and the treatments (food, home remedies, and medications) used to ameliorate disease are generally temperature opposites; for example, a cold treatment is used for a hot disease. Some examples of hot diseases are constipation, diarrhea, fever, pregnancy, ulcers, and rashes. Examples of cold diseases include arthritis, a cold, indigestion, menstrual cramps, stomachaches, and muscle spasms.
- Hispanic use of complementary and alternative therapies is substantial; these therapies are often used to support chronic conditions. Diabetes is a hot disease. Hypertension, which is considered to be caused by anger, fear, nervousness, and thick blood, is a hot disease. It is treated by the cold treatments of lemon juice and various teas. Asthma is a cold disease, treated by traditional herbal mixtures and by massage. Home treatments traditionally complement traditional therapies and include cactus, aloe vera, and bitter gourd. If home treatments, which are generally initiated by an influential female in the home, are not successful, family and friends are consulted for advice. A spiritual leader (curanderismo) may also be consulted to perform a healing ritual for an especially recalcitrant problem. If this treatment fails to resolve the problem, an allopathic physician may be consulted.
- Because there is potential for drug interactions between allopathic medicines and the traditional medicines of the Hispanic population, it is especially important that allopathic providers understand the home treatments that this population is using. One way to ease the assessment of the use of home treatments is with an open mind and with acceptance of folk practices.

From Dayer-Berenson, L. (2010). *Cultural competencies for nursing*. Sudbury, MA: Jones & Bartlett Learning; Tabur, M. M., Crowe, T. K., & Torres, E. (2009). A review of curanderismo and healing practices among Mexicans and Mexican Americans. *Occupational Therapy International*, 16(1), 82–88; Ortiz, B. I., Shields, K. M., Clauson, K. A., & Clay, P. G. (2007). Complementary and alternative medicine use among Hispanics in the United States. *Annals of Pharmacotherapy*, 41, 994–1004.

Any illness, stress, emotional upset, or spiritual distress can affect the flow of life energy. These disruptions in the flow of life energy can cause or exacerbate illness in the physical body and can increase emotional and spiritual distress (Box 14-7: Diversity Awareness). The basic goal behind the various modalities of energy therapy is to release blockages of energy flow, stimulate deficient life energy, and rebalance life energy.

Acupuncture

Acupuncture manipulates life energy, referred to as chi or qi in some cultures, by stimulating precisely mapped points on the skin surface (Box 14-8: Research for Evidence-Based Practice). The points overlie the channels, called meridians, through which chi travels. The channels are named for the organs they affect, such as the lung meridian, heart meridian, and kidney meridian. Acupuncture may be used to diagnose disharmony; the points become tender to palpation in the presence of a disturbance in energy flow. The acupuncture points act as valves in the meridian system. When the points are stimulated, acupuncture acts as a treatment modality to correct disturbances in flow. When

BOX 14-8 RESEARCH FOR EVIDENCED-BASED PRACTICE

A meta-analysis of acupuncture's effectiveness as well as advances in the understanding of acupuncture's physiological action have led to the acceptance and broader use for this modality and new research directions (MacPherson et al., 2016). Acupuncture efficacy has been demonstrated in pain control and nausea suppression. In a melding of new technologies with this ancient tradition, acupuncture neuroimaging research has not only identified a novel brain-based marker for clinical pain perception but has also demonstrated brain image changes due to acupuncture therapy (MacPherson et al., 2016). Patients with fibromyalgia treated with acupuncture showed elevation of the level of a brain marker that correlates with pain intensity that normalized after treatment; positron emission tomography detected an increase of mu-opioid receptor-binding potential in multiple brain regions that correlated with reported relief of fibromyalgia pain.

Another study used functional magnetic resonance imaging to demonstrate a return to normal mapping after acupuncture treatment of carpal tunnel syndrome that correlated with subjective and objective symptom relief. This and other research has led to the development of clinical guidelines, health policy, and reimbursement practices for acupuncture therapies (MacPherson et al., 2016).

From MacPherson, H., Hammerschlag, R., Coeytaux, R. R., Davis, R. T., Harris, R. E., Kong, J. T., Wayne, P. M. (2016). Unanticipated insights into biomedicine from the study of acupuncture. *Journal of Alternative and Complementary Medicine*, 22(2), 101–107.

stimulated, the valve may open to release blocked or excess chi or close to allow chi to collect if chi is deficient. Stimulation of the points may be accomplished in several ways: by inserting fine needles into the points, by electrostimulation, by laser, by light stimulation, and by burning herbs on or over the points to increase point stimulation, a technique called moxibustion. Acupuncture is one of the oldest healing practices in the world. Good evidence exists for the efficacy of acupuncture in a variety of realms, and the cost of treatment is often covered by insurance providers.

Acupressure is a form of acupuncture, where the meridian points are stimulated with pressing, rubbing, squeezing, and stretching movements. The technique is taught in some massage schools because it is often used along with massage to move and balance the body's energies. Shiatsu uses a sequence of rhythmic pressure on acupressure meridians. A systematic review revealed that auricular point acupressure is a promising treatment for chronic pain management (Lin et al., 2015; Zhao et al., 2015).

Touch Therapies

In touch therapies, such as therapeutic touch, healing touch, and reiki, practitioners use their hands to direct life energies drawn from the environment to the individual in an effort to restore balance and harmony within the human energy system (Figure 14-2). Reiki comes from Japanese tradition and requires training by a reiki master. In addition to teaching the hand placements and symbolic gestures used in reiki, the master attunes the student (Box 14-9: Innovative Practice). Attunement opens the energy channel, enabling the student to bring universal energy through the body and to the recipient. Reiki is a form of energy therapy and has been evaluated in several clinical trials for



FIGURE 14-2 The assessment phase of therapeutic touch. The practitioner is attempting to sense disturbances or imbalances in the person's energy field.

BOX 14-9 INNOVATIVE PRACTICE

Inclusion of alternative and complementary practices is a challenge in an acute care hospital. At Brigham and Women's Hospital (BWH) in Boston, Massachusetts, an integrative care program, including a reiki volunteer program, has helped to provide a means for integrating healing practices for both nurses and patients (Hahn et al., 2014). BWH has the largest reiki volunteer program in the country, with 60 volunteers who have provided more than 35,000 treatments in the past 5 years. One of the authors (Hahn et al., 2014) noted "many times, patients become so relaxed they fall asleep. Nurses also request Reiki for themselves and staff on their unit." The team also offers music therapy, pet therapy, and meditation.

To increase the availability of these therapies, educational offerings are available on the internal television program channel. Staff reiki sessions were used to help caregivers deal with the stress resulting from caring for victims of the 2013 Boston Marathon bombing. Volunteers provided reiki to 289 staff members who tended those wounded by the bombing.

From Hahn, J., Reilly, P., & Buchanan, T. (2014). Development of a hospital reiki training program: Training volunteers to provide reiki to patients, families, and staff in the acute care setting. *Dimensions of Critical Care Nursing*, 33(1), 15–21.

treatment of anxiety and improvement of well-being in people undergoing cancer treatments (Fleisher et al., 2014). During these therapies the hands can be placed directly on the person's body or at a distance from the body.

Therapeutic touch was conceptualized by nursing theorist Martha Rogers. She felt humans are composed of energy fields that interact with the energy fields of their environments (Phillips, 2015). Therapeutic touch practice comprises three essential elements. The first element is centering by the practitioner. Centering is a process of becoming calm, present in the moment, and connected with the individual being treated, allowing the practitioner to give the person undivided attention

(Hover-Kramer, 2011). The centered practitioner is able to let go of personal feelings and emotions and is more open to inner perceptions. During assessment, the second element, the practitioner's hands move over the individual's body at a height of approximately 3 inches above the skin in an attempt to sense disturbances or imbalances in the person's energy field. The final element is a series of techniques to change the patterns in the human energy field, unruffling, to direct energy to the person to replenish depleted energy, modulation, and to balance or redistribute the individual's energies. Healing touch is similar to therapeutic touch but adds full-body techniques for moving energy and disorder-specific energetic interventions to the modulation phase of therapeutic touch (Hover-Kramer, 2011).

Jin Shin Jyutsu uses fingertips pressed on specific healing point combinations to balance energy along specific pathways. Polarity therapy is a combination of energy work, caring intention, movement exercises, and dietary regimens and is aimed at clearing energy blockages and building health (American Polarity Therapy Association, 2015). Many practitioners use magnets or magnet therapy to control magnetic fields around many body systems to aid in healing and in the functioning of the systems.

Other Energy Modalities

Although the basis for many religious faiths, prayer focuses on the subtle energy life force known by different names. Prayer has different meanings to different people. A prayer may be a request for divine intervention, a type of meditation, or a form of intentionality that is useful in healing. Praying for others may be a form of distant healing. Although a recent meta-analysis (Radin et al., 2015) of high-quality experiments failed to show reliable effects, many who practice energy work believe that their efforts are effective over long distances. One method of participating in distance healing is the healing circle. The members of the healing circle join hands. Each member sends healing energy to his or her neighbor on the right until the energy is flowing around the circle. When the energy is flowing readily, each member of the group focuses the energy on one group member, who acts to send the energy to someone that person knows who is in need of healing. Each member of the circle may, in turn, receive energy from the group and send it to an individual in need of healing.

Music therapy uses a variety of methods in a therapeutic relationship to address physical, emotional, cognitive, and social needs of individuals. Music influences the limbic system, the area of the brain involved with emotions and feelings. Music is a form of sound energy, and this energy can be relaxing or stimulating, and has been used to decrease pain, depression, and disability. Dependent on the person and the mood desired, all forms of music can be used. In a randomized controlled trial in an ICU setting, harp music significantly decreased pain perception by 27% but did not significantly affect vital signs (Chiasson et al., 2013). Music has been successfully used to reduce distress in people with dementia (Mitchell & Agnelli, 2015).

Two-thirds of US households have at least one pet; nearly half of older Americans own a pet, but research on the therapeutic benefit of pets has been limited or not well designed. Cherniak

and Cherniak (2014) provided an overview of international research findings that indicate reported benefits to older participants in the management of agitation, some benefit with regard to the level of depression, the degree of loneliness, and a variety of physical activity benefits. Only one study demonstrated that older people with a pet may be more likely to fall or have an economic burden in caring for them. Cherniak and Cherniak (2014) conclude there is a need for more well-conducted research.

NURSING PRESENCE

Nurses have the potential to alleviate suffering and improve health care outcomes through their *therapeutic presence* (Carlson & Lowe, 2013; Ross, 2015). By connecting deeply with individuals and their families, nurses are in a unique position to facilitate their journey toward recovery or a peaceful death. When using *nursing presence* as a holistic intervention and establishing a therapeutic relationship, nurses are fulfilling the definition of nursing as an art and a science. Aiken and colleagues (Shang et al., 2013) at the University of Pennsylvania have provided a plethora of evidence about positive outcomes, lower mortality and morbidity, decreased readmission rates, and improved patient and nurse satisfaction scores when nurses are able to be present in meaningful ways.

Holistic health involves knowing the physical self, the emotional self, the mental self, and the spiritual self, seeking a comfortable balance among these aspects of being (Table 14-4), and knowing what changes need to be made to achieve this balance (AHNA, 2012c). This knowledge is vital to both the nurse attempting holistic practice and the individual interested in pursuing holistic health.

The *Wellness Quiz* can assist both nurses and individuals in the exploration of self that begins the process of self-care (Box 14-10).

When self-knowledge is gained, one or more of the holistic health strategies mentioned in this chapter, as well as emerging therapies, can be useful in helping people achieve optimal wellness. Every person is a whole, unique being; therefore each person needs to explore the possible strategies and individually decide which modalities are the best methods to achieve an improved state of wellness. People beginning this self-exploration and the practice of holistic health strategies may find that the practice changes their lives. Using presence and giving the gift of self enhances personal growth in the caregiver.

TABLE 14-4 Being There Versus Being With

The Nurse Who Is There	The Nurse Who
Is attentive	Is available with whole self
Is task oriented	Enters the person's world
Does the right thing	Becomes vulnerable
Fulfills a role	Is present as a whole person
Assists with coping	Alleviates suffering
Provides security	Enables growth

Safety and Effectiveness

Most CAM therapies lack a strong scientific evidence base, as many have not been studied with rigorous, well-designed clinical trials. The National Institutes of Health is sponsoring research to fill the knowledge gap and build this foundation for safety, efficacy, and suitability for specific conditions.

The US FDA regulates dietary supplements, but the regulations are less strict than those for prescription or over-the-counter medications. For example, safety and efficacy do not have to be proven before a product is marketed, although once the product is on the market, the FDA does monitor label claims and inserts.

Most CAM providers are not credentialed in a standardized national system, so credentialing regulations and standards differ nationally (NCCIH, 2015i). Some require training, testing, and continuing education, but most do not. Many practitioners belong to professional organizations that establish the requirements for their profession (Box 14-11).

It is imperative that nurses and other health care professionals have knowledge of CAM practices, safety, and guidelines for use to inform and protect users. Many medical and nursing schools now include alternative/complementary therapies in their curricula. To help ensure client safety, practitioners and users should review the following principles:

- Carefully select CAM practitioners with appropriate training and experience. The US National Library of Medicine (2016), a division of the National Institutes of Health, provides a directory of providers, services, and facilities (<https://www.nlm.nih.gov/medlineplus/directories.html>).
- Take time to research and understand the treatment and its effectiveness.
- Be aware of scams and fraudulent claims.
- Know the costs and if the treatment is covered by insurance.
- Quality is not always regulated for dietary supplements, and they may have side effects or react dangerously with other medications and supplements. In addition, they may not have been tested on children or pregnant women, so check labels with care.
- Some energy treatments may have side effects and cause inflammation that can affect other conditions and may not have been tested on children or pregnant women.

BOX 14-10 Wellness Quiz

- Do you wake up with enthusiasm for the day ahead?
- Do you have the high energy you need to do what you want?
- Do you laugh easily and often, especially at yourself?
- Do you confidently find solutions for the challenges in your life?
- Do you feel valued and appreciated?
- Do you appreciate others and let them know it?
- Do you have a circle of warm, caring friends?
- Do the choices you make every day get you what you want?

If you answered "no" to any of these questions, congratulations! You have identified areas in your life that you may want to change. This can be valuable information.

From Caton, S. (Ed.). (2003). *Wellness from within: The first step*. Anaheim, CA: American Holistic Health Association.

BOX 14-11 More Website Information

- The NCCIH webpages at <http://nccih.nih.gov/health/> provide further guidance on how to be an informed consumer, how to obtain information for the health care professional, and how to find and select a CAM practitioner.
- The NCCIH Clearinghouse (<http://nccih.nih.gov>) provides information on CAM and NCCIH, including publications and searches of federal databases of scientific and medical literature. The NCCIH Clearinghouse does not provide medical advice, treatment recommendations, or referrals to practitioners. The Office of Dietary Supplements (<https://ods.od.nih.gov>) seeks to strengthen knowledge and understanding of dietary supplements by evaluating scientific information, supporting research, sharing research results, and educating the public. Its resources include publications (such as *Dietary Supplements: What You Need to Know*), fact sheets on a variety of specific supplement ingredients (such as vitamin D and black cohosh), and the *PubMed Dietary Supplement Subset*.
- PubMed (<http://www.ncbi.nlm.nih.gov/sites/entrez>) is a service of the US National Library of Medicine (2016) and contains publication information and (in most cases) brief summaries of articles from scientific and medical journals.
- The National Library of Medicine's MedlinePlus provides resources that help answer health questions. MedlinePlus brings together authoritative information from the National Institutes of Health as well as other government agencies and health-related organizations (see <http://www.medlineplus.gov>).
- The National Guideline Clearinghouse (<http://www.guideline.gov>) provides evidence-based clinical practice guidelines and includes the use of CAM practices.
- Institute of Medicine *Clinical Practice Guidelines We Can Trust* (<http://iom.nationalacademies.org/Reports/2011/Clinical-Practice-Guidelines-We-Can-Trust.aspx>).

- Always inform the care providers and both traditional and holistic practitioners about the use of CAM therapies.

The American Nurses Association recognizes holistic nursing as an official nursing specialty with its own defined scope and standards of practice. The AHNA (2015a) defines holistic nursing as "all nursing that has healing the whole person as its goal and integrates **complementary and alternative medicine (CAM)** approaches into clinical practice." According to the AHNA, a holistic nurse:

- Is a legally licensed nurse who takes a mind-body-spirit-emotion approach to the practice of nursing
- Serves as a bridge between conventional healing and complementary and alternative healing practices, and is trained in both health care models
- Works in a variety of settings—from hospitals to universities to private practice
- May specialize in one or more modalities (or methods of healing), such as acupuncture, chiropractic, or energetic healing (AHNA, 2015a)

Let us return to Ms. Gonzalez and review what is known about her CAM options and their safety and efficacy for her. To review, lung cancer has recently been diagnosed in Ms. Gonzalez. She has never smoked and has never taken prescription medications. Her family and friends have counseled her about various CAM modalities. She is also scheduled to receive traditional allopathic lung cancer treatment.

Teaching Points for Ms. Gonzalez:

- Aspirin prolongs bleeding, so she should stop taking aspirin 5 days before surgery.
- Coenzyme Q₁₀ is claimed to have three main possible benefits: possible anticancer effect; protect the heart from toxic damage caused by chemotherapy drugs; and counteract chronic fatigue. Evidence to support coenzyme Q₁₀ working as an anticancer agent is lacking (Rottorf et al., 2014).
- Amygdalin/laetrile has been banned in the United States (Stapf et al., 2015).
- Milk thistle may have protective effects for her liver if she needs chemotherapy.
- Green tea has antioxidant properties and may counteract her chemotherapy, and uses oxidation to work on cancer cells.
- Kava kava may have an effect or it may have a placebo effect, but it may interact with anesthetic agents, and thus its use must be stopped 1 week before her surgery.
- Yoga, reiki, and acupuncture have demonstrated positive outcomes, and she should be referred to licensed practitioners.
- A careful assessment of her dietary supplements is necessary, as many inhibit therapies, including radiation therapy. Antioxidants are useful for prevention of cancer, but with some cancer treatments, they are counterproductive (Shang et al., 2013).

Now see if you can answer these questions.

- What is the difference between reiki and massage?
- What occurs in a usual visit for acupuncture or a reiki session?
- How do these therapies work?
- Are these therapies evidence-based?
- What is the best understanding of the biological and physiological mechanisms for these therapies?
- What is the best understanding of the safety of these therapies?
- Which therapies are covered by her insurance?
- Would Ms. Gonzalez's therapies be considered complementary, alternative, or integrative?

Therapeutic touch was offered to David P. Although he was skeptical that this treatment would be effective, he agreed to treatment to please his daughter. Increased heat was noted in the neck and shoulder areas. A 30-minute therapeutic touch treatment was performed, with special attention given to the neck and shoulder area. Immediately following the therapeutic touch, David P. rated his pain as 0 on a scale of 1 to 10 and reported that he "couldn't remember when he'd been so relaxed" and the excess heat had dissipated. David P. was also given some simple yoga exercises for the neck and advised to perform the exercises twice a day, five gentle repetitions each time. David P. was seen in the clinic a total of eight times for therapeutic touch and was given increasingly difficult yoga stretches for the neck and shoulders. His pain rating at the end of treatment remained at 0 on the 1 to 10 scale. He had stopped taking ibuprofen, saying, "I don't need it anymore." His neck range of motion had increased, and he was driving and working in his garden again. He continues his yoga stretches and has started performing daily qigong exercises.

SUMMARY

Holistic health strategies are designed to view the individual as a biopsychosocial-spiritual whole being. Many holistic health strategies have been practiced in other cultures for thousands of years; some began as religious practices. Many of these strategies can be used to help nurses and those they serve reach the *Healthy People 2020* goals. However, high-quality evidence-based research is lacking, although there is an increased awareness of the practices and more studies are being done. Holistic health practitioner and many consumers are convinced that these practices help promote and maintain health or cure a variety of health conditions. Believing is sometimes therapy in itself. The placebo effect

is not well understood but has a strong influence on the results of any research study, whether in conventional or complementary medicine.

Every person is a unique, individual being; therefore some exploration of self, the various strategies, and the practitioner will be necessary before it is determined which strategy is the right fit for each individual. Nurses must understand holistic health strategies because individuals are using them in increasing numbers, and they are evolving and expanding into new methods, such as hot yoga, where the therapy is conducted in a heated room at a temperature above 90° F. Nurses who begin to practice holistic interventions may find them a useful and exciting adjunct to their nursing practice and their personal lives.

CASE STUDY

Use of Therapeutic Touch: David P.

David P., an 82-year-old white man, came to the clinic reporting neck pain and stiffness of approximately 4 months' duration. He was previously treated with ibuprofen (Motrin), acetaminophen, and oxycodone (Percocet) as well as with physical therapy. At the time of the initial clinic visit, David P. was still taking ibuprofen but had stopped taking oxycodone because the pain "isn't bad enough to take drugs [narcotics]." He rated his neck pain as 5 on a scale of 1 to 10. Neck range of motion had increased, but he had problems when driving. David P. lives next to a very busy street and did not feel that he could turn his neck well enough to see the traffic coming. He was afraid to pull out into the street. His daughter had driven him to the clinic. She said, "Pop is still in pain. He has

little interest in doing anything. He walks like an old man, and he can't work in his garden because of the pain." The goal of treatment for David P. is pain relief and increased range of motion.

Reflective Questions

- What holistic health strategies might be used to relieve David's pain and to help him increase his range of motion?
- After the treatment goals have been reached, what holistic health strategies would you recommend to assist David P. in maintaining and improving his health?

CARE PLAN

Use of Therapeutic Touch: David P.

***NURSING DIAGNOSIS:** Disturbed energy field disturbance related to slowing or blocking of energy flow secondary to repetitive motion injury

Defining Characteristics

- Perceptions of changes in patterns of energy flow, such as:
- Temperature change: warmth, coolness
- Visual changes: image, color
- Disruption of the field: vacant, hole, spike, bulge
- Movement: wave, spike, tingling, dense, flowing
- Sounds: tone, words

Related Factors

- Pathophysiological: illness, injury
- Treatment-related: immobility, perioperative experience, labor and delivery
- Situational: pain, fear, anxiety, grieving
- Maturational: age-related developmental difficulties or crises

Expected Outcomes

- The person will report increased sense of relaxation.
- The person will report decreased anxiety and tension.
- The person will demonstrate evidence of physical relaxation (e.g., decreased blood pressure, pulse, respiratory rate, and muscle tension).
- The person will report an increased sense of well-being.

Interventions

- Provide privacy if possible.
- Explain energy therapy (therapeutic touch, reiki, healing touch) and obtain permission to treat the person.
- Position the person comfortably.
- Become quiet and still (centered) and bring the focus to the person.
- Assess (scan) the energy field for openness and flow.
- Clear the exterior energy field by combing through the field from head to toe (unruffling).
- Move the palms of the hands toward the person, 2 to 4 inches over the person's body, from head to feet in a smooth, light movement.
- Sense the cues to energy imbalance (i.e., warmth, coolness, tightness, heaviness, tingling, emptiness).
- Focus on perceived areas of imbalance to repattern the energy flow.
- Reassess and smooth the exterior energy field, ensuring that the energy flow is open in the feet.
- Gently stop the treatment and allow the person time to rest.
- Encourage the person to discuss the experience.

*NANDA Nursing Diagnoses—Herdman, T. H. & Kamitsuru, S. (Eds.). Nursing Diagnoses—Definitions and Classification 2015–2017. Copyright © 2014, 1994–2014 NANDA International. Used by arrangement with John Wiley & Sons Limited. In order to make safe and effective judgments using the NANDA-I nursing diagnoses it is essential that nurses refer to the definitions and defining characteristics of the diagnoses listed in this work.